slurp

Slurp Code Team

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START HERE

1 Getting Started **1**
- 1.1 Introduction . . . 1
- 1.2 Hosting . . . 1
- 1.3 Basic Setup . . . 1
- 1.4 Documentation . . . 1
- 1.5 Fuchsia Programming Site . . . 2
- 1.6 Logorama . . . 2
- 1.7 DITA Project . . . 3

2 Codewars **5**
- 2.1 Achieve mastery through challenge . . . 5
- 2.2 Go . . . 5
- 2.3 Specials . . . 6

3 Git **7**
- 3.1 Essential Git commands . . . 7
- 3.2 Sync your fork . . . 10
- 3.3 Squashing Commits . . . 11
- 3.4 Contributor Workflow . . . 11

4 GNU Freedom & Team Building **13**
- 4.1 Collaboration with Discord Servers, GitHub, Free Education Gamified . . . 13
- 4.2 Popular GNU Software . . . 13
- 4.3 Other Software . . . 13

5 Stamps from the past **15**

6 Cocaine **33**
- 6.1 What about the cost of these drugs? . . . 34
- 6.2 About the Author . . . 34
- 6.3 Resources . . . 34

7 Goa and The Stuff **35**
- 7.1 About the Author . . . 36

8 Grunge Culture **37**
- 8.1 About the Author . . . 38

9 LSD - POV **39**
- 9.1 About the Author . . . 41

10 Methamphetamine **43**
10.1 About the Author . . . 45

11 Queen Rhapsody **47**

12 60 THE 60s **49**
12.1 About the Author . . . 51

13 The Vietnam War and Drugs, A deadly combination **53**
13.1 About the Author . . . 55

14 Al Karama: The Home of Heroes **57**
14.1 Forces of Both Parties . . . 58
14.2 Combat Approaches . . . 59
14.3 White Weapon Battle . . . 59
14.4 Losses of Both Parties . . . 61

15 Amer Shafee, One of The Best Goalkeepers in History **63**
15.1 About the Author . . . 64

16 Captain Habis Al-Majali, the legend of the battles of Latrun and Bab Al-Wad **65**
16.1 About the Author . . . 68

17 Omar Al-Abdallat, The Sound of Jordan **69**
17.1 About the Author . . . 70

18 Teresa Halasa, a Jordanian Legend **71**
18.1 About the Author . . . 73

19 The Battle of Al-Latrun **75**
19.1 About the Author . . . 77

20 Wasfi Al-Tal **79**
20.1 About the Author . . . 83

21 Anderson Darling Test **85**
21.1 Kurtosis . . . 90
21.2 Types of kurtosis . . . 90
21.3 Excess kurtosis . . . 92
21.4 Asymmetry . . . 92
21.5 Chi Square Test . . . 95
21.6 About the Author . . . 102

22 Analysis of variance ANOVA for one factor and two factors **103**
22.1 ANOVA for a single factor . . . 103
22.2 VARIANCE ANALYSIS . . . 106
22.3 Analysis of variance for two factors . . . 106
22.4 About the Author . . . 110

23 Bayes Theorem **111**
23.1 Exercise 1 . . . 111
23.2 Exercise 2 . . . 112
23.3 Exercise 3 . . . 113
23.4 About the Author . . . 113

24 Block Design **115**
24.1 Random block design . . . 115

25 The Black Sholes Model **129**
25.1 About the Author . . . 136

26 The most common statistical errors used by researchers in their studies **137**
26.1 About the Author . . . 146

27 Continuous Probability Distribution **147**
27.1 Characteristics of the continuous probability distribution . . . 147
27.2 Gamma Distribution . . . 148
27.3 Advantages Of Gamma Distribution . . . 148
27.4 Disadvantages Of Gamma Distribution . . . 151
27.5 Beta Distribution . . . 156
27.6 Beta Distribution Applications . . . 156
27.7 About the Author . . . 160

28 What is a correlation? **161**
28.1 About the Author . . . 171

29 1 Mathematical curiosities **173**
29.1 1) Kaprekar's constant is a mysterious number . . . 173
29.2 2) Where does the sexagesimal system come from? . . . 174
29.3 3) Some mathematical tips that may interest you . . . 175

30 9 Determination coefficient **179**
30.1 Semi-partial correlation coefficients . . . 185
30.2 Partial correlation . . . 187

31 Descriptive Statistics **195**
31.1 Random descriptive statistics . . . 195
31.2 Measurement scales . . . 197
31.3 How the data is organized . . . 198
31.4 Table 1: Originally collected data . . . 198
31.5 Table 2 . . . 198
31.6 Table 3 - Frequencies (f) . . . 199
31.7 Relative frequencies . . . 199
31.8 Mean, median and mode . . . 199
31.9 About the Author . . . 200

32 Discriminant Analysis **201**
32.1 About the Author . . . 213

33 × Exponential Distribution **215**
33.1 Some examples of exponential distribution . . . 215
33.2 The density function of a continuous random variable that is exponentially distributed is defined by . . . 215
33.3 Applications of the exponential distribution . . . 216

34 Fermat's Theorem And More Than Three Centuries Of History **219**
34.1 GREAT MATHEMATICS PROVEN FERMAT'S THEOREM FOR SOME CASES . . . 221
34.2 About the Author . . . 224

35 Fibonacci series **225**
35.1 The Fibonacci series, the golden ratio, and how they describe the universal proportions of the world around us . . . 225

35.2 The Fibonacci sequence in nature . . . 226
35.3 The Fibonacci series and the golden ratio in art . . . 228
35.4 Original Author . . . 229

36 Fractal Ingles **231**
36.1 Fractals and their novel way of better explaining the world around us . . . 231
36.2 Classic examples of fractals . . . 235
36.3 The Sierpinski triangle . . . 236
36.4 Sierpinski's carpet . . . 237
36.5 Julia's set . . . 237
36.6 The Mandelbrot set . . . 238
36.7 Fractals in finance . . . 241

37 Free Distribution Testing **243**
37.1 The Sign Test . . . 244
37.2 Single-Tail Test Definition . . . 244
37.3 Two-Tailed Test . . . 245
37.4 Left Tail Test Right Tail Test Two-tail test . . . 247
37.5 The Wilcoxon Signed-Rank Test . . . 249
37.6 Main Characteristics Of The Wilcoxon Signed-Rank Test . . . 249
37.7 Wilcoxon Signed-Rank Test Example 2 For Paired Samples . . . 251
37.8 About the Author . . . 253

38 Frequentist versus Bayesian statistics **255**
38.1 Hypothesis testing . . . 259
38.2 About the Author . . . 260

39 The Gauss-Jordan method to solve Systems of Linear Equations **261**
39.1 The Gauss method . . . 262
39.2 Repeating the steps going down . . . 263
39.3 Getting results and turning the tide to move upwards . . . 264
39.4 Some details to keep in mind when programming this method . . . 265
39.5 The Jordan improvement . . . 266
39.6 About the Author . . . 267

40 Graphic Schema Theory **269**
40.1 About the Author . . . 270

41 Kendall's correlation coefficient for repeating variables **271**
41.1 Normal Distribution . . . 271
41.2 Kendall's correlation coefficient with equal variables . . . 272
41.3 About the Author . . . 275

42 Long-term behavior of Markov Chains **277**
42.1 Stationary Vectors . . . 277

43 Markov Chains **285**
43.1 Stochastic matrices . . . 286
43.2 State diagrams . . . 286
43.3 Markov regular chains . . . 288

44 Multivariate Statistics **297**
44.1 About the Author . . . 307

45 Negative Binomial Distribution **309**
45.1 Geometric distribution . . . 314

45.2 Particle distribution in levels or states . . . 321

46 Nonparametric tests (part two) 325
46.1 The Kruskal-Wallis test . . . 330
46.2 Friedman rank analysis of variance . . . 334
46.3 About the Author . . . 339

47 Numeral Systems 341
47.1 A hard decision . . . 341
47.2 The Roman numeral system . . . 342
47.3 The power of Powers . . . 343
47.4 The importance of Zero . . . 344
47.5 Other numeral systems . . . 344
47.6 Octal and Hexadecimal . . . 345
47.7 About the Author . . . 346

48 Parametric statistics 347

49 Parametric Methods To Compare Two Means 359
49.1 Comparison between two independent means . . . 361
49.2 Steps to apply the Student's t test for independent groups of the same size: . . . 362
49.3 Student's t test for independent samples of different sizes . . . 368
49.4 Student's t test for two dependent samples . . . 371
49.5 About the Author . . . 373

50 Point Estimation Methods 375
50.1 Moment Method . . . 375
50.2 Mathematical hope . . . 376
50.3 Example of mathematical expectation . . . 376
50.4 Exercise 1 Of Moments . . . 377
50.5 Important Concepts When Conducting A Statistical Hypothesis Test . . . 378
50.6 Important concepts when conducting a statistical hypothesis test . . . 378
50.7 Hypothesis testing regarding proportions . . . 383
50.8 About the Author . . . 384

51 Poisson Distribution 385
51.1 Some History . . . 385
51.2 Amount function . . . 386
51.3 Benford's law . . . 391
51.4 Benford's Law Enforcement . . . 393
51.5 About the Author . . . 397

52 Probabilities 399
52.1 Events . . . 401
52.2 Conditional probability . . . 404
52.3 Bayes theorem . . . 406
52.4 Counting techniques . . . 408

53 Sampling methods 411
53.1 Sampling methods . . . 412
53.2 Examples of sampling methods . . . 412
53.3 Different utilities of probability sampling . . . 414
53.4 Different types of non-probability sampling . . . 415
53.5 Non-probability sampling types . . . 415
53.6 Uses and utilities of sampling or non-probability . . . 421

53.7 Sampling errors to avoid . . . 421
53.8 The main risks of making a sampling error . . . 421
53.9 Recommendations to obtain a good sample within the investigation . . . 422
53.10 Errors mostly made with respect to the accuracy of the answers . . . 423

54 Standard deviation **425**
54.1 General considerations . . . 426
54.2 About the Author . . . 429

55 Statistical estimation **431**
55.1 The point estimate . . . 431
55.2 The precision error . . . 439
55.3 About the Author . . . 439

56 Tests to see if the data meet a normal distribution **441**
56.1 Shapiro Wilk test . . . 442
56.2 Advantages of Kolmogórov Smirnov . . . 445
56.3 Example of the test kolmogorov Smirnov . . . 445
56.4 Interval limits Z values of interval limits . . . 446
56.5 Calculation of the D statistic of the Kolmogorov Smirnov test . . . 449
56.6 Lilliefors test . . . 451

57 The Monte Carlo method **453**
57.1 About the Author . . . 467

58 Types of probability distributions **469**
58.1 Bernoulli's distribution . . . 473
58.2 Discrete Uniform Distribution . . . 475
58.3 About the Author . . . 483

59 Persian or Farsi **485**
59.1 About the Author . . . 486

60 Iran's Best Wrestlers **487**
60.1 About the Author . . . 488

61 Persepolis **489**

62 Shapouri House **491**
62.1 Gallery . . . 492
62.2 About the Author . . . 497

63 Tabatabai House **499**
63.1 Images . . . 499
63.2 About the Author . . . 499

64 Acid House **501**
64.1 What exactly is the TB-303? . . . 501
64.2 Sources . . . 502
64.3 About the Author . . . 502

65 Acid Trance **503**
65.1 Sources . . . 504
65.2 About the Author . . . 504

66 Ambient **505**
66.1 Sources . . . 506
66.2 About the Author . . . 506

67 Big Beat **507**
67.1 About the Author . . . 508

68 Dubstep **509**
68.1 Sources . . . 510
68.2 About the Author . . . 510

69 Electro **511**
69.1 Sources . . . 512
69.2 About the Author . . . 512

70 Goa **513**
70.1 About the Author . . . 514

71 Hardcore **515**
71.1 About the Author . . . 516

72 House **517**
72.1 About the Author . . . 518

73 IDM **519**
73.1 The IDM List . . . 520
73.2 About the Author . . . 521

74 Jungle Drum Bass **523**
74.1 Sources . . . 524
74.2 About the Author . . . 524

75 Nu Jazz **525**
75.1 About the Author . . . 526

76 Nu Skool Breaks **527**
76.1 About the Author . . . 528

77 Progressive **529**
77.1 Sources . . . 530
77.2 About the Author . . . 530

78 Speed garage **531**
78.1 About the Author . . . 532

79 Techno **533**
79.1 About the Author . . . 534

80 Trance **535**
80.1 Sources . . . 536
80.2 About the Author . . . 536

81 Trip Hop **537**
81.1 Sources . . . 538
81.2 About the Author . . . 538

82 The DJ **539**
82.1 The present and the future . . . 540

83 Electronic Musical Instrument **541**
83.1 Sources . . . 542
83.2 About the Author . . . 542

84 Denis D'or **543**
84.1 About the Author . . . 544
84.2 References . . . 544

85 Electromechanical Piano **545**
85.1 What is an 'electromechanical' instrument? . . . 545
85.2 About the Author . . . 546
85.3 References . . . 546

86 Musical Telegraph **547**
86.1 What Is An Electrical Telegraph? . . . 547
86.2 Musical Telegraph . . . 547
86.3 Next Topic: Telharmonium . . . 550
86.4 Sources . . . 550
86.5 About the Author . . . 550

87 Telharmonium **551**
87.1 [The Keyboard of the Telharmonium] . . . 551
87.2 [Thaddeus Cahill's patent documents for the first Telharmonium of 1897] . . . 552
87.3 About the Author . . . 553
87.4 References . . . 553

88 Singing Arc **555**
88.1 Next topic: Helmholtz Sound Synthesiser . . . 556
88.2 Sources . . . 556
88.3 About the Author . . . 556

89 Wireless Organ **557**
89.1 Georges Désilets . . . 557
89.2 First Version . . . 557
89.3 Next topic: Optophonic Piano . . . 559
89.4 Sources . . . 559
89.5 About the Author . . . 559

90 Optophonic Piano **561**
90.1 Sources . . . 562
90.2 About the Author . . . 562

91 Synthetic Tone **563**
91.1 Sources . . . 565
91.2 About the Author . . . 565

92 Electrophon **567**
92.1 Sources . . . 569
92.2 About the Author . . . 569

93 ♪ Hugoniot Organ **571**
93.1 Sources . . . 573
93.2 About the Author . . . 573

94 Theremin **575**
94.1 Sources . . . 576
94.2 About the Author . . . 576

95 Staccatone **577**
95.1 Sources . . . 578
95.2 About the Author . . . 578

96 Sphärophon **579**
96.1 Sources . . . 581
96.2 About the Author . . . 581

97 The Luminaphone **583**
97.1 Sources . . . 585
97.2 About the Author . . . 585

98 The Radio Harmonium **587**
98.1 Vacuum tube . . . 587
98.2 Sources . . . 588
98.3 About the Author . . . 588

99 The Pianorad **589**
99.1 Theory of the Instrument . . . 590
99.2 Sources . . . 591
99.3 About the Author . . . 591

100 Keyboard Electric Harmonium **593**
100.1 Sources . . . 595
100.2 About the Author . . . 595

101 Kurbelspharophon **597**
101.1 Next topic . . . 598
101.2 Sources . . . 599
101.3 About the author . . . 599

102 Clavecin Électrique **601**
102.1 Sources . . . 602
102.2 About the Author . . . 603

103 Helmholtz Sound Synthesiser **605**
103.1 Next topic: Choralcelo . . . 606
103.2 Sources . . . 606
103.3 About the Author . . . 606

104 Choralcelo **607**
104.1 Sources . . . 609
104.2 About the Author . . . 609

105 Audion Piano **611**
105.1 Sources . . . 613
105.2 About the Author . . . 613

106 Sound-Producing Device **615**
106.1 Sources . . . 616
106.2 About the Author . . . 616

107 Amman - The Capital of Jordan **617**
107.1 About the Author . . . 618
107.2 References . . . 618

108 Amsterdam **619**
108.1 About the Author . . . 621

109 Andorra **623**
109.1 Romanesque churches . . . 623
109.2 Andorra la Vella . . . 624
109.3 Tristaina Lakes . . . 624
109.4 Important towns to see in Andorra . . . 624
109.5 Naturland . . . 625
109.6 Caldea . . . 625
109.7 Skiing in GrandValira . . . 625
109.8 Roc of the Quer viewpoint . . . 626
109.9 Andorran bridges . . . 626
109.10 Meritxell Sanctuary . . . 626

110 Auckland **627**
110.1 Queen Street . . . 627
110.2 Sky Tower . . . 627
110.3 Giapo Ice Cream . . . 628
110.4 Viaduct Harbor . . . 628
110.5 Wynyard Quarter . . . 628
110.6 Mount Eden . . . 629
110.7 Auckland Harbor . . . 629
110.8 Auckland Domain . . . 629
110.9 Auckland War Memorial Museum . . . 629
110.10 Winter Garden Botanical Garden . . . 629
110.11 Cornwall Park . . . 630
110.12 Albert Park . . . 630
110.13 One Tree Hill . . . 630
110.14 About the Author . . . 630

111 Bangkok **631**
111.1 The Grand Palace in Bangkok . . . 631
111.2 Bangkok markets . . . 632
111.3 Chatuchak Market . . . 632
111.4 Khao San Road . . . 633
111.5 Chao Phraya . . . 634
111.6 Wat pho . . . 634
111.7 Viewpoints of Bangkok . . . 635
111.8 Wat Arun . . . 636
111.9 Chinatown . . . 636
111.10 Malls . . . 636
111.11 Jim Thompson House . . . 636
111.12 About the Author . . . 637

112 Barcelona **639**
112.1 The Holy Family . . . 639
112.2 The Gothic neighborhood . . . 640
112.3 House Batllo . . . 640
112.4 The Rambla . . . 641
112.5 Hospital of Santa Creu i Sant Pau . . . 641

112.6 El Born . . . 641
112.7 Park Guell . . . 641
112.8 Viewpoints of Barcelona . . . 642
112.9 House Mila . . . 642
112.10About the Author . . . 643

113 Beijing **645**
113.1 About the Author . . . 648

114 Belfast **649**
114.1 Route of the murals . . . 649
114.2 Belfast City Council . . . 650
114.3 Harland and Wolff Shipyards . . . 650
114.4 Historic pubs . . . 651
114.5 Queen's University Belfast . . . 651
114.6 Botanical Garden . . . 652
114.7 St Anne's Cathedral . . . 652
114.8 Belfast Castle . . . 652
114.9 St George's Market . . . 653
114.10Giants Causeway . . . 653
114.11About the Author . . . 653

115 Bogota **655**
115.1 Monserrate Hill . . . 656
115.2 The Candelaria . . . 656
115.3 The Gold Museum . . . 656
115.4 Funnel Alley . . . 657
115.5 Bolivar Square . . . 657
115.6 Botero Museum . . . 658
115.7 Church of San Francisco . . . 658
115.8 Journalists' Park . . . 658
115.9 Santa Clara Church Museum . . . 658
115.10Have a few drinks in the T Zone . . . 658
115.11Usaquen neighborhood . . . 658
115.12Tours in Bogota . . . 659
115.13About the Author . . . 659

116 Brasilia **661**
116.1 Brasilia Cathedral . . . 661
116.2 Planalto Palace . . . 662
116.3 Paranoia Lake . . . 663
116.4 Juscelino Kubitschek Bridge . . . 663
116.5 Honestino Guimarães National Museum . . . 663
116.6 Pantheon Tancredo Neves . . . 664
116.7 TV Tower . . . 664
116.8 Square of the Three Powers . . . 664
116.9 South Lake Jetty . . . 665
116.10Sanctuary Don Bosco . . . 665
116.11About the Author . . . 665

117 Brisbane **667**
117.1 About the Author . . . 668

118 Brussels **669**
118.1 Grand Place . . . 669

118.2 Saint-Hubert Galleries . . . 670
118.3 Manneken Pis . . . 670
118.4 Brussels Cinquantenaire Park . . . 670
118.5 Atomium . . . 671
118.6 Palace of Justice . . . 671
118.7 Sablon Quarter . . . 671
118.8 Royal Park of Brussels . . . 672
118.9 Saint Michael and Saint Gudula Cathedral . . . 672
118.10 Comic book route . . . 672
118.11 The European Quarter . . . 672
118.12 Mini Europe . . . 672
118.13 The Sacred Heart Basilica . . . 673
118.14 About the Author . . . 673

119 Bucaramanga **675**
119.1 Visit the cathedral . . . 675
119.2 Stroll through the botanical garden . . . 676
119.3 The Hill of the Holy . . . 676
119.4 The Total Book House . . . 677
119.5 Parks and gardens . . . 677
119.6 Experience the local dishes in Cabrón . . . 677
119.7 The House of Bolivar Museum . . . 677
119.8 Bucaramanga Water Park . . . 677
119.9 Museum of Modern Art . . . 678
119.10 House Luis Peru de la Croix . . . 678
119.11 Paragliding . . . 678
119.12 Visit the Patrimonial Town of Giron . . . 678
119.13 Chicamocha Bucaramanga National Park . . . 678
119.14 About the Author . . . 679

120 Bucharest **681**
120.1 Bucharest Patriarchal Cathedral . . . 681
120.2 Uniri Square . . . 682
120.3 Stravopoleos Monastery . . . 682
120.4 Macca–Vilacrosse Passage . . . 682
120.5 Revolution Square . . . 683
120.6 Athenaeum . . . 684
120.7 Arch of Triumph . . . 684
120.8 Where to eat and go out at night in Bucharest . . . 684
120.9 About the Author . . . 684

121 Budapest **685**
121.1 Budapest Parliament . . . 685
121.2 Chain bridge . . . 686
121.3 Vaci Utca . . . 687
121.4 Gellert Spa . . . 687
121.5 Historic cafes . . . 688
121.6 Jewish quarter . . . 688
121.7 Ruins bars . . . 689
121.8 St. Stephen's Basilica . . . 689
121.9 Budapest Opera . . . 689
121.10 Andrassy Avenue . . . 689
121.11 Varosliget Park . . . 689
121.12 Szechenyi Spa . . . 689

121.13 Buddha Castle . . . 689
121.14 About the Author . . . 690

122 Buenos Aires **691**
122.1 About the Author . . . 693

123 Cartagena de Indias **695**
123.1 About the Author . . . 698

124 Copenhagen **699**
124.1 Nyhavn . . . 700
124.2 The little Mermaid . . . 700
124.3 Christiania . . . 700
124.4 Stroget Street . . . 700
124.5 Rosenborg Castle . . . 701
124.6 Church of San Salvador . . . 701
124.7 Amalienborg Palace and the Marble Church . . . 701
124.8 Tivoli Gardens . . . 702
124.9 Slotsholmen . . . 702
124.10 Round Tower . . . 703
124.11 About the Author . . . 703

125 Dharamshala – An Exquisite Spiritual Retreat **705**
125.1 **Things to do in Dharamshala:** . . . 705
125.2 About the Author . . . 707

126 Dubai **709**
126.1 About the Author . . . 710

127 Florence **711**
127.1 Florence Cathedral . . . 711
127.2 Giotto's Campanile . . . 712
127.3 Baptistery of San Giovanni . . . 713
127.4 New Market . . . 714
127.5 Della Signoria Square . . . 714
127.6 Palazzo Vecchio . . . 714
127.7 Church of Santa Croce . . . 714
127.8 Uffizi Gallery . . . 714
127.9 Ponte Vecchio . . . 715
127.10 Oltrano neighborhood . . . 715
127.11 The Pitti Palace and the Boboli Gardens . . . 716
127.12 Michelangelo Square . . . 716
127.13 Church of Santa Maria Novella . . . 716
127.14 Academy Gallery . . . 716
127.15 Medici Chapel . . . 716
127.16 About the Author . . . 716

128 Frankfurt **717**
128.1 Romerberg square . . . 718
128.2 Goethe's house . . . 718
128.3 Sachsenhausen district . . . 719
128.4 Main Tower . . . 720
128.5 Collegiate Church of Saint Bartholomew . . . 721
128.6 Stroll along the banks of the Main . . . 721
128.7 Frankfurt Stock Exchange . . . 721

128.8 Palm Garden . . . 722
128.9 Museums to visit in Frankfurt . . . 722
128.10 Jewish cemetery . . . 722
128.11 About the Author . . . 722

129 Gijon **723**
129.1 San Lorenzo Beach . . . 723
129.2 The Labor of Gijon . . . 724
129.3 Cimadevilla neighborhood of Gijon . . . 725
129.4 Visit the Port . . . 725
129.5 Hill Park . . . 725
129.6 Marquis Square . . . 726
129.7 The Church of San Pedro Apostol in Gijon . . . 726
129.8 Gijon Main Square . . . 726
129.9 Poniente Beach . . . 726
129.10 Begoña walk . . . 727
129.11 About the Author . . . 727

130 Hawaii **729**
130.1 Hawaii Volcanoes National Park . . . 729
130.2 Waimea Canyon . . . 730
130.3 Honolulu . . . 731
130.4 Molokai . . . 732
130.5 Hapuna Beach . . . 732
130.6 Haleakala National Park . . . 732
130.7 Na Pali Coast . . . 733
130.8 Oahu's North Shore . . . 733
130.9 Lanikai Beach . . . 733
130.10 Kaanapali Beach . . . 733
130.11 About the Author . . . 733

131 Heidelberg **735**
131.1 Altstadt or Old Town . . . 735
131.2 Karlsplatz or Charles Square . . . 737
131.3 Charles Theodore Bridge . . . 737
131.4 Philosopher's Walk . . . 737
131.5 The King's Chair . . . 737
131.6 Heidelberg Castle . . . 738
131.7 Old University of Heidelberg . . . 738
131.8 About the Author . . . 738

132 Hong Kong **739**
132.1 About the Author . . . 740

133 Hong Kong **741**
133.1 Avenue of stars . . . 741
133.2 Symphony of light . . . 742
133.3 Nathan Road . . . 742
133.4 Lai Kwai Fong . . . 742
133.5 Eat dim sum . . . 742
133.6 Kowloon Park . . . 742
133.7 Hong Kong Beaches . . . 742
133.8 Eat at Tim Ho Wan . . . 742
133.9 Hong Kong temples . . . 742
133.10 Climb Victoria Peak . . . 743

133.11Choi Hung Estate . . . 743
133.12Monster Building . . . 743
133.13Ladies Market . . . 743
133.14Temple Street Market . . . 744
133.15Victoria Bay Cruise . . . 744
133.16Longest escalator in the world . . . 744
133.17Double-decker trams . . . 744
133.18Nan Lian Garden . . . 744
133.19The Soho neighborhood . . . 744
133.20Mong Kok neighborhood . . . 744
133.21Big Tian Tian Buddha . . . 745
133.22Disneyland Hong Kong . . . 745
133.23Macau Island Tour . . . 746
133.24About the Author . . . 747

134 Ibiza **749**
134.1 About the Author . . . 750

135 Istanbul **751**
135.1 RESOURCES – You can see these websites for further reading about Istanbul . . . 752

136 Jakarta **753**
136.1 Kota Kua . . . 753
136.2 Batavian Coffee . . . 753
136.3 The Great Istiqlal Mosque . . . 754
136.4 Jakarta Cathedral . . . 754
136.5 The Indonesian National Monument . . . 754
136.6 The Sky Bar . . . 755
136.7 Anloc a beach to watch the sunset . . . 755
136.8 Go to a shopping center . . . 755
136.9 Chinatown . . . 755
136.10Gastronomy in Indonesia . . . 755
136.11About the Author . . . 756

137 Johannesburg **757**
137.1 Constitution Hill . . . 757
137.2 Go up to the Carlton Center . . . 758
137.3 Apartheid Museum . . . 758
137.4 Soccer City Stadium . . . 758
137.5 Visit Soweto . . . 759
137.6 Liliesleaf farm . . . 760
137.7 About the Author . . . 761

138 Kyoto **763**
138.1 Fushimi Inari Taisha . . . 763
138.2 Kinkaku-ji . . . 764
138.3 Gion District . . . 765
138.4 Kiyomizu-dera . . . 766
138.5 Arashiyama Bamboo Forest . . . 767
138.6 Ginkaku-ji . . . 767
138.7 Path of Philosophy . . . 767
138.8 Ryoanji . . . 768
138.9 Sannenzaka and Ninenzaka streets . . . 768
138.10Heian Jingu and Sanjusangendo . . . 768
138.11About the Author . . . 768

139 Las Vegas **769**
139.1 About the Author . . . 770

140 Lima **771**
140.1 Main Square . . . 771
140.2 Love Park . . . 772
140.3 Huaca Pullcana . . . 772
140.4 Barranco neighborhood . . . 773
140.5 Cathedral Basilica of Lima . . . 773
140.6 Miraflores . . . 773
140.7 Saint Francis Monastery . . . 774
140.8 Magical Water Circuit . . . 774
140.9 San Martin Square . . . 774
140.10About the Author . . . 774

141 Lisbon **775**
141.1 About the Author . . . 779

142 London **781**
142.1 About the Author . . . 784

143 Madrid **785**
143.1 1 - The Gate of the Sun . . . 785
143.2 2 - Main Square . . . 785
143.3 3 - The San Miguel Market . . . 786
143.4 4 - The Town Square . . . 787
143.5 5 - Almudena Cathedral . . . 787
143.6 6 - The Royal Palace . . . 787
143.7 7 - The Temple of Debod . . . 788
143.8 8 - The Plaza España . . . 788
143.9 9 - The Great Way . . . 788
143.1010 - Cibeles Square . . . 788
143.11About the Author . . . 789

144 Malaga **791**
144.1 The Alcazaba of Malaga . . . 791
144.2 Larios Street . . . 792
144.3 Malaga Cathedral . . . 792
144.4 Gibralfaro Castle . . . 793
144.5 The Picasso Museum . . . 793
144.6 The Roman Theater . . . 793
144.7 Stroll through the Port . . . 793
144.8 Soho Neighborhood . . . 793
144.9 Malaga Park . . . 793
144.10Atarazanas Market . . . 794
144.11About the Author . . . 794

145 Melbourne **795**
145.1 About the Author . . . 796

146 Mexico City **797**
146.1 The Zocalo . . . 797
146.2 Palace of Fine Arts . . . 798
146.3 Main temple . . . 798
146.4 Coyoacan neighborhood . . . 799

146.5 Francisco I. Madero Street . . . 799
146.6 The forest of Chapultepec . . . 799
146.7 Visit the pyramids of Teotihuacán . . . 799
146.8 San Angel neighborhood . . . 800
146.9 Basilica of Saint Mary of Guadalupe . . . 800
146.10 Xochimilco . . . 800
146.11 About the Author . . . 801

147 Montevideo **803**
147.1 Intendancy viewpoint . . . 804
147.2 July 18 Avenue . . . 804
147.3 Independence Square . . . 804
147.4 Palace Saved . . . 804
147.5 Rambla of Montevideo . . . 805
147.6 Beaches in Montevideo . . . 805
147.7 Parque Rodó and the Summer Theater . . . 805
147.8 Legislative Palace . . . 806
147.9 Dr. Tristán Navaja Market . . . 806
147.10 Where to eat in Montevideo . . . 806
147.11 The places to visit in Montevideo at night . . . 806
147.12 About the Author . . . 807

148 Moscow **809**
148.1 About the Author . . . 810

149 Newcastle **811**
149.1 About the Author . . . 811

150 Nice **813**
150.1 Vielle Ville . . . 813
150.2 Promenade des Anglais . . . 814
150.3 Saint Nicholas Cathedral . . . 815
150.4 Castle Hill . . . 816
150.5 Lascaris Palace and Matisse Museum . . . 816
150.6 Flower Market . . . 817
150.7 Nice churches . . . 817
150.8 Lympia Harbor . . . 817
150.9 Nice squares . . . 817
150.10 Excursions from Nice . . . 818
150.11 About the Author . . . 818

151 Paris **819**
151.1 About the Author . . . 820

152 Pattaya **821**
152.1 About the Author . . . 823

153 Porto **825**
153.1 Lello and Irmão Bookstore . . . 825
153.2 Clerigos Church and Tower . . . 826
153.3 Ribeira . . . 827
153.4 The Porto Cathedral . . . 827
153.5 Do Barredo neighborhood . . . 829
153.6 Street of the Flowers . . . 829
153.7 Bolhao Market . . . 829

153.8 Rua Santa Catarina . . . 829
153.9 Stock Exchange Palace . . . 829
153.10 Church of San Francisco . . . 829
153.11 Vila Nova de Gaia . . . 829
153.12 San Bento Station . . . 830
153.13 Porto Walls . . . 830
153.14 Crystal Palace Gardens . . . 830
153.15 About the Author . . . 830

154 Prescott (pronounced "Preskit" or "Preskut"by the locals) 831
154.1 Logo . . . 832
154.2 About the Author . . . 832

155 Rio de Janeiro 835
155.1 Ipanema and Leblon Beach . . . 835
155.2 Rodrigo de Freitas Lagoon . . . 836
155.3 Copacabana . . . 836
155.4 Lake Park . . . 836
155.5 Corcovado and Christ the Redeemer . . . 836
155.6 Bread of Sugar . . . 837
155.7 Santa Teresa neighborhood . . . 837
155.8 Maracana . . . 838
155.9 Museum of Modern Art (MAM) . . . 838
155.10 Tijuca Forest National Park . . . 838
155.11 Museum of Contemporary Art of Niterói . . . 838
155.12 Botanical Garden . . . 838
155.13 National Museum of Fine Arts . . . 839
155.14 Sao Bento Monastery . . . 839
155.15 Favelas . . . 839
155.16 About the Author . . . 839

156 San Francisco 841
156.1 The Golden Gate . . . 841
156.2 The Presidio Park . . . 842
156.3 Fisherman's Wharf . . . 842
156.4 Alcatraz Island . . . 842
156.5 Castro neighborhood . . . 843
156.6 Haight-Ashbury . . . 843
156.7 Painted Ladies . . . 843
156.8 Twin Peaks . . . 844
156.9 Golden Gate Park . . . 844
156.10 Chinatown . . . 844
156.11 Little Italy . . . 844
156.12 Japantown . . . 845
156.13 About the Author . . . 845

157 Santiago de Chile 847
157.1 Main Square . . . 847
157.2 The Coin Palace . . . 847
157.3 The San Cristobal hill . . . 848
157.4 The Metropolitan Park . . . 848
157.5 Santa Lucia Hill . . . 848
157.6 The Bellavista neighborhood . . . 849
157.7 The Chascona . . . 849
157.8 Lastarria neighborhood . . . 849

157.9 Central Market . . . 849
157.10 Paris London neighborhood . . . 849
157.11 Museum of Memory and Human Rights . . . 849
157.12 About the Author . . . 850

158 Santiago de Compostela **851**
158.1 The Cathedral of Santiago of Compostela . . . 851
158.2 Obradoiro Square . . . 852
158.3 Historic helmet . . . 853
158.4 Convent of San Francisco . . . 853
158.5 Food Market . . . 853
158.6 Galician People's Museum . . . 854
158.7 Climb Mount Pedroso . . . 854
158.8 Monastery of San Martin Pinario . . . 854
158.9 Alameda Park . . . 854
158.10 River walk along the Sarela River . . . 854
158.11 About the Author . . . 855

159 Saragossa **857**
159.1 Basilica of Our Lady of the Pillar . . . 857
159.2 Pillar Square . . . 858
159.3 Aljaferia Palace . . . 858
159.4 Cathedral of the Savior . . . 859
159.5 The Tube of Zaragoza . . . 859
159.6 Saragossa Old Town . . . 860
159.7 Sunset from the Stone Bridge . . . 860
159.8 The Roman Saragossa . . . 860
159.9 Central Market . . . 860
159.10 Large Park Jose Antonio Labordeta . . . 860
159.11 About the Author . . . 861

160 Shanghai **863**
160.1 Shanghai Promenade: The Bund . . . 863
160.2 Yu Garden . . . 864
160.3 The Jade Buddha Temple . . . 864
160.4 The Shanghai Museum . . . 864
160.5 Longhua Temple and Pagoda . . . 864
160.6 The Oriental Pearl Tower . . . 864
160.7 Shopping on Nanjing Road . . . 865
160.8 Town square . . . 865
160.9 The French Connection: Tianzifang . . . 865
160.10 Xujiahui Cathedral and Sheshan Basilica . . . 865
160.11 Shanghai Science and Technology Museum . . . 866
160.12 The Chinese Art Museum . . . 866
160.13 The Maglev . . . 866
160.14 About the Author . . . 867

161 Stockholm **869**
161.1 Gamla Stan . . . 869
161.2 Royal Palace . . . 870
161.3 Riddarholmen Church . . . 870
161.4 Parliament of Sweden . . . 870
161.5 Saint Nicholas Cathedral . . . 870
161.6 Stockholm City Hall . . . 871
161.7 Kungstradgarden Park . . . 871

161.8 Subway . . . 871
161.9 Vasa Museum . . . 871
161.10 Skansen-Museum . . . 871
161.11 Drottningholm Palace . . . 871
161.12 ABBA Museum . . . 872
161.13 A boat ride . . . 872
161.14 Sodermalm neighborhood . . . 872
161.15 Sergel Square . . . 872
161.16 About the Author . . . 872

162 Tokyo **875**
162.1 1. The Imperial Palace . . . 875
162.2 2. The Ginza District . . . 875
162.3 3. National Museum of Natural Sciences . . . 876
162.4 4. Ueno Park, Zoo . . . 876
162.5 5. The Temple of Senso-Ji . . . 876
162.6 6. Tokyo National Museum . . . 876
162.7 7. National Museum of Western Art . . . 876
162.8 8. Meiji Shrine . . . 876
162.9 9.- Miraikan Museum . . . 876
162.10 10. Tokyo Skytree . . . 877
162.11 11. National Art Center . . . 877
162.12 12. Kabuki-za Theater . . . 877
162.13 13. Mori Art Museum . . . 877
162.14 14. Tokyo Disney Sea . . . 877

163 Venice **879**
163.1 About the Author . . . 881

164 Vienna **883**
164.1 Schonbrunn Palace . . . 883
164.2 Naschmarkt Market . . . 884
164.3 Hofburg Palace . . . 884
164.4 Austrian National Library . . . 884
164.5 Spanish Riding School . . . 885
164.6 The Vienna Opera . . . 885
164.7 Capuchin Crypt . . . 885
164.8 St. Stephen's Cathedral . . . 886
164.9 Stadtpark . . . 886
164.10 Ringstrasse . . . 886
164.11 Church of San Carlos Borromeo . . . 886
164.12 Belvedere Palace . . . 886
164.13 Prater . . . 887
164.14 Mozart's House . . . 887
164.15 About the Author . . . 887

165 Warsaw **889**
165.1 Old City . . . 889
165.2 Royal Castle . . . 890
165.3 Palace of Culture and Science . . . 891
165.4 New City . . . 891
165.5 Warsaw Royal Route . . . 891
165.6 Warsaw Ghetto . . . 892
165.7 Prague neighborhood . . . 892
165.8 Chopin in Warsaw . . . 892

165.9 Lazienki Park . . . 893
165.10 Wilanów Palace . . . 893
165.11 About the Author . . . 893

166 Washington **895**
166.1 White House . . . 895
166.2 George Washington Monument . . . 896
166.3 Capitol . . . 897
166.4 Library of Congress . . . 898
166.5 Most interesting museums in the city . . . 899
166.6 Smithsonian Castle Garden . . . 899
166.7 Tidal Basin and the Thomas Jefferson Memorial . . . 899
166.8 Reflecting Pool . . . 900
166.9 Abraham Lincoln Memorial . . . 900
166.10 The night lights of the National Mall . . . 900
166.11 The Georgetown neighborhood . . . 901
166.12 Arlington cemetery . . . 901
166.13 Chinatown and Ford's Theater . . . 901
166.14 About the Author . . . 901

167 Zürich **903**
167.1 The historic center . . . 903
167.2 Lake Zurich . . . 904
167.3 Grossmunster Church . . . 905
167.4 National Museum of Zurich . . . 905
167.5 Bahnhofstrasse . . . 905
167.6 Üetliberg viewpoint . . . 906
167.7 The Opera . . . 906
167.8 Lindenhoff . . . 906
167.9 Zurich Botanical Garden . . . 906
167.10 About the Author . . . 907

168 Costa Rica **909**
168.1 Manuel Antonio National Park . . . 909
168.2 Marino Ballena National Park . . . 909
168.3 Corcovado . . . 910
168.4 Puerto Viejo and Cahuita . . . 910
168.5 Tortuguero . . . 910
168.6 Guanacaste . . . 910
168.7 Malpais and Santa Teresa . . . 911
168.8 Montezuma . . . 911
168.9 Poas Volcano . . . 911
168.10 Peace Waterfall . . . 911
168.11 San Jose, the capital of Costa Rica . . . 912
168.12 Irazu volcano . . . 912
168.13 Turrialba volcano . . . 912
168.14 Arenal Volcano . . . 912
168.15 Hot springs of La Fortuna . . . 913
168.16 Rincon de la Vieja volcano . . . 913
168.17 Green Mount . . . 913
168.18 Cities and towns . . . 913
168.19 About the Author . . . 913

169 Greece **915**
169.1 About the Author . . . 917

170 Kingdom of Jordan - Tourism **919**

171 Kenya **923**
171.1 Nairobi . . . 923
171.2 Lake Naivasha . . . 924
171.3 Lake Nakuru . . . 924
171.4 Maasai Mara . . . 924
171.5 Aberdares National Park . . . 925
171.6 Mount Kenya . . . 925
171.7 Amboseli National Park . . . 925
171.8 Tsavo National Park . . . 926
171.9 Samburu National Reserve . . . 926
171.10 Lake Turkana . . . 926
171.11 Visit Lamu . . . 926
171.12 About the Author . . . 927

172 Qatar **929**
172.1 Katara Cultural Village . . . 930
172.2 Doha Museum of Islamic Art . . . 930
172.3 National Museum of Qatar . . . 931
172.4 The Pearl Monument . . . 931
172.5 Aspire Park . . . 931
172.6 Imam Muhammad ibn Abd Al Wahhab Mosque . . . 932
172.7 MIA Park . . . 932
172.8 Doha Golf Club . . . 932
172.9 Aqua Park Qatar . . . 932
172.10 About the Author . . . 932

173 Scotland **933**
173.1 Eilean Donan Castle . . . 933
173.2 Neist Point on the Isle of Skye . . . 934
173.3 Urquhart Castle and Loch Ness . . . 934
173.4 Glen Coe . . . 935
173.5 Saint Andrews . . . 935
173.6 Whiskey distillery . . . 936
173.7 Dunnottar Castle** . . . 936
173.8 Rosslyn Chapel and The Borders . . . 936
173.9 Stirling . . . 936
173.10 Loch Lomond and the Trossachs National Park . . . 936
173.11 Edinburgh . . . 936
173.12 About the Author . . . 937

174 Tanzania **939**
174.1 Serengeti National Park . . . 939
174.2 Zanzibar . . . 940
174.3 Ngorongoro Conservation Area . . . 941
174.4 Kilimanjaro National Park . . . 941
174.5 Lake Tanganyika . . . 942
174.6 Tarangire national park . . . 942
174.7 Lake Manyara National Park . . . 942
174.8 Dar es salaam . . . 942
174.9 About the Author . . . 943

175 Turkey **945**

176 Chino Valley **947**
176.1 About the Author . . . 949

177 Arizona **951**
177.1 Logo . . . 952
177.2 About the Author . . . 952

178 Colorado **953**
178.1 About the Author . . . 955

179 Aruba **957**
179.1 Beaches . . . 957
179.2 Diving or snorkeling . . . 958
179.3 To surf . . . 959
179.4 Tour Aruba on a Harley Davidson . . . 959
179.5 Ostrich Farm . . . 959
179.6 Stroll through Oranjestad . . . 960
179.7 Visiting Aruba during Carnival . . . 960
179.8 Getting married in Aruba . . . 961
179.9 About the Author . . . 961

180 Bali **963**
180.1 Luhur Uluwatu Temple . . . 963
180.2 Ubud . . . 964
180.3 Rice terraces . . . 964
180.4 Pura Tanah Lot . . . 964
180.5 Volcanoes . . . 964
180.6 Pure Besakih . . . 965
180.7 Waterfalls . . . 965
180.8 Ulun Danu Temple . . . 965
180.9 Other Bali Temples . . . 966
180.10 Balinese beaches . . . 967
180.11 About the Author . . . 967

181 Curacao **969**
181.1 Kenapa Beach . . . 969
181.2 Marine Aquarium . . . 969
181.3 Alma Blu . . . 970
181.4 Savonet-Museum . . . 970
181.5 Sunset Blueview Terrace . . . 970
181.6 Handelskade . . . 970
181.7 Israel-Immanuel Synagogue . . . 971
181.8 Kura Hulanda Museum . . . 971
181.9 Little Curacao . . . 971
181.10 Beaches . . . 971
181.11 Snorkeling and diving . . . 972
181.12 Shete Boka National Park . . . 972
181.13 Christoffelpark National Park . . . 972
181.14 Drink Curaçao Produced in Curaçao . . . 972
181.15 The Forts . . . 973
181.16 Ostrich farm . . . 973
181.17 Hato Caves . . . 973
181.18 About the Author . . . 974

182 Database **975**

182.1 Overview . . . 975
182.2 What is a database? . . . 975
182.3 When to use NULL . . . 976
182.4 What RDBMS should you use? . . . 977
182.5 Avoid NULL (usually) . . . 978
182.6 camelCase or underscore_case? . . . 978
182.7 When to Index? . . . 980
182.8 Why "ID"? . . . 981
182.9 Naming ID Columns . . . 982
182.10 Normalization Example: States . . . 983
182.11 Database Design: Three Areas of Optimization . . . 984
182.12 Enum: Just Say No . . . 984
182.13 About the Author . . . 985

183 How to Use the .sql file **987**
183.1 Introduction . . . 987
183.2 Installing the Database . . . 987
183.3 Additional Notes . . . 988
183.4 Purge the Database to Reload It . . . 989
183.5 Users . . . 989
183.6 About the Author . . . 990

184 Absinthe **991**
184.1 About the Author . . . 992

185 Arak **993**
185.1 About the Author . . . 996

186 Beer **997**
186.1 Logo . . . 998
186.2 About the Author . . . 998

187 Whiskey **999**
187.1 Scotland . . . 1001
187.2 Canada . . . 1002
187.3 United States . . . 1003
187.4 Japan . . . 1004
187.5 About the Author . . . 1004

188 Activism **1005**
188.1 Logo . . . 1006
188.2 About the Author . . . 1006

189 Australian Actors **1007**
189.1 About the Author . . . 1009

190 Australian Army **1011**
190.1 References . . . 1012
190.2 About the Author . . . 1012

191 Ball Aerospace **1013**
191.1 Logo . . . 1014
191.2 About the Author . . . 1014

192 Cooking & Healthy Meals **1015**
192.1 About the Author . . . 1016

193 Cinema Is Considered As The Seventh Art **1017**
193.1 The Beautiful Art . . . 1018
193.2 About the Author . . . 1020

194 David Bowie The Legend **1021**
194.1 About the Author . . . 1023

195 Dogs **1025**
195.1 About the Author . . . 1026

196 Driving Off-Road **1027**
196.1 About the Author . . . 1029

197 1st Australian Task Force (1 ATF) **1031**
197.1 Copied from Wikipedia . . . 1031

198 Galatasaray University **1033**

199 How to Really Enjoy Casino Gaming **1039**
199.1 Logo . . . 1040
199.2 About the Author . . . 1040

200 PC Maintenance **1041**
200.1 About the Author . . . 1042

201 Pizza **1043**
201.1 Logo . . . 1043
201.2 About the Author . . . 1044

202 Sheriff Rick Grimes is an Idiot **1045**
202.1 About the Author . . . 1046

203 Silversmith **1047**
203.1 About the Author . . . 1048

204 Steve Irwin, an Australian Legend **1049**
204.1 About the Author . . . 1050

205 The origin of cinema **1051**
205.1 About the Author . . . 1053

206 Working Out (You know, with weights) **1055**
206.1 Logo . . . 1056
206.2 About the Author . . . 1056

207 Codewars Go Colly CLI Scraper **1057**

208 Connect using Java from a Client to IBM System i - AS400 using JTOpen **1059**
208.1 About the Author . . . 1061

209 Diffs **1063**
209.1 Animated PDF differencing . . . 1063
209.2 Colordiff . . . 1063

210 DITA to PDF with Eclipse **1065**
210.1 Overview . . . 1065
210.2 How DITA-OT PDF Plugins work . . . 1065

210.3 List of resources and technologies used on this GitHub project . . . 1066

211 Eclipse cheat sheets to DITA to PDF **1069**
211.1 How DITA-OT PDF Plugins work . . . 1070

212 Firebase Best Practices **1071**
212.1 What is Firebase Cloud Firestore? . . . 1071
212.2 Firestore Best Practices . . . 1071
212.3 What is Firebase Authentication? . . . 1071
212.4 Authentication best practices . . . 1072
212.5 What is Firebase Storage? . . . 1072

213 GNU Aspell **1073**

214 Golang **1075**
214.1 Links . . . 1075

215 Links **1077**
215.1 Guides . . . 1077
215.2 GitHub Cheat Sheets . . . 1077
215.3 Git GUI clients . . . 1077
215.4 Database . . . 1078
215.5 Advanced Links . . . 1078
215.6 Free short courses . . . 1078
215.7 Good Tunes . . . 1079

216 Open Source XML **1081**
216.1 Editors . . . 1081
216.2 Tools . . . 1081

217 RST2MD **1083**
217.1 Pandoc . . . 1083
217.2 Converting a file . . . 1083

218 Top 4 VS Code extensions every developer should use **1085**
218.1 What is VS Code? . . . 1085
218.2 1. Live Server . . . 1085
218.3 2. Prettier . . . 1085
218.4 3. JavaScript Code Snippets . . . 1085
218.5 4. Bracket Pair Colorizer . . . 1085
218.6 About the Author . . . 1085

219 What Programming Language to choose as a beginner? **1087**
219.1 About the Author . . . 1087

220 Corel Draw **1089**
220.1 Links . . . 1089
220.2 About the Author . . . 1089

221 Serif Software **1091**
221.1 Image editing . . . 1091
221.2 About the Author . . . 1094

222 Eclipse cheat sheets (XML) to DITA with Python **1095**
222.1 Overview . . . 1095

223 Python is a useful and versatile programming language **1097**
223.1 Big data and data analysis: . . . 1097
223.2 Data mining: . . . 1097
223.3 Data science: . . . 1097
223.4 Artificial intelligence: . . . 1098
223.5 Blockchain: . . . 1098
223.6 Machine learning: . . . 1098
223.7 Web development: . . . 1098
223.8 3D graphics and games: . . . 1098
223.9 Python includes an interactive mode . . . 1098
223.10About the Author . . . 1099

224 Getting stared with Python on IBM System i **1101**
224.1 October 2020 . . . 1101
224.2 About the Author . . . 1103

225 Pylint **1105**
225.1 The Difference Between What Happens When The Python Interpreter Catches Errors And What Happens When You Run A Linter . . . 1105
225.2 How Pylint Helps Further . . . 1105
225.3 Pylint Environment . . . 1105
225.4 Installing it . . . 1105
225.5 Default options . . . 1106
225.6 Further Resources . . . 1106
225.7 About the Author . . . 1106

226 Sphinx, The Code Documentation Tool, An Introduction **1107**
226.1 How to set up the Sphinx code documentation tool and get started with it . . . 1107
226.2 What Is Sphinx . . . 1107
226.3 Languages Sphinx Can Document . . . 1107
226.4 Output Formats . . . 1107
226.5 Installing Sphinx . . . 1108
226.6 Using Sphinx To Write Documentation . . . 1108
226.7 Things To Try . . . 1108
226.8 One More Piece Of Encouragement . . . 1109
226.9 About the Author . . . 1109

227 Using Flake8, An Introduction - "A tool for cleaning your Python code" **1111**
227.1 Introduction . . . 1111
227.2 The Difference Between What Happens When The Python Interpreter Catches Errors And What Happens When You Run A Linter . . . 1111
227.3 How Flake8 Helps Further . . . 1111
227.4 Flake8 Environment . . . 1111
227.5 Installing Flake8 . . . 1112
227.6 Running Flake8 . . . 1112
227.7 Getting Help . . . 1112
227.8 Further Resources . . . 1112
227.9 About the Author . . . 1113

228 Built in datatypes **1115**
228.1 Built with . . . 1115

229 Eclipse cheat sheets (XML) to DITA with Ruby, XSL, Nokogiri **1117**
229.1 From Java, XSLT 2.0 with Saxon to Ruby, XSLT 1.0 with the Nokogiri Ruby gem . . . 1117
229.2 DITA Background . . . 1117

229.3 The Project . . . 1117
229.4 Resources . . . 1118

230 Hashcheck **1119**
230.1 Ruby script to check file checksums with the Windows CertUtil Command . . . 1119

231 Ruby **1121**
231.1 Ruby a programmer's best friend . . . 1121
231.2 Links . . . 1121

232 Ruby Strip **1123**
232.1 Ruby white space strip command line application . . . 1123

233 Seek **1125**
233.1 When you need those jobs hypersonic -> seek . . . 1125
233.2 Seek . . . 1126

234 Well Formed **1127**

235 AICF announces Indian Squad for 44th Chess Olympiad **1129**
235.1 About the Author . . . 1131

236 Bobby Fischer, yeah? **1133**
236.1 About the Author . . . 1135

237 Boris Spassky **1137**
237.1 About the Author . . . 1138

238Chess And Mathematics **1139**
238.1 The Close Relationship between Chess and Mathematics . . . 1139
238.2 The Legend Of The Origin Of Chess . . . 1139
238.3 Chess and Mathematics . . . 1140
238.4 The Horse Problem . . . 1141
238.5 Mathematical Curiosities In Chess . . . 1142
238.6 Game Theory And Chess . . . 1142
238.7 Certain Geometric Aspects To Take Into Account In Chess . . . 1142
238.8 A Chain Of Pawns Against The Rule Of The Square . . . 1144
238.9 Exceptions to the rule of the square . . . 1146
238.10Avoid Checkmate Against A King And Knight . . . 1148
238.11The Problem Of The Kings . . . 1148
238.12The International Game Classification System(FIDE) . . . 1150
238.13Find The Position Of 8 Queens On The Board . . . 1150
238.14Can A Chess Game Be Infinite? . . . 1154
238.15About the Author . . . 1154

239 Chess addiction **1155**
239.1 About the Author . . . 1156

240 Effect of modern chess engines on professional chess players **1157**
240.1 Reference . . . 1158
240.2 About the Author . . . 1158

241 Elo Rating **1159**
241.1 About the Author . . . 1160

242 FIDE GRAND PRIX 2022 **1161**
242.1 -PLAYERS . . . 1161
242.2 -Time Control . . . 1161
242.3 -FIRST LEG . . . 1161
242.4 -SECOND LEG . . . 1162
242.5 -THIRD LEG . . . 1162
242.6 -Prize Fund . . . 1162

243 Garry Kasparov a Chess Player **1163**
243.1 About the Author . . . 1164

244 Hans Niemann wins 27th Tepe Sigeman & Co Tournament, Arjun Erigaisi second **1165**
244.1 About the Author . . . 1166

245 Hikaru wins first leg of Grand Prix: Levon stunned **1167**
245.1 Reference . . . 1168
245.2 About the Author . . . 1168

246 Inclusion of Chess in Olympics **1169**
246.1 About the Author . . . 1170

247 India wins bid for hosting Chess Olympiad, all set to host most awaited chess event **1171**
247.1 About the Author . . . 1172

248 Jan-Krzysztof Duda wins OSLO ESPORTS CUP ahead of Magnus and other top Grandmasters **1173**
248.1 About the Author . . . 1174

249 The Greatest Attacking Player in Chess History **1175**
249.1 About the Author . . . 1176

250 No Two Situations or Events are Exactly the Same in Life and in Business so is Your 64 Black and White Squares on Your Chess Board **1177**
250.1 References . . . 1180
250.2 About the Author . . . 1181

251 Richard Rapport wins the second leg of Grand Prix: Almost qualified for Candidates **1183**
251.1 About the Author . . . 1184

252 Should Chess be added in academics? **1185**
252.1 Reference . . . 1186
252.2 About the Author . . . 1186

253 TATA STEEL CHESS WIJK AAN ZEE 2022 **1187**

254 THE PAWN **1189**
254.1 About the Author . . . 1190

255 Wesley So wins final leg of FIDE grand prix series, Hikaru and Richard qualify for Candidates **1191**
255.1 About the Author . . . 1191

256 The Australian Open **1193**
256.1 History of the Australian Open . . . 1195
256.2 Below we will show a table with the record of titles won in the men's modality . . . 1201
256.3 In the female modality, the players who have the records are the following: . . . 1202
256.4 Other important records . . . 1202
256.5 The Players who achieved both the junior and senior titles: . . . 1202

256.6 Left-handed players with the most titles: . . . 1203
256.7 The greatest time distances between the first and the last title won . . . 1203
256.8 Players with the results with the greatest difference in the score (6-0, 6-0 and 6-0) . . . 1204
256.9 Highest number of games played in a final: . . . 1204
256.10 Fewest games played in a final: . . . 1204
256.11 The best matches of the Australian Open . . . 1204
256.12 Rod Laver vs. Tony Roche in the 1969 semi-finals . . . 1204
256.13 Chanda Rubín against Arantxa Sánchez in the Quarterfinals of the year 1996 . . . 1205
256.14 Serena Williams versus Kim Clijsters in the 2003 Semifinals . . . 1205
256.15 Rafael Nadal vs. Roger Federer in the 2009 final . . . 1205
256.16 Jennifer Capriati versus Martina Hingis in the 2002 final . . . 1206
256.17 Martina Navratilova vs. Chris Evert in the 1981 final . . . 1206
256.18 Pete Sampras vs. Andre Agassi in the 2000 Semifinals . . . 1207
256.19 Boris Becker and Omar Camporese in the 1991 Third Round . . . 1207
256.20 Andy Roddick versus Younes El Aynaoui in the 2003 quarterfinals . . . 1208
256.21 Novak Djokovic vs. Stan Wawrinka in the 2013 Fourth Round . . . 1209
256.22 Novak Djokovic vs. Rafael Nadal in the 2012 final . . . 1209
256.23 Most recent finals . . . 1210
256.24 About the Author . . . 1210

257 Roland Garros **1211**
257.1 Historical background . . . 1212
257.2 French Championship . . . 1213
257.3 The Four Musketeers . . . 1214
257.4 Professionalism and the "Open Era" . . . 1214
257.5 The ATP protects new talents . . . 1218
257.6 Old venues . . . 1219
257.7 Track 1 . . . 1219
257.8 Attached tracks . . . 1219
257.9 Modernization project . . . 1219
257.10 Surface characteristics . . . 1220
257.11 Awards . . . 1221
257.12 Trophies . . . 1221
257.13 Historical background of titles . . . 1222
257.14 Unseeded winners . . . 1224
257.15 The longest game . . . 1225
257.16 The game with the biggest difference in the score . . . 1225
257.17 The best matches in history . . . 1226
257.18 About the Author . . . 1229

258 The Wimbledon Championships **1231**
258.1 The biggest finals in Wimbledon history . . . 1232
258.2 Wimbledom final in 2001 . . . 1233
258.3 Federer and Nadal in the 2008 final . . . 1235
258.4 2009 Championship Final . . . 1236
258.5 Djokovic vs Federer in the 2019 final . . . 1237
258.6 Wimbledon's longest match . . . 1238
258.7 Wimbledon traditions . . . 1240
258.8 Historical facts . . . 1240
258.9 About the Author . . . 1245

259 The US Open **1247**
259.1 History . . . 1248
259.2 West side tennis club . . . 1250

259.3 Open Era . . . 1251
259.4 Arthur Ashe Stadium in 2010 . . . 1253
259.5 Area . . . 1254
259.6 Challenges in the player line . . . 1254
259.7 The best games of the US Open . . . 1255
259.8 Manuel Orantes vs. Guillermo Vilas in the 1975 Semifinals . . . 1255
259.9 Novak Djokovic beat Roger Federer in the 2011 Semifinals** . . . 1256
259.10 Martina Navratilova vs. Steffi Graf in the 1991 Semifinals . . . 1256
259.11 Bjorn Borg vs. Jimmy Connors in the 1976 Final . . . 1257
259.12 Jimmy Connors vs. John McEnroe in the 1980 Semifinals . . . 1258
259.13 Venus Williams vs. Serena Williams, 2008 quarterfinals . . . 1258
259.14 Steffi Graf vs. Monica Seles in the 1995 Finals . . . 1259
259.15 Andre Agassi vs. Pete Sampras in the 2001 quarterfinals . . . 1260
259.16 About the Author . . . 1261

260 Harriet, the movie **1263**
260.1 About the Author . . . 1264

261 Life is Beautiful **1265**
261.1 About the Author . . . 1266

262 The Fight Club **1267**
262.1 About the Author . . . 1268

263 The seventh seal **1269**
263.1 About the Author . . . 1270

264 Downton Abbey **1271**
264.1 About the Author . . . 1272

265 Law & Order **1273**
265.1 Related TV series and shows . . . 1274
265.2 About the Author . . . 1275

266 Law & Order: Special Victims Unit **1277**
266.1 About the Author . . . 1279

267 The squid game **1281**
267.1 About the Author . . . 1282

268 Indices and tables **1283**

CHAPTER

ONE

GETTING STARTED

Stay here if you want a basic intro to the world of GitHub. If you just want to work on the `doc` folder or our documentation site https://slurp.readthedocs.io/ then skip to *Documentation*

1.1 Introduction

This set of documentation is written in Markdown which is a lightweight and easy-to-use syntax for styling all forms of writing.

Markdown takes about 10 minutes to learn and GitHub provides its three-minute read on Mastering Markdown

Discussion about code base improvements happens in GitHub issues and on pull requests.

1.2 Hosting

- Cloudflare Workers
- GitHub Pages
- Heroku - no longer free
- Read the Docs
- Render

1.3 Basic Setup

The project requires Golang, Node, Ruby, Python and more.

From the root of the repository:

```
python3 -m venv venv
source venv/bin/activate
pip3 install -r requirements.txt
```

1.4 Documentation

Python Sphinx based `slurp documentation` site written mainly in Markdown. We have a local requirements file just for the `Read the Docs` hosting in the `doc` folder

```
cd doc || exit
python3 -m venv venv
source venv/bin/activate
pip3 install -r requirements.txt
```

Files are stored in `doc/source`. From the `doc` folder you can build the HTML output files which are stored in `doc/build`. These local build files are ignored from Git.

```
cd doc || exit
make html
```

On Read the Docs we also have PDF and Epub versions

1.5 Fuchsia Programming Site

`Fuchsia Programming` is a Jekyll based site that requires Ruby which is stored in the `docs` folder. Don't get mixed up with `doc` from the *documentation* site above.

```
cd docs || exit
bundle exec jekyll serve
```

For ease of use and for those that don't have Ruby installed we now have a Dockerfile that runs the Fuchsia Programming site.

Run `$ docker build --tag slurp .` to build the image. Then to run the container:

`$ docker run --publish 4000:4000 slurp`

Example output:

```
slurp % docker run --publish 4000:4000 slurp
Configuration file: /app/docs/_config.yml
            Source: /app/docs
       Destination: /app/docs/_site
 Incremental build: disabled. Enable with --incremental
      Generating...
       Jekyll Feed: Generating feed for posts
                    done in 2.102 seconds.
 Auto-regeneration: enabled for '/app/docs'
    Server address: http://0.0.0.0:4000/slurp/
  Server running... press ctrl-c to stop.
```

1.6 Logorama

`Logorama` is a Jekyll based logo showcase site that requires Ruby

```
cd logorama || exit
bundle exec jekyll serve
```

1.7 DITA Project

`DITA To PDF` - Vanilla

```
cd eclipse-cheatsheets-to-dita-to-pdf/output || exit
dita --input=map.ditamap --format=pdf -o pdf
```

CHAPTER

TWO

CODEWARS

2.1 Achieve mastery through challenge



2.2 Go

2.2.1 8 kyu

- Function 1 - hello world
- Multiply
- Opposite number
- Function 3 - multiplying two numbers
- Return Negative
- Grasshopper - Terminal game combat function
- String repeat
- Convert boolean values to strings 'Yes' or 'No'
- Even or Odd
- Remove First and Last Character

- Sum of positive
- Multiple of index
- Beginner - Lost Without a Map

2.2.2 7 kyu

- Are the numbers in order?
- Is this a triangle?
- Mumbling

2.2.3 6 kyu

- Consecutive strings
- Decode the Morse code
- Split Strings
- IP Validation

2.3 Specials

- Two to One
- Find the longest gap!
- Complete The Pattern #2
- Largest 5 digit number in a series
- Does an array contain all elements from another
- Repeated Substring
- Life of Possibilities
- Scramblies
- Weight for weight

CHAPTER

THREE

GIT

3.1 Essential Git commands

So you have just cloned your `fork` from GitHub and the first Git command you should try is

```
$ git branch
* main
```

Now you want to submit a patch or new feature so you can create a new branch and switch to it by using

```
$ git checkout -b feature-branch
Switched to a new branch 'feature-branch'
```

And now the `git branch` command lists two local branches with the current branch highlighted by the *

```
$ git branch
* feature-branch
  main
```

When creating a pull request you need to create a new branch or more technically a `feature branch`. In the above example the `feature-branch` is a new branch, but you should try to be more descriptive when naming the new feature branch.

A more verbose version of `git branch` is

```
$ git branch -v
* improve-docs-2 3d55e793 Merge pull request #244 from fuchsia-programming/pull-243-
↪restyled
  main         3d55e793 Merge pull request #244 from fuchsia-programming/pull-243-
↪restyled
```

You can also show the branches in column format

```
$ git branch --column
* codewars   main
```

Another way to create a new branch is

```
git branch test-branch
```

The difference between using `git branch` and `git checkout -b` to create a branch is that `git checkout -b` will switch to the branch. Running `git branch` again shows this

```
$ git branch
* codewars
  main
  test-branch
```

To checkout a branch you can use `git checkout`

```
$ git checkout test-branch
Switched to branch 'test-branch'
```

Another useful command is `git status`

```
$ git status
  On branch docs
  Changes not staged for commit:
    (use "git add <file>..." to update what will be committed)
    (use "git checkout -- <file>..." to discard changes in working directory)

          modified:   CONTRIBUTING.md

  no changes added to commit (use "git add" and/or "git commit -a")
```

A very short version of `git status` is

```
$  git status -s
M _docs/git.md
```

You can see your changes with `git diff`

```
$ git diff
diff --git a/_data/docs_nav.yml b/_data/docs_nav.yml
index f7abb8fe..54db1374 100644
--- a/_data/docs_nav.yml
+++ b/_data/docs_nav.yml
@@ -15,5 +15,7 @@
       link: /docs/sql-file/
     - title:  Eclipse cheat sheets (XML) to DITA with Ruby, XSL, Nokogiri
       link: /docs/eclipse-cheat-sheets-to-dita-with-ruby-xsl-nokogiri/
+    - title:  DITA TO PDF WITH ECLIPSE
+      link: /docs/dita-to-pdf-with-eclipse/
     - title:  Links
       link: /docs/links/
diff --git a/_docs/dita-to-pdf-with-eclipse.md b/_docs/dita-to-pdf-with-eclipse.md
index e69de29b..b15f58fc 100644
--- a/_docs/dita-to-pdf-with-eclipse.md
+++ b/_docs/dita-to-pdf-with-eclipse.md
@@ -0,0 +1,126 @@
+---
+title: DITA TO PDF WITH ECLIPSE
+permalink: /docs/dita-to-pdf-with-eclipse/
+---
+
+# Overview
```

A very compact version of `git diff` is

```
$ git diff --compact-summary
_docs/git.md | 15 +++++++++++++++
1 file changed, 15 insertions(+)
```

To only see which files are changed run

```
$ git diff --name-only
_docs/git.md
```

The `origin` and the `upstream` are displayed below for a GitHub user. You should think of the `upstream` as the `source` and the `origin` as your `fork`

```
$ git remote -v
origin  https://github.com/jbampton/fuchsia-programming.github.io.git (fetch)
origin  https://github.com/jbampton/fuchsia-programming.github.io.git (push)
upstream        https://github.com/fuchsia-programming/fuchsia-programming.github.io.git␣
↪(fetch)
upstream        https://github.com/fuchsia-programming/fuchsia-programming.github.io.git␣
↪(push)
```

The `git log` command is shown below and it contains the history of the past commits

```
$ git log
commit a5cdeaba94db770797fe84bc8666116a97a06d3f (HEAD -> ruby-cheat-sheets, upstream/
↪main, origin/main, origin/HEAD, main)
Merge: b4e0ff91 08c5dac7
Author: John Bampton <jbampton@users.noreply.github.com>
Date:   Sat Dec 14 08:46:16 2019 +1000

    Merge pull request #240 from fuchsia-programming/pull-239-restyled

    Restyle Add documentation to the website.

commit 08c5dac76558c2ad01e964537c76a31cc9e222b5
Author: Restyled.io <commits@restyled.io>
Date:   Fri Dec 13 22:23:37 2019 +0000

    Restyled by whitespace
```

A more compact version of `git log` is seen below

```
$ git log --oneline
cde978e9 (HEAD -> improve-docs, upstream/main, origin/main, origin/HEAD, main) Merge␣
↪pull request #242 from fuchsia-programming/pull-241-restyled
17b1d497 Restyled by prettier-markdown
cdfe2158 Add more documentation.
a5cdeaba Merge pull request #240 from fuchsia-programming/pull-239-restyled
08c5dac7 Restyled by whitespace
9c63aff1 Restyled by prettier-yaml
561d38b3 Restyled by prettier-markdown
1b5e30b4 Add documentation to the website.
b4e0ff91 Merge pull request #238 from jbampton/configure-percy
```

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```
13a2afe3 Add percy config file.
6d1050f7 Merge pull request #237 from fuchsia-programming/pull-236-restyled
fcd730b0 Restyled by whitespace
```

Once your feature branch has been merged into the upstream you should delete it

```
git branch -D overcommit
Deleted branch overcommit (was 00e2413).
```

To list your own `local` branches, your remote `origin` branches and all the remote `upstream` branches

```
$ git branch -a
  main
* ruby-cheat-sheets
  remotes/origin/HEAD -> origin/main
  remotes/origin/main
  remotes/upstream/main
  remotes/upstream/pull-183-restyled
  remotes/upstream/pull-190-restyled
  remotes/upstream/pull-196-restyled
  remotes/upstream/pull-199-restyled
  remotes/upstream/pull-212-restyled
  remotes/upstream/pull-218-restyled
```

To list your remote branches

```
$ git branch -r
  origin/HEAD -> origin/main
  origin/main
  upstream/main
  upstream/pull-183-restyled
  upstream/pull-190-restyled
  upstream/pull-196-restyled
  upstream/pull-199-restyled
  upstream/pull-212-restyled
  upstream/pull-218-restyled
```

You can edit or `amend` your previous commit

```
git commit --amend
```

You can check your git `version`

```
$ git --version
git version 2.21.0 (Apple Git-122.2)
```

3.2 Sync your fork

Refer to the GitHub help article on **Syncing a fork**.

```
git checkout main
git fetch upstream
```

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```
git merge upstream/main
git push
```

3.3 Squashing Commits

You may be asked by a maintainer to squash your commits before it will be merged.

```
git checkout your-feature-branch
git rebase -i HEAD~n
# n is the number of commits in the pull request.
# Set commits (except the one in the first line) from 'pick' to 'squash', save and quit.
# On the next screen, edit/refine commit messages.
# Save and quit.
git push -f # (force push to GitHub)
```

3.4 Contributor Workflow

To contribute a patch, the workflow is as follows:

- Fork repository
- Create topic branch
- Commit patches
- Push changes to your fork
- Create pull request

If a commit references an issue, please add the reference. For example: `refs #351` or `fixes #123`. Using the `fixes` or `closes` keywords will cause the applicable issue to be closed when the pull request is merged.

CHAPTER

FOUR

GNU FREEDOM & TEAM BUILDING

4.1 Collaboration with Discord Servers, GitHub, Free Education Gamified

My good friend `Max` and mainly myself promote `free` education, and we heavily use both Discord and GitHub for mass collaboration. We have a few GitHub Organizations with over 100+ team members. And in our two main Discord Servers we have over 100+ members.

We find younger developers come from the Windows 10 environment where paid software tools are common. Paid software is extremely expensive and even more so for users in poorer countries where GDP is lower. When software first came on the scene it was in the form of a disk. Over the years many tools arose to copy disks and get around copyright. These days software licensing is much more advanced and is usually paid monthly or annually and most software is downloaded.

GNU is a Unix-like operating system and Open Source is more about collaboration than code. GNU is completely free software and the GNU OS kernel `Hurd` started before the Linux kernel. GNU Hurd was in `1984`. And Linux was in 1991.

And therefore the concept of heavily collaborating is really learning and sharing and free education. Everyone has the right to free education. In some of the most recent years `Octoverse` reports mainly students and mentors have been joining GitHub.

These days there are many alternatives to paid software and both Linux and GNU have a plethora of tools that are all free.

4.2 Popular GNU Software

- GNU Emacs
- GNU Image Manipulation Program (GIMP)
- GNU Midnight Commander is a visual file manager
- GNU nano is a small editor for on the terminal
- GNU Screen is a screen manager with VT100/ANSI terminal emulation

4.3 Other Software

- GNU Aspell is the standard spell checker for the GNU operating system

CHAPTER

FIVE

STAMPS FROM THE PAST




AUSTRALIA
AUSTRALIA
AUSTRALIA


AUSTRALIA 10
7c Australia
POSTE ITALIANE
JOSEPH COOK
S M BRUCE
W M HUGHES
ANDREW FISHER
5c
6c


POSTAGE
AUSTRALIA
Australia
5c
EDMUND BARTON
ALFRED DEAKIN
QUEENSLAND
1860
1960
AUSTRALIA
50c
6c


UAR
ZIMBABWE
Zimbabwe
ČESKOSLOVENSKO


EUROPA
ITALIA
L. 20
L. 90
HONG KONG
$1
esposizione mondiale di filatelia


NEW ZEALAND 75c
NEW ZEALAND 45c
NEW ZEALAND 18c
New Zealand 55c
NGATA 45c
TE ATA-O-TU 60c
New Zealand
40c
Carnelian 5c
Amethyst 4c
Iron Pyrites 3c
Agate 2c
NEW ZEALAND 25c
POLICE CENTENARY
7c
6c
1c
nectarines 30c
citrus fruit 9c
grapes
New Zealand
$1
45c
30c
Carnelian 5c
NEW ZEALAND 45c
NEW ZEALAND 70c
TWIN LIDGES
New Zealand 40c


ZIMBABWE
Zimbabwe 11c
11c POSTAGE
30c
34 PENCE — INDUSTRY YEAR 1986
25c POSTAGE


JUGOSLAVIJA
HELVETIA
LUXEMBOURG
ESPAÑA
CORREOS
Boys Town
NEBRASKA 1975
USAirmail
Philip Mazzei
Patriot Remembered
Raiph Bunche
AIR MAIL
JOHN DEWEY
UNITED STATES
30 CENTS


PAPUA NEW GUINEA
NATIONAL DAY
PAPUA NEW GUINEA
CONSTITUTIONAL DEVELOPMENT
PAPUA NEW GUINEA
PAPUA NEW GUINEA
FIFTIETH ANNIVERSARY OF AVIATION
PAPUA NEW GUINEA
papua new guinea
PAPUA NEW GUINEA
PAPUA NEW GUINEA
PAPUA NEW GUINEA
SINGAPORE
HELPS
THE POSTMAN
SINGAPORE
SINGAPORE
SINGAPORE
RSA 20c
PORTUGAL
10c SINGAPORE
SINGAPORE
SINGAPORE
HELLAS
INDIA
INDIA


DEUTSCHE BUNDESPOST
Helvetia
EIRE
18 ÉIRE
Canada
CANADA
POSTES POSTAGE
Canada 34
Canada 20
Olympiade
XXI
Olympiad
Montreal
1976


EUROPA
HELLAS
ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
NIPPON
fiji
Public School, Levuka
NORFOLK ISLAND
REPUBLIC OF KOREA
대한민국우표


HONG KONG
ZIMBABWE
21c POSTAGE
REPUBLIK ÖSTERREICH
BUNDESPOST BERLIN
MOÇAMBIQUE
RHODESIA


AUSTRALIA
Australia
ANTARCTIC TERRITORY
Nuclear power
Animal Science
Fauna Conservation
Animals aid to Man
Oil & Natural Gas
Bauxite to Aluminium
Iceberg Alley, Mawson
Australia 25c
Australia 10c
Australia 24c
Australia 12c
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United Nations 1945 1970
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EXPORT


Australia
AUSTRALIA 36c
AUSTRALIAN ANTARCTIC TERRITORY
CAMPIONATO VELICO MONDIALE
POSTE ITALIANE
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CHRISTMAS 1977
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CHAPTER

SIX

COCAINE

Also known as coke is a stimulatory drug mostly used for recreational use and commonly snorted but can be smoked and/or injected.

The effects begin within seconds or minutes and only lasts from a few minutes to a couple hours, there are medical uses for cocaine as well as in surgery.

Cocaine is highly addictive with a significant risk of dependency. The first thing you know that you don't want nothing else but coke and it is also rarely sold on the street, this pure form and commonly mixed with local anesthetics among and many of their substances which is a large reason why it is so common that users report a feeling of being physically tired when using the drug when in fact pure cocaine actually produces a very energetic effect.

Feeling pleasure motivates us to repeat behaviors, when the reward circuit is activated, each individual cell on the circuit release electrical and chemical signals, the small gap between the sending and receiving cells is called the synapse.

When dopamine binds to the exterior of the dopamine receptor, this causes proteins attached to the interior part of the receptors to carry the signal onward within the cell. Some dopamine molecules re-enter the sending cell via dopamine transporters and can be re-released.

When a reward is encountered the presynaptic cell releases a larger amount of dopamine in a sudden burst. Dopamine transporters will then quickly remove the excess. Dopamine surges in response to natural rewards help the brain learn and adapt to a complex world.

However, drugs are able to hijack this process contributing to unhealthy behaviors and consequences. When someone first uses cocaine the drug quickly enters the brain where it blocks the transporters on the presynaptic cell since dopamine cannot re-enter the presynaptic cell it begins to accumulate in the synapse, where it can reach abnormally high levels and remain there much longer than usual.

The postsynaptic cell becomes hyper activated which produces a feeling of euphoria, this creates an incredibly powerful association between cocaine and pleasure making a person want to repeat the experience of taking the drug.

Vast amounts of cocaine come from South America because of the abundance of coca plants that grow in the mountains and jungle areas.

The drug stimulates the brain in the same way that a real achievement might do, like winning a college football game. This feeling is the main reason people who get addicted want to get high on cocaine again and again.

But each high requires a little more of the drug to get the same effect. Users also often feel superior to other people and so the effect of the cocaine high can have a particular appeal to people with low self-esteem, or who are in situations where a greater level of confidence is desirable, such as performers.

And talking of performers, there have been scores of famous addicts over the years. Many were musicians and few lived to tell the tale.

Cocaine use has been prevalent with the rich and famous but deaths are less common from cocaine use alone. In 2012, Whitney Houston was found submerged in a filled bathtub at the Beverly Hilton Hotel in Los Angeles. According to the autopsy report, she died of a combination of a possible heart attack and cocaine use.

And then in August 2014 the world was shocked when comedian Robin Williams hanged himself in his California home. There has been much debate around the reasons for William's death and though most relate it to his ongoing battle with depression, his widow Susan told people magazine it was a debilitating brain disease called diffuse Lewy body dementia or dementia with Lewy bodies (DLB) that took hold of Williams and probably led him to suicide.

Whether depression or brain disease, Robin Williams was known to have a long-standing issue with both alcohol and cocaine.

6.1 What about the cost of these drugs?

As they are on the black-market drug prices are not affected by inflation, like the usual products we purchase. But supply and demand can still have an influence on the price. Tom Wainwright, the former Economist reporter in Mexico City and author of Narconomics, told Business Insider, "The price of cocaine in the United States has hardly moved.

In the past couple of decades, it's been about $150 per pure gram, and that's barely budged, so there's a puzzle there." Wainwright went on to explain that the static nature of cocaine prices can likely be explained by the hold cartels and other traffickers have over the cocaine market at its origins.

They have the ability to dictate prices to producers.

6.2 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

6.3 Resources

- https://www.drugabuse.gov/publications/drugfacts/cocaine
- https://www.webmd.com/mental-health/addiction/cocaine-use-and-its-effects
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2851032/

CHAPTER

SEVEN

GOA AND THE STUFF

My friend, "M" one day in 2016, did the craziest thing ever. He sold his house, his Ford F350 and all his belongings and quit his job and relocated his entire life to India, specifically; Goa.

He loved Goa so much, but love is cruel. One day he got mixed up with some shady group regarding drugs and ended up in jail. Just a few months ago he got out and you'd think he'll fly back to Jordan immediately, but no, he's still there living his life and loving every minute.

Beautiful things are always dangerous. And in case you visit Goa one day and wish to play it safe but also smoke some dope! Here's a little guide for you:

Well, as beautiful as Goan beaches are, I wouldn't tell you to go smoke weed on any beach at all. Beaches in the North are always buzzing with people so places like Baga, Calangute, Candolim or Miramar are a big no-no. You never know who's coming after you.



Anjuna and Vagator are relatively relaxed so you could easily sit in Curlies' and see the waves come and go while you smoke that blunt. Morjim is yet another beautiful beach and somehow doesn't stay crowded. From my personal experience, an early-morning session at Morjim would be no less than magical.

However, I must warn you about the consequences. Goan police is really strict about drugs and especially when it's with tourists so you better keep your eyes open while you're smoking. If you're not a regular smoker and don't have a lot of experience smoking in public places, take extra care.

Also, I'm assuming if you're traveling to Goa, you would spend most part of your trip in the North but beaches in the South are far more secluded and cleaner so you might want to make that extra effort in your pursuit of trying to be one with nature.

You are a noob in Goa, or even a noob to 'stuff' normally (and just wish to smoke up in Goa to own a time of your life), here are some general recommendations on where to find your stuff cc: Goa.

The Capris/Cigarette Shops: the most effective and most reliable leads may be found at your nearest Paanwala if he doesn't keep the things with himself. The likelihood is he'll have some to sell it to you, but if he doesn't he will direct you to the closest peddler.

You'll completely trust your Paanwala for this information; they never lie regarding anything because they need their cuts sorted.

The Internet Cafes/Money-Exchange Shops: This culture is exclusively credited to Goa alone, where the peddlers operate right out of those internet cafes. They'll obviously not provide you with the things right then & there, but 99 out of 100 times, they might have what you wish.

And there's actually a logic behind it – since all the firangs (read: Russians) are certain to visit the money-exchange shops once they land in Goa, these shop owners became stuff-operators in due course time taking their cuts for every sale. Whether you reside in Palolem, Arambol, Baga, or Calangute, these shops are everywhere and now you recognize why.

The restaurant waiters: Although it's going to sound outrageous initially, it's completely safe to ask any restaurant waiter where you'll get your "quote". Just confirm that the waiter is comparatively young to stay in the safer side. they're another species within the state that thrives on the 'middleman's commission' for the things.

The bike/car/scooter lenders: These are probably the primary guys you'd attend see after checking during a hotel or a shack because you simply can't do without an Activa in Goa. It's absolutely safe to ask them for the whereabouts of stuff.



The shack owners: If you're staying or dining in an exceeding shack on a Goa beach, it's extremely easy to seek out the great stuff. Just enquire the person sitting at the counter. He may or might not be directly involved but 7 out of 10 times he would direct you to the one that may have the data on what you would like. But only ask if the owner's an Indian, never ask from a firing owner.

7.1 About the Author

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CHAPTER

EIGHT

GRUNGE CULTURE

Seattle-based bands have topped the world charts in that era. Nirvana, Pearl Jam, and Soundgarden have sold millions of records.... musical movements centered around Seattle in a sound and style that became known as grunge.

A month before that album came out, they were, the basis of the generation of... X societies.

How does the grunge become a movement, as I understand it, is the fact that these kids have the ability to say anything they want to say, express anything they want to express, any anger, any pain, any anguish, any torment, and they feel a kinship, a oneness, that this young man has been through, tragedy?



What you actually see happening in Seattle is this kind of explosion of sub culture. I think it's a very important thing and a very healthy thing to have happen anywhere, particularly in a place like Seattle, it's so conservative and so reserved to have something like this happen here's been nothing short of, like, major electrical shock.

Everything was suddenly just buzzing with activity. I mean, singles were being put out, but there was no point earlier in history that you could have a magazine devote an entire record review section just to local record reviews.

People from underground fan scenes across the country were already starting to snipe about Seattle and how much hype it was receiving. When things started to become spotlighted, more venues opened up and more opportunities opened up for people to play but there was never a lack of great musical talent and it was always really diverse and there was always an unspoken sense of community about it.

Well, Seattle was really lame, specifically, in the early '80s, I mean, Seattle was like a million second cities. It had a

fake Talking Heads, it had a fake Killing Joke, it had all the fake Ramones you could shake a stick at, you know, and people from Bellevue singing with English accents.

There was this big poodle metal scene. Bands with, big fancy guitars and just tons and tons of hairspray, eyeliner used to hang out on First Avenue. There was a donut shop right there which was right next to The Showbox which is right there. It's a comedy club now. And that was like the big punk rock venue.

"Nobody was too worried about success because we knew we were living in Seattle, you know, it wasn't LA".

Seattle the largest city located in the Pacific northwestern of USA and one of the America's fastest-growing cities historically the world war two brought growth to the city but Seattle never had much of a cultural environment no one could predict the city would be the place of the creation of one of the biggest subcultures in history: grunge

Another big contribute from the World War Two to grunge was the creation of the youth culture. For teenagers even, the word itself played an important role in grunge teens had now more leisure time and disposal income in early 80s the adolescence of those who would be part of the Seattle music scene was a mix of dropping out from school hanging out with each other attending gigs in local clubs and playing music together by going to the same place as kids of punk rock and kids of metal converged the scenes were mixing although there was a little disdain for the punk rockers and what they represented at that time.

Bands played for fun it was an escape and yet a fantasy everyone relevant in grunge went to the same places and same house parties everyone knew each other and they would form and break up bands not only because of music skills, primarily it was because of personal compatibility.

Music is a mix between social and cultural experiences and the personalities of the musicians it is one of the reasons most of grunge bands were always replacing their members it was a do-it-yourself philosophy bands would practice in their houses call to their friends whenever they needed a manager a producer or a roadie they would figure out the studios to record their demos by themselves.

You man, Green River, Soundgarden malfunction and the melvins were the most known bands in Seattle in the early 80s Soundgarden than the melvins were a big influence of Nirvana.

The sound of these bands was loud and fast a complaining set to a drop D tuning the concerts were crazy energetic and weird but they were authentic and sincere, they possessed the primary aesthetic value sincerity the crazy performances and the gestures of the band members were part of the musical experience. it created affection and desire in the audience females were a constant presence at the concerts the good luck of some band members would attract them to the venues.

many argue Nirvana success was only based on kurt's Cobain look, a subculture was emerging it was already possible to identify.

they surrounded themselves with the weirdness and introspection of some band members the way they dress themselves the crowd at the concerts the slang and the identification between the bands and their fans.

the Seattle music scene was more than music by now it was a lifestyle.

8.1 About the Author

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CHAPTER

NINE

LSD - POV

“I felt one with the entire city. I could feel every building. I was tripping in a very strange way.” Hello and welcome to a point of view of someone tripped on LSD, for you to read and feel, I recommend blasting Shpongle Music while reading the below



It was our friend’s birthday… and then the six of us decided to use LSD at his birthday party. We swallowed the LSD in the evening…and about two hours later we all started tripping really hard.

I hardly felt anything at first.

At a certain point we had to leave the house because it was too crowded.

It started when I stood up. I felt very small. Literally small.

The strange thing was that I didn’t have any visuals. My vision was normal.

With the five people who took LSD we went to the city. When we were in the city we had to turn a corner and after we did that…

I noticed that five or six men were closing in on us. The others didn’t notice this because they were under the influence of LSD.

I saw a few people with their hands in their pockets, ready to grab something.

And someone else had his fist ready, so I thought: We're about to get mugged.

I called out to my girlfriend, but she didn't hear me. The others didn't hear me shout either, but they kept on closing in on us.

A friend turned around and recognized one of the guys closing in on us.

He said: 'Yo, man. How's it going?'

At that point, the other people surrounding us quickly ran away.

At that moment I started to cry.

At some point the LSD kicked in, but still without visuals. I felt one with the entire city.

I could feel every building. I could feel all my friends walking.

I was tripping in a very strange way.

It was unpleasant but I also thought:

This is a new experience, so in that sense it was interesting.

My friends asked: 'Yo, why are you crying?' I said: Didn't you notice?

They asked: 'What are you on about? I said: We were about to get mugged.

I told my friend that he saved our lives.

When we were back home I finally started to calm down.

That trip scared me so much that I'm afraid to do LSD again.

Understandable. When I tried LSD it was in the woods with a safe group.

But when we were back at the car a group of strangers came along.

And somehow, it didn't feel right to be around strangers. And I can imagine that in your case…

That you can feel really anxious after you've almost been mugged.

It might've been pleasant to calm me down a bit.

We were prepared. We picked up the LSD two days in advance.

We stored it in the refrigerator.

It was my second time doing LSD…



So I figured that it would be the same as the first time. I had a full stomach. I read a lot online. That's always good. We also have the do's and don'ts. I felt good. I was really looking forward to it. The location is also important. You were supposed to stay home… But this proves that with psychedelics the situation can always change.

https://www.youtube.com/watch?v=naoknj1ebqI

9.1 About the Author

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CHAPTER

TEN

METHAMPHETAMINE

A drug that was also known for a while as redneck cocaine.

Dr. Perry Halkitis: “Believed to be only used by hicks in rural areas. They use it, but so do gay men in urban centers.”



Over 11 million Americans have tried meth at least once. The same data says that 440,000 were last month’s users. But this is all data from 2012. Its use is likely still on the rise, according to DEA meth seizure data. Crystal Meth is extremely addictive.

Methamphetamine meth for short is a very addictive stimulant drug it is a powder that can be made into a pill or a shiny rock called a crystal. The powder can be eaten or snorted at the nose it can also be mixed with liquid and injected into your body with a needle

Crystal meth is smoked in a small glass pipe meth at first causes a rush of good feelings but then users feel edgy overly excited angry or afraid which can quickly lead to addiction.

It causes medical problems including making your body temperature so high that you pass out severe itching meth mouth broken teeth dry mouth and thinking and emotional problems

How do we treat methamphetamine?



Addiction as opposed to other drugs of abuse well as I've said methamphetamine is a very powerful stimulant drug so maybe we should talk in terms of how it affects the body and how it affects the mind of the person's psychology and treatment it's separated into those two areas physically a stimulant drug is it's not the same in withdrawal.

In the way, it's acting on the body as a depressant drug like heroin or alcohol so the body of the methamphetamine addict, if you like, is going to be in no harm or danger as such when they're in withdrawal from the drug especially with young addicts the body is going to repair very very quickly given enough sleep and proper nutrition, etc.

So this is the period that we call stabilization so upon entering treatment somebody who's got a methamphetamine addiction is going to crash as we call it for several days and allowances are made in the treatment program for that person to rest and eat properly and sometimes they'll be sleeping for days at a time otherwise if we were to try to do therapy with such with the methamphetamine addict, they become very irate very difficult to deal with and their body needs to rest at that point, however, there is another side to methamphetamine addiction which is much more serious really which is the psychological withdrawn so the illness of addiction generally will create cravings and with the methamphetamine addict.

Addict very strong cravings so for a start is probably appropriate and important for a methamphetamine addict to be an inpatient treatment in a residential setting because that is what their craving is going to be so strong that having a secure environment where they can't easily go away and get methamphetamine is very important.



Secondly, they're going to have lots of psychological issues like depression feeling extremely agitated high anxiety, and so on and they may even have the appearance of symptoms of other cyclic.

Cyclic Ileana seas that have been hidden by the methamphetamine abuse like attention deficit disorder a DD depression anxiety and so on so a lot of methamphetamine abusers started using the drug to cope with the symptoms of those illnesses and then became addicted and so also now have the illness of addiction so in that case, we may be prescribing antidepressants and drugs that are appropriate to ameliorate the effects of psychological problems that are coming up and then, of course, is group therapy and one-to-one therapy physical exercise good nutrition and all of these things help the psychology of the recovering methamphetamine addict so common models of counseling that would be used would be the same as with other drugs of abuse twelve steps 12-step fellowship cognitive behavioral therapy motivational interviewing all of these models of counseling have very good evidence base in treating methamphetamine addiction as they do other addictions so in short residential treatment setting period of crashing sleeping resting which we call stabilization and then an extended period of psychological therapy to help with the illness of addiction itself and co-occurring illnesses which often present in conjunction with addiction like anxiety depression a DD and so on.

10.1 About the Author

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CHAPTER

ELEVEN

QUEEN RHAPSODY

One of those bands that can be easy to overlook. They're the kind of band you take for granted, because you can't remember a time when they weren't there - so there's often a lot that most people don't know about them.

With that in mind, let's rock'n'roll !

Shocking though it might be, Freddie Mercury wasn't the given name of Queen's frontman. He was actually born into a devout Zoroastrian family to parents from India. His birth name?

Farrokh Bulsara.

He was actually born in Zanzibar but spent a good chunk of his childhood at a private school in India, where he started going by Freddie.

"I'll always walk around like a Persian popinjay. And no one's gonna stop me, honey."

However, he didn't actually change his last name until around the time that Queen was founded. Luckily, his chosen moniker tends to roll off the tongue a little easier than the one he was born with.

Although their name is one of the most famous in rock history, Queen wasn't always called Queen.

In their pupal state, when the band consisted of Brian May, Roger Taylor and Tim Staffell, it was actually known as Smile. In 1970, however, Staffell left the group to join another band, the delightfully-named Humpy Bong, and Smile's remaining members took on one of their fans as lead singer, leading to a name-change in the process.

That fan was one Farrokh Bulsara and their new name was 'Queen'. Feeling the pressure "Under Pressure" was the result of a winning combination of David Bowie, hard drugs, and failure.

In July 1981, Bowie went into the studio to record backup vocals for a Queen song called

"Cool Cat."

Unable to get that particular song to work and despondent at their lack of success, Queen and Bowie fell into their back-up plan: drinking wine and doing cocaine.

As the evening progressed, something that could generously be referred to as 'creativity' began to take hold. Queen and Bowie started messing around with a completely different song, written by Queen's drummer Roger Taylor and tentatively titled "Feel Like."

In a burst of creative hedonism, the song metamorphosed into something amazing. The bass line came together, the duet was improvised, and "Under Pressure" as we know it was born.

A kind of science

Brian May might not necessarily be a household name, but you'd struggle to find someone who isn't familiar with his work. As guitarist for Queen, he wrote "Brighton Rock," "Fat Bottomed Girls," and "We Will Rock You." That would be more than enough accomplishments for most people, but, as the years grew on, he just kept on going.

May had dropped out of college back in the '70s to pursue a career in music. Although that panned out a little more than alright, he nonetheless decided to go back to school over 30 years later to wrap up his doctoral thesis in astrophysics.

Since then, he's worked with NASA on a number of projects and even has an asteroid named after him.

Queen's bassist John Deacon has been a lot of things. On Queen's first album, for example, he was 'Deacon John', because the other band members thought it sounded more interesting. He's also a trained electronics engineer, and without him, Queen wouldn't sound the way they do.

Deacon was the creator of the legendary Deacy Amp, the sound system that gave Queen their trademark orchestral tones.

It's a piece of equipment that enthusiasts and engineers spent years trying to replicate, but with limited success.

It wasn't until 2008, when a group of engineers tore the original machine apart, that they managed to find some semblance of an understanding of its inner workings.

Even more impressively, Deacon created the original Deacy Amp out of pieces he found in the trash.

Bohemian Rhapsody

With all of the glamour, fame and jet-setting hedonism that Queen enjoyed throughout their career, it doesn't seem like much of a surprise that the band's story has been turned into a movie.

But it's been a long road to getting a Queen movie made. The first shot at one was announced in 2010, with Sacha Baron Cohen attached to play Freddie Mercury.

Three years later, and with nothing filmed, Cohen left the project, citing a number of reasons for exiting the film, the most crucial being creative differences with the surviving band members.

Cohen had wanted to make a gritty, adult-oriented look at the life and death of Freddie Mercury, while Brian May and Roger Taylor instead wanted a more family-friendly vibe, with half the movie focused on how Queen had kept going after Mercury's death.

From there, the project continued to hit further speed bumps, burning through actors and directors before Rami Malek was eventually confirmed as the star and Bryan Singer came in to direct.

After one last controversy, the firing of Singer and his replacement by Dexter Fletcher, Bohemian Rhapsody finally secured a November 2018 release.

CHAPTER

TWELVE

60 THE 60S

The 1960s was an era of growth: women found their voices, the fashion industry became more colorful than ever, and music changed in ways nobody could have imagined. It was a time of innovation - and these are the things 1960s Americans just couldn't live without.

Prior to 1960, the most effective and popular form of birth control was the condom. Not only did they prevent pregnancy, but they also minimized the risk of contracting sexually transmitted diseases. Still, condoms could be inconvenient, and would sometimes break or come off. Luckily, a new form of contraception was right around the corner.

When the FDA approved a drug to ease menstrual problems in 1957, it was never intended to be a contraceptive. But it actually did prevent pregnancy, causing an awful lot of women to suddenly report severe menstrual disorders. Known as Enovid, by 1960, the FDA had finally recognized the drug as an effective way to stave off pregnancy. It quickly became commonly called "the Pill." Within two years, 1.2 million women were taking the Pill as it exploded in popularity.



But the drug remained controversial, largely due to the Pope's views on family - and the reactionary groups who charged Planned Parenthood with, in their words, "committing genocide."

For those reasons, the Pill remained illegal in several states even as it rose to become the most popular method of birth control. And then, in 1969, Barbara Seaman's book, The Doctor's Case Against the Pill, revealed such risky side effects as blood clots, heart attacks, strokes, weight gain, depression, and even "loss of libido" - which kind of defeated the purpose of the Pill in the first place.

Enovid was discontinued in the U.S. in 1988, and today has been replaced by a number of more effective contraceptive pills.

Many, many different musical genres can trace their roots to the 1960s. For one, there's the British Invasion, which revolutionized rock thanks to the Beatles, the Rolling Stones, and the Who. But the decade also saw a huge rise in the popularity of a number of other genres, including Motown, psychedelic rock, and folk. Put them all together and they made for one groovy scene.

Valium, which made its first appearance in 1963, was prescribed to manage anxiety – and quickly became one of the most commonly prescribed drugs of all time. Drug manufacturers had actually been researching anti-anxiety pills since the late 1800s, but many of them contained highly addictive opiates. It was hoped that Valium would change that.



Spoiler alert: it didn't.

Even so, big pharma continued marketing it as safe, and falsely insisted it was nearly impossible to overdose on valium. Over a 10-year period, the drug was prescribed to 59.3 million patients. The primary target market was women, many who were harried housewives assigned to domestic duties at home.

Wearing tie-dye became hip among the younger generations, who became a kind of spiritual extension of writer Jack Kerouac's beat generation of the 50's. The only real difference was that, rather than beatniks, these people were known as hippies. "We're doing the hardest work in the world, because we're growing. We're trying to change."

Composed mostly of young people, hippies fought the suppression of society by developing their own culture and way of living. It was an attempt to become a kinder generation, with many going vegetarian, using natural methods for medicine, practicing free love - and, of course, doing a whole lot of drugs.

Hippies came from white middle-class families and grew up in suburbs, which were very white. So were crowds at Woodstock and other rock festivals. They had little experience with people of other races. Hippies made African-Americans uncomfortable. While hippies sneered at success, poor young blacks had to fight to join the mainstream that freaks rejected.

Young whites found their parents to be gluttons of consumer culture. Hippies saw that consumption failed to make their parents happy, but they did not understand that their parents were reacting to deprivation between 1929 and 1945. Young blacks craved consumer goods as signs of success and acceptance.

Hippies had a moral vision of the world, and so do the Star Wars films. Luke Skywalker is a technologically empowered individual living an authentic life defending his community. J. K. Rowling builds on these themes in the Harry Potter books, but she adds fantasy, mysticism and the supernatural. These are counterculture values. Freaks felt that mainstream society had gone awry because it was too scientific and too rational. At times, hippies argued, feelings were more important. Rowling entreats the reader to trust in feelings.

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"If everyone demanded peace instead of another television set, then there would be peace.
↪"
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~ John Lennon

Peace.

12.1 About the Author

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CHAPTER

THIRTEEN

THE VIETNAM WAR AND DRUGS, A DEADLY COMBINATION

The Vietnam War was a long, costly and divisive conflict that pitted the communist government of North Vietnam against South Vietnam and its principal ally, the United States.

The conflict was intensified by the ongoing Cold War between the United States and the Soviet Union. More than 3 million people (including over 58,000 Americans) were killed in the Vietnam War, and more than half of the dead were Vietnamese civilians.

the Vietnam War from 1955 to 1973, though it was now combined with rampant non-sanctioned drug use.

Speed continued to be the approved drug of choice, but now soldiers gained access to illicit drugs like heroin. Desperate soldiers would combine these two powerful drugs to create their homemade injectable speedballs. This potent combination creates a push-pull effect, both boosting energy and helping them relax.

The high from these speedballs were stronger and more long-lasting than the high they could get from using either drug on its own, and it helped the soldiers to deal with the brutal conditions of war, as well as cope with the horrible atrocities that they witnessed – and even committed - during these wars.

Drug use during the Vietnam war reached epidemic levels - according to the Pentagon, by the time the U.S. withdrew from the war in 1973, some 70 percent of all-American soldiers in Vietnam had taken drugs. Shockingly, the authorized use of drugs by soldiers in combat continues around the world to this day.



The research was conducted on the history of drug use pre-post and during the Vietnam War found that overall there was heavy use of drugs from the majority of soldiers, some cases found the government would give the soldiers drugs to help them cope with the anxiety and stress caused by the war.

The soldiers were self-medicating with the main choice being heroin the availability of the drug was staggering according to one veteran you could just buy it by the roadside.

There was every kind of drug and alcohol for sale, American beer, and hard alcohol but also cannabis, pills of every kind, and harder drugs. in several provinces, you could buy pure liquid opium in a large vial for about ten dollars!

The soldiers used to dip cigarettes and joints in the opium, a large vial was more than you could use in a month even if you had a serious habit which I eventually did "said one soldier", there was an incredibly high number of drugs in Vietnam because there was a local demand for the drugs and also a new large international soldier demand.



The soldiers would pick up when they went into larger cities and towns and then bring it back with them to the remote outposts deep in the jungles of Vietnam.

They found that ninety percent of people who left for combat with traces of drugs in their system reported heavy drug use while in Vietnam. forty-five percent of people who were negative for drug use before departing also reported heavy drug use while in Vietnam.

The easy access ability led to massive numbers of soldiers who were addicted as heroin is the most addictive drug on the market. long term use of heroin can lead users to develop a tolerance to the drug they need larger and larger doses to feel the same effects and end up addicted. almost half of all soldiers tried heroin while in Vietnam surprisingly the soldiers were able to recover from the addictions fairly quickly once they returned home.

Turns out the only 5% of soldiers continued their addiction once they returned home, the reason this is because they were using heroin to get away from the reality of life for the American soldier in Vietnam.

A soldier says "I went to Vietnam in September of 1969 and during the time that I was there, I went through certain experiences that led me into using drugs. One of the experiences as I recall is during a night ambush, I killed a 12-year-old kid, you know it was something that I couldn't handle at that time, you know. Seeing him dead lying in the ground the next morning. It stayed on my mind so, I started using drugs and I kept that up until I came back to the states."

13.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

FOURTEEN

AL KARAMA: THE HOME OF HEROES

The Day of Dignity is immortal in the history of our Jordanian armed forces and the national memory as one of the honorable pages of our glorious history, and a station of determination and faith, and the example of the Arab army in patience and pride. On the twenty-first of March, 48 years ago, the land of Rabat and the Almoravids in the Jordan Valley witnessed - The Holy River Jordan - The fiercest battles with an arrogant enemy who possessed the equipment, and whose arrogance overwhelmed him, and the euphoria of June 67 took him to build bridges of illusion and imagination, believing that crossing the Jordan River in the east would be just a picnic. At the dawn of the twenty-first of March his legions crawled silently After the attacks on our western front that have not stopped since the 1967 war, he seeks to translate his ambitions and implement his plans while he surrounds himself with an aura of arrogance to impose what he sees and wants of coercion and expansion.



The goals of “Israel” from its invasion of Jordan can be summarized as follows:

The enemy wanted from the battle to destroy the Jordanian leadership and its forces and its self-confidence after it was surprised by the situation that arose as a result of the June War, which is Jordan’s rejection of the results of this war, as it remained steadfast with its vitality, activity, and determination to struggle to remove the effects of the aggression, and the Israeli leadership believed that the Jordanian army He lives in disarray after the June War, and miscalculated

because the Jordanian leadership worked to reorganize and quickly, and occupied new defensive positions on the eastern bank of the Jordan River so that the fighting spirit and determination to fight the battle remained at its highest levels, and it appeared in Jordan's remarkable steadfastness.

The site of the Battle of Karama is important from a religious point of view, as it represents the land of Rabat for the sake of God within the Levant region.

As for the geographical and strategic importance of this region, it constitutes the center point in the heart of the Arab world, as it is more like a gateway through which the armies going to Palestine pass, whether these armies are coming from the east or the west, the north or the south, and it was the scene of decisive battles in Islamic history, and a gateway to For the victories that achieved the nation's prestige, dignity and status, and for spreading the message of truth, justice and humanity, such as the battle of Hattin and Ain Jalut.

The Jordan Valley is a low area located between two coordinated mountain ranges, the Western Mountains and the Eastern Mountains, and it is said that they were one block. In the third geological age, the crater that formed the Jordan Valley occurred.

The Ghor region is rich in agricultural, water, and trees resources. It produces vegetables and fruits, which are good pastoral areas. As for its water sources, it is represented in the Jordan River - Lake Tiberias - the Dead Sea, and the Eastern Ghor Canal, in addition to many water springs, ponds, and wells. The Ghor is the nerve of agricultural and economic life for Jordan.

There is one transverse road in the Ghor that extends from the Jordanian Hamma to Aqaba. As for the roads connecting the eastern and western highlands, they are bridges (King Hussein Bridge, King Abdullah Bridge, Prince Muhammad Bridge). The eastern and western parts of the area are characterized by the difficulty of transportation, rugged roads, high altitudes, and the presence of trees and sections. The sloping, rocky area is a strategic area where individuals lie against the mechanisms and impede their movement in the event of any advance by the enemy forces, as happened in the battle of Karama.



14.1 Forces of Both Parties

1. Israeli forces. As a result of the information available from the intelligence sources and the observation of the battlefield, the Israeli forces were estimated to have an armored division with their supporting weapons in addition to the air force, as follows:
    - 7th Armored Brigade
    - 60th Armored Brigade.

- 80th Mechanized Infantry Brigade.
- Paratroopers battalion of the 35th Paratroopers Brigade.
- 5 field artillery and heavy artillery battalions.
- the Four squadrons of combat aircraft (Mirage, Mister).
- Several helicopters capable of transporting two battalions at once.
- Armored engineering battalion.

2. Jordanian forces. The 1st Infantry Division defends the central and southern region, starting from Sail al-Zarqa in the north to Aqaba in the south, and was distributed as follows:
   - Hittin Brigade occupies defensive positions on the approach Naour.
   - Princess Alia Brigade occupies defensive positions on the approach of Wadi Shuaib.
   - Al-Qadisiyah Brigade occupies defensive positions on the approaching crossbar.
   - The 60th Armored Brigade of Prince Hassan bin Talal supports the 1st Infantry Division, as one of its battalions was distributed among brigades and a battalion in the army's reserve role in the Tabarbour area.
   - The division is supported by three field artillery battalions and a heavy artillery company.
   - The division supports a field engineering battalion.

14.2 Combat Approaches

The Battle of Karama began at 05:30 am on March 21, 1968, and continued for sixteen hours of bitter fighting along the front. Through the course of incidents and analysis of combat operations, it became clear that the attacking Israeli forces built their plan on three main approaches and a fourth, misleading approach. To disperse the efforts of the armed forces, and all these approaches lead, according to the nature of the land and paved roads to the heights of Salt, Amman, and Karak, and the approaches were as follows:

1. Approaching the crossbar. From Prince Muhammed Bridge (Damia) to the Masri Triangle to the main Arda road to Salt.
2. Approach Wadi Shuaib. From the King Hussein Bridge (formerly Allenby) to the Southern Shouneh, to the main road adjacent to Wadi Shuaib, and then to Salt.
3. Sowayma Approach. From Prince Abdullah Bridge to Ghor Al-Rama to Naour and then to Amman.
4. Gore net axis. From the south of the Dead Sea to Ghor Al Safi and Ghor Al Mazraa to the main road to Karak.

14.3 White Weapon Battle

The landing operation carried out by the Israeli forces east of the town of Al-Karama, was aimed at relieving the pressure on its forces that crossed east of the river, in addition to destroying the town of Al-Karama, especially when it was unable to put any new forces across the bridges, due to its destruction by the Royal Artillery Corps, and this Conclusive evidence that the defensive plans through which the Arab army forces fought their defensive battle were tight, and the dense and accurate artillery support contributed to their success, in addition to the steadfastness of the soldiers in defensive positions, and in its depth, the landing process east of the town of Karama was a limited operation, where a section of the fedayeen was They work there as a launching pad for guerrilla action, sometimes based on the desire of the Jordanian leadership. Indeed, the Israelis destroyed the town of Al-Karama after they clashed with Jordanian forces and guerrilla fighters present there.

With the end of the events of the battle, the enemy had completely failed in its military operations, without achieving any of the goals for which it had begun these operations and on all approaches and axes, and returned to dragging the tails of disappointment and failure, and the desired goals from behind the battle were destroyed in front of the rock

of Jordanian steadfastness, to prove to the enemy Once again, he can continue one battle after another, and to destroy the enemy's continuous attempts to undermine Jordan and its steadfastness. The Jordanian soldier has proven that his fighting spirit stems from the determination to fight battles of heroism, honor, bravery, and sacrifice.

In his historic speech, the late King Hussein bin Talal said on the day after the battle: "If I had to point out any of the lessons learned from this battle, my brothers, arrogance, and vanity lead to defeat, and belief in God and determination to persevere whatever the sacrifice is the way. The first is victory, and it is self-reliance first and foremost, clarity of purpose and nobility of the goal that gave us comfort when we decide that we are steadfast and steadfast to death, determined to do so, we do not budge and do not retreat, regardless of the challenges and difficulties."

And the enemy's failure in its plans, which was known from the documents that the Israeli leaders had and left on the battlefield, which is to occupy the eastern heights and invite journalists to lunch in Amman.

This battle also embodied the importance of the will of the Arab soldier, which was elaborate and highly efficient, and effectively contributed to the resolution and success of the battle. It also highlighted the importance of moral preparation, as this preparation was to the fullest. The morale of the Arab army was high as they awaited the day of revenge and revenge against their enemy. They waited anxiously for the zero hour to respond to injustice and tyranny.



The battle highlighted the good planning, preparation, and good implementation of the Arab army, as well as the importance of intelligence, as the enemy did not succeed in achieving the element of surprise due to the strength of the Jordanian military intelligence, which was closely monitoring the situation and sending reports to the specialists, as it examined and analyzed the results and predicted the news of the aggression by Israel, which Gave a chance to equip and stand up to her.

14.4 Losses of Both Parties

Our valiant forces: 86 martyrs and 108 wounded, 13 tanks and 39 different vehicles were destroyed.

Israeli forces: (250 dead and 450 wounded, and 88 different vehicles were destroyed, including 47 tanks, 18 tankers, 24 armed cars, 19 cargo cars, and 7 fighter planes).

14.4.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

FIFTEEN

AMER SHAFEE, ONE OF THE BEST GOALKEEPERS IN HISTORY

Amer Shafee, who started with Yarmouk youth in 1994, emerged quickly through his joining the national teams, where he guarded the first national team goal since 2000, and before that he was like the junior team in 1995, the youth team in 1997, and the Olympic team in 2000. In the Asian finals that the team fought The National 2004 in China appeared as a patron at a decent level that made him the most prominent on the Asian continent, and it was he who pushed Al-Faisaly to sign him for the 2004-2005 season and then played with the Egyptian Ismaili 2005 before returning to Yarmouk in the 2005-2006 season and finally with Al-Wehdat in 2006.



Shafie has a proven track record through his remarkable presence in the events he went through with the national team. In addition to the 2004 Asian finals, he emerged in the finals that took place in Doha 2011 and won the title of the best player in more than one match the team played at the time. But now, Shafie is presenting great levels with Al-Wehdat and the Jordanian national team.

Shafie has played 168 international matches with the Jordanian national team, as he is considered the third most goalkeeper in the history of world football, after Saudi Mohammed Al-Deayea (178 matches) and Italian Gianluigi Buffon (174 matches).

Over the course of his 18-year international career, Shafie, born on February 14, 1982, was the focus of all the achievements of the Jordan national team, before he recently announced his retirement from football at the age of 39.

And the official account of the Jordan Football Association, via the social networking site "Twitter", published a video clip, in which Shafie appeared, saying: "Today I made the most difficult decision in my life, after long thinking and

consulting my close ones, today I officially announce the end of my career that spanned for more than 25 years in football stadiums.



He added: "During my career, I gave my effort and time to serve the Jordanian football, and I found it difficult to remain at the same level and readiness.

He continued, "I thank Prince Ali bin Al Hussein, president of the Jordanian Federation, who was a support for me and the players, and was a brother and friend, and I thank the technical staff, and I thank the Jordanian football fans."

Shafia appeared with Yarmouk Club in Jordan when he was 17 years old, and scored his name among the most prominent goalkeepers in the Jordanian league, to witness in 2002 that the expert Egyptian coach Mahmoud El Gohary gave him the opportunity to join the national team.

Shafie played a major role in the Jordanian team's qualification for the first time in its history to the Asian Cup finals, in 2004 in China, after keeping a clean sheet in three matches, twice against Lebanon and once against North Korea.

Then in the finals, Shafie announced himself among the stars of the continent, after he performed wonderful performances that contributed to the qualification of the Al-Nashama team from the group that included the former champions Kuwait and South Korea, along with the UAE team and runners-up in 1996, where he kept a clean sheet in the three matches.

15.1 About the Author

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CHAPTER

SIXTEEN

CAPTAIN HABIS AL-MAJALI, THE LEGEND OF THE BATTLES OF LATRUN AND BAB AL-WAD



His Excellency Field Marshal Habis Al-Majali / (Habis imprisoned them in the valley… Habis and his soldiers and Tadi)

The year of Hayya is that revolution that was ignited by the men of Karak and those around it, bearing hundreds or even thousands of pages of ancient history. The divinity or identity of Karak is a decisive moment in the history of the struggle of the Arab people, and a first sign of the transformation from a dark era to another filled with hope and obsessions together, here. in This historical moment, and the freemen scatter their souls for the land and dignity to lift the injustice and darkness, so they spread it merrily, as they shoot bullets from guns that are numbered and counted. To fill the castle with detainees and prisoners, which was built civilization after civilization to preserve the land, souls, and honor.



In the midst of all this, amid his harbingers, Bandar al-Karakiyya gave birth to Habis al-Majali and gave birth to him in prison while accompanying (Makhshas). They were the first two political detainees in the region, revolutionary free women and the wives of elders, who led a revolution that was a major gateway through which the Arab liberation movements crossed until the start of the Great Arab Revolution.



Habis Al-Majali was born from the womb of the revolution, and on his forehead are the banners of the next stage. In that year 1910 AD, he dated the birth of Field Marshal Habis al-Majali, although some argue that his birth was in the year 1914 AD, but the Arabs were chronicling the events and he was one of the sons of the Hayya year, and perhaps one of the effects of that stage If I pushed Habis to join military service at an early age, he is predisposed to struggle and equestrianism, bearing in his memory and thought the images of those tournaments that parents and grandparents wrote in the records of Jordanian pottery. The orientations of a young man crowned his life and his homeland with heroism and redemption, as the Karaki boy began to prove his military genius and true loyalty through his ascension through the ranks and military positions, which the higher and more advanced his responsibilities became, the heavier his responsibilities and the greater his duties.

Habes al-Majali is a military legend whose images were evident during the wars of the Salvation Army in Palestine in 1948 AD. Israeli and Arab documents still testify to his courage and skill whenever the battle heated up. He is the lion of the battles of Jerusalem in Latrun and Bab al-Wad.

In the Battle of Latrun, during which Habes led the Jordanian forces, consisting of (1200) soldiers, in a fierce confrontation with a well-armed number of (6500) soldiers, this young commander was able to push the Jordanian forces to excel and achieve a victory of his peers in those wars, calling on the army's fighters. The Arab, with his famous phrase (death or worldly life), inflicted a heavy defeat on the Israeli forces. Some Jewish parties estimated their losses at two thousand dead. A large number of Israelis, including the former Prime Minister of Israel (Ariel Sharon), were captured and transferred to the prisoner camp in the city of Mafraq. This battle was A major step in the liberation of Jerusalem, so that Captain Habis Al-Majali would have broken the expectations of the enemy, and raised the morale of the Arab armies that had suffered from successive failures.

In difficult circumstances that Jordan faced, Field Marshal Habis al-Majali became commander-in-chief of the army in 1970 AD, to prove once again that he is the loyal and courageous soldier, and that he is able, if the need arises, to respond to the call of duty in the darkest of circumstances so that Amman will return as the capital of security and tranquility, and a home for the free Arabs and their distress. (Abu Sattam) Habis did not spare a single day of his life for the dear homeland.

He held several positions and endowed him with everything he could do to preserve the Jordanian land and serve its people and leadership. He was appointed chief of His Majesty the King's trustees, minister of the court, minister of defense, and a member of the Senate until his death.

Field Marshal Habis al-Majali lived for nearly ninety years, which he spent as a combat soldier, a brave leader, and a high-ranking official until his death on 4/24/2001.



16.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

SEVENTEEN

OMAR AL-ABDALLAT, THE SOUND OF JORDAN

Omar Hussein Al-Abdallat, a Jordanian singer from the city of Salt, was born in the northern region of Marka and spent most of his life there. He started singing since he was nine years old at parties and weddings and learned to play the lute to sing Jordanian heritage songs and songs in the Gulf, and he stuck to his artistic ambition to reach the level of Senior technician.



Omar Al-Abdullah released a song for the homeland, which is one of his first songs, which was the reason for his fame, which is (Hashemi Hashemi), during the reign of King Hussein bin Talal, and after that, he participated with the Ma'an Folk Troupe, which is one of the most popular groups in the world. At the time, he released a song in the early nineties called "Ya Saad".

He released more than one patriotic and emotional album, as he sang Jordanian songs such as: "Our Army, the Homeland Army", the song "Ghaz Al-Bayariq", the song "Army of Heroes", and "Kif Al-Himma", and sang for the struggling people in Palestine during the conditions of Gaza the song "Coming Coming" He also sang the "Quds of the Homeland" song "We are Palestinian".

Al-Abdallat participated in more than one operetta, most notably: "The Arab Dream", "Baghdad Don't be in Pain", "The Arab Conscience", "Voice of Peace", and participated in many festivals at the local and Arab levels.



In 2019, Omar Al-Abdullah was a guest on one of the programs, and the presenter of the program tried to make him fall into the trap of questions to find out if he considered that the State of Qatar supported "terrorism." He asked him if he would be allowed to sing in it if he agreed to the 13 conditions of the blockading countries, to which Al-Abdullah replied by saying: Qatar is an Arab country, and I do not know these conditions."

The announcer returned and asked him if he sang in Qatar after the crisis, "because it supports terrorism," he replied, " I did not sing after what happened, but not for this reason." Omar's answers were highly praised by the Jordanians, who considered that Saudi Arabia was trying to exploit them in their crisis with Qatar, through its media.

17.1 About the Author

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CHAPTER

EIGHTEEN

TERESA HALASA, A JORDANIAN LEGEND

A plane carrying 140 Israelis was hijacked. Who is Teresa Halasa, who almost killed Netanyahu?

Little did the girl who joined the armed struggle in the ranks of the Palestine Liberation Organization at the age of seventeen know that she would one day be an icon of struggle and redemption against the Israelis and that she would be the woman who one day nearly killed the Prime Minister Benjamin Netanyahu.

It is the Jordanian fighter Teresa Halasa, who passed away on March 28, 2020, at the age of 66, in the Jordanian capital, Amman, after a struggle with a terminal illness.



Teresa Halasa, or as some call her Teresa, was born in the old town of Akka, northern Palestine, to a Christian Jordanian family, and she is the third among her brothers.

Her father came to Palestine in 1946 from the city of Karak, and her mother is Palestinian Nadia Hanna, who was born in the village of Rama (Akka) in Upper Galilee.

Teresa completed her secondary education at the Terrassa National School in Akka, and then completed her studies in the field of nursing at the English Hospital in Nazareth.

Teresa Halsa's world struggle career began in 1971 when she decided to join the armed struggle in the ranks of the Palestine Liberation Organization, one year after the events in Akka, which was the arrest and killing of a member of what was later known as the "Akka Group" at sea.

At his funeral, the Israeli forces prevented his family from seeing his body before burial to prevent seeing the traces of torture he was subjected to before he was killed, which represented a pivotal shift in Teresa's life and her decision to join the Liberation Group.

In addition to the events in Akka, its influence on Palestinian guerrilla operations against Israel - which increased in the early seventies - was an additional reason for its decision.

On November 23, Teresa said goodbye to her village and left Arab lands towards the West Bank, then to Lebanon, accompanied by a young female classmate and without her family's knowledge.

After arriving in Lebanon, she directly joined the Fatah movement and joined the Black September group, which had recently moved from Jordan to Lebanon, after the clashes between it and the Jordanian army.

Teresa was known for her strong position that women had a right to resist on the front lines.

In May 1972, she had what she wanted. She was one of the 4 militants who participated in the hijacking of the passengers of Sabina Flight 571, a Belgian Boeing 707 flying from Vienna, the capital of Austria, to Lod Airport in Tel Aviv, she and Ali Taha Abu Siena. Zakaria al-Atrash, and Rima Issa.



Ali Hassan al-Salama was the main planner of this operation, and for those who do not know who al-Salama is, he is one of the leaders of the Palestine Liberation Army, which Israeli Prime Minister Golda Meir nicknamed the Red Prince because he led many special operations against Israeli forces in the world.

As for the purpose of hijacking the Sabina flight, it was certainly to exchange the hostages with Jordanian and Palestinian prisoners held by the Israeli occupation forces.

After she was arrested, she was brought to trial in Israel, and she was sentenced to life imprisonment twice, and forty years, or 220 years.

But after 12 years, she was released after a prisoner exchange with the Israeli government, and then she was exiled to Jordan.

After her release, Teresa Halasa lived in Amman with her husband and three children, deprived of entering the Palestinian territories and seeing her family in Akka and Haifa, and she had a statement that she never regretted her armed action, as she said that she refused to surrender during the hijacking of the plane. It is worth noting that Teresa treated the civilian hostages well, and declared that her problem was primarily with the establishment and the Israeli state.



18.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

NINETEEN

THE BATTLE OF AL-LATRUN

Al-Latrun was a battle between the Jordanian army and the Israeli forces that lasted from May 15 until May 23, 1948.

It was one of the battles of Jerusalem in the Arab-Israeli war (the 1948 war). This battle was followed by another battle, Bab al-Wad, through which Jerusalem was liberated. The battles of Latrun and Bab al-Wad are among the few successful battles. 1200 Jordanian soldiers were able to defend Jerusalem in return for 6,500 Israelis.

The losses of the Israeli forces were great in this battle, and among them was the American officer David Marcus, who stood by the Israelis, and was killed by an error which was caused by shooting from an Israeli soldier, and the Jordanian forces were led by Field Marshal Habis Al-Majali. The Israeli army was led by Ariel Sharon, who later became Prime Minister (2001-2006).



Ariel Sharon was wounded in the battle, and he was captured by the Jordanian Arab army. Capt. Habis Al-Majali - the Marshal later - captured him on that day, who treated him and transferred him to the back lines, then to Mafraq in Jordan, where the concentration camp for Jewish prisoners was set up.

After the second truce. In 1985, Israeli MP Uzi Landau said in the Knesset that the number of Israeli dead in Latrun exceeded 2,000, and after severe criticism, he lowered his estimate to 1,000. The leader of the volunteer fighters was from the Bedouin Sheikh Nahar bin Sab` al-Nuaimi (the brother of Dhiba).



After the death of former Israeli Prime Minister Ariel Sharon at the age of 85, after he fell into a deep coma from torment in the world eight years ago, after suffering a stroke.

We stop here at a bright station in the life of the late, God willing, Field Marshal Habis al-Majali. In the battle of Latrun in 1948, the commander of the Fourth Battalion, Captain "then" Habis al-Majali, was able to capture the terrorist, the former head of the Zionist gangs, Ariel Sharon, who himself wrote in his memoirs. He was captured by the Jordanian army during the 1948 war, along with his soldiers, and was captured on that day by Captain Habis Al-Majali, the "later Marshal", who treated him and transferred him to the back lines. Then he was taken to Mafraq in Jordan, where the camp for Israeli prisoners was set up, and he was replaced by an Arab prisoner when the exchange took place. prisoners after the second armistice.

Sharon, who joined the ranks of the Haganah organization or "gangs" in 1942 and was 14 years old at the time, and moved to work in the Israeli army, after the establishment of the State of Israel, wrote that when the peace agreement between Jordan and Israel was signed in Wadi Araba, he asked - i.e. Ariel Sharon - Meeting Habis, however, "Al-Basha" Al-Majali refused to meet him in mockery of him, and it was reported by Al-Basha Al-Majali said: I have captured many of them, so how can he ask me to remember him!

May God have mercy on Field Marshal Habis Al-Majali as wide as his love for his homeland, his people, his army, and his Hashemite leadership. and the difference is great between the death of heroes who die with their dignity while leaving Khawabi with loyalty, purity, masculinity, and tolerance, like Pasha Majali.. and the death of criminals, tyrants, like the terrorist Sharon stained his biography. With heinous crimes!



19.1 About the Author

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CHAPTER

TWENTY

WASFI AL-TAL

The twenty-eighth of November of each year is a painful memory in the hearts of Jordanians of the loss of the master of men, the former Prime Minister, the martyr Wasfi Al-Tal, whose name has always been associated in the hearts of Jordanians with sincerity, dedication and the achievement of civilizational achievements that are respected and appreciated by all Jordanians without exception.



We remember the late Wasfi al-Tal, who had the white hands in accomplishing dozens of civilized projects. In his first government in 1962, the establishment of the University of Jordan came as the first scientific edifice in Jordan, followed by the King Talal Dam project, which resulted in the reclamation of thousands of acres in the central Jordan Valley, which was later formed Jordan's food basket, and one of the tributaries supporting the Jordanian economy in the field of exporting vegetables and fruits to neighboring countries, as well as the eastern Ghor Canal project, which took over the transfer of the waters of the Jordan River and Yarmouk River for drinking purposes to the residents of the central region through the Zay water station, as well as irrigating agricultural projects in the northern Jordan Valley.

One of the vital projects that took place during the era of Wasfi al-Tal's first government was the establishment of the desert highway, which formed the main nerve connecting northern and central Jordan with the governorates of the south, passing through the governorates of Karak, Tafileh, and Ma'an, all the way to the city of Aqaba, where this road contributed to an increase in the volume of Jordan's exports of phosphate and the increase in the volume of Jordan's

imports Through the port of Aqaba to the local Jordanian markets, in addition to the reclamation of agricultural lands in many areas of the central Jordanian desert, especially in the Al-Dhalil area, where Al-Tal was the first to initiate the reclamation of lands in the mentioned area for agricultural purposes.



Wasfi al-Tal also had the honor of initiating the establishment of the Phosphate Company and the Potash Company to exploit the vast wealth of the Dead Sea and expand the Jordanian coast on the Gulf of Aqaba to a distance of 100 km to the south.

In Wasfi al-Tal's second government, the Jordanian television and satellite station were established, which became Jordan's point of contact with the outside world, the Jordan University Hospital, and the development of Al-Bashir Hospital to be the most important medical edifice in the capital, Amman.

And when we recall Wasfi al-Tal, we remember his devotion to the Palestinian cause, as he rushed in his early youth as a fighter in the ranks of the Palestinian Salvation Army led by the leader Fawzi al-Qawuqji, after which he moved as an officer in the ranks of the Syrian army to rise to the rank of lieutenant colonel as a combat officer and then returned to Palestine, which he loved to work with the Palestinian businessman Musa al-Alami to establish The largest agricultural project in Jericho Governorate, which is still generating good for its neighbors and works in it.

He also decided to establish Al-Ra'i newspaper to be a spokesperson for the Jordanian state, and also decided to establish the National Union Party to be a motive for political and partisan life in the country, and I also experienced many humanitarian situations for that man who devoted a day from Every week to receive citizens in the presidential house, offering help and assistance to those who seek it from among the sons of the country, without discrimination or favoritism to anyone.



On a summer day, a delegation from the people of Al-Hussein camp came to him at the presidential house, complaining about the lack of water in their homes. He immediately contacted the Director of Civil Defense, asking him to drive a water tank himself into the camp to encourage the rest of his colleagues to accomplish the task of delivering water to the camp's homes through tanks in the camp. Over three hours.

One day, he recalled the occurrence of a crisis represented by the lack of sugar in shops all over the country, where the Minister of National Economy at the time came to him complaining about the refusal of the sugar agent in Jordan to provide sugar to the citizens. The late Wasfi contacted the agent and informed him of the need to provide a verbal warning. Sugar in three hours as it was provided in all shops urgently.

Among the well-known positions of Wasfi Al-Tal is his frequent visits to all cities, villages, and camps in the Kingdom, where he would visit every week a Jordanian city and several villages to see the conditions of citizens and work to solve the problems they face on the ground without referring to the so-called work committees.

Among his achievements, may God have mercy on him, is that he instructed the cancellation of the security records of many politicians and partisans, and ordered the transfer of their files to the "House of Fire" in the cement factory in Fuheis, and allowed the return of many politicians who had sought refuge with Jordanian pain to Egypt, Syria, and Lebanon, and returned them to Jordan, and appointed a number of them in Leadership positions, and I mention among them Nazir Rashid, Ali Abu Nawar, Ali Al-Hiyari, Abdullah Al-Rimawi, and many others.



Wasfi al-Tal was a liberal nationalist and participated in all seminars and conferences held in many countries of the world in support of the Palestinian cause, and he always used to say that the best way to fight the Israeli enemy is popular resistance because of what Israel obtained from advanced weapons and military equipment from Western countries that exceeded them. In its size and influence, all Arab countries combined.

Events have proven that the popular resistance is the most effective and most successful means of combating the Israeli enemy, and this is what everyone saw in the first and second Intifadas of stones in the West Bank and Gaza Strip, which was confirmed recently, as the Islamic resistance achieved clear and clear victories over the Israeli enemy, especially in the Gaza Strip.

Israeli Prime Minister Yitzhak Shamir said when he was asked about the Arab figure who was threatening the Israeli entity. Adoption of popular resistance against Israel. Where he said: "Wasfi al-Tal was the most dangerous Arab figure for Israel because he always called for the adoption of popular resistance against Israel."

Wasfi Al-Tal was a pioneering Jordanian tale and today Wadha is an example of a good biography that does not fade with time… Features of Wasfi's biography He exchanged the homeland and leadership in loyalty.



Wasfi al-Tal was a jewel in the forehead of the homeland and one of his brave soldiers who served him honorably with the late leader King Hussein bin Talal and the rest of the honorable like Hazaa Al-Majali, Mustafa Khalifa, Habis Al-Majali, Qasim Al-Maaytah, Ibrahim Hashem, Melhem Al-Tal, Abdul-Wahhab Al-Majali, Imran Al-Maaytah, Kasib Al-Safouq, Ahmed Toukan, Anwar Al-Khatib, and other men.

The honorable homelanders who gave their lives to serve the country and its people.

20.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

TWENTYONE

ANDERSON DARLING TEST

This is another of the tests called goodness of fit and based on the normal distribution, it measures the area that exists between the fitted line and the empirical distribution function (based on the data). The Anderson Darling test is measured using a squared distance that has a higher weight, with respect to the tails of the distribution.

This test can be used to check if the data are able to satisfy the assumption of normality and it can also be defined as a statistic, used to check if a certain set of sample data comes from a population whose probability distribution is continuous. The Anderson Darling test is based on comparing the cumulative empirical distribution function of the sample results with the expected distribution, in the case that the data are normal. At the time of contrasting the results, in the case that the difference between both distributions (the empirical and the observed one) is too large, the null hypothesis would be rejected and therefore the conclusion is reached that the population does not have a normal distribution.

The statistic used for this test is given by the area that exists between the fitted line that is determined by the chosen distribution and the function that is based on the points of the graph. As the statistic is the square distance that has a greater weight in the distribution tails, this implies that a small value obtained from the Anderson Darling test would indicate a greater adjustment of the distribution to the data and this statistic is given by the following formula:

A2= -N-S

Where N is the number of cases and S is the standard deviation, but it can also be expressed as follows:

$$A_n^2 = -\sum_{i=1}^{N} \frac{(2i-1)}{n} [lnF(Y_i) + \ln (1 - F(Y_{n+1-i})]$$

Being:

n = the sample size or number of data

i = the ordered observations

F(Yi) = Empirical distribution function

There are two steps to perform the Anderson Darling test: The first step is to create the two cumulative distributions where the first distribution corresponds to the raw data, while the second distribution is the normal one. The second step is to compare both cumulative distributions to determine the largest difference in absolute value between the two distributions. In such a case that the difference has a very wide margin, the null hypothesis is rejected and this would imply that the data have a normal distribution.

The test statistic is responsible for measuring the fit of the data to a specific distribution. This indicates that for a particular distribution and data set, the smaller the statistic the better the fit of the data to the distribution. You can even use this Anderson Darling statistic in order to compare the fit of various distributions to determine which one is the best fit. The idea is that the Anderson Darling statistic is essentially smaller than the others, in order to conclude that we find the best distribution. In the case that the statistics are very close to each other, it is advisable to use some additional criteria such as probability graphs, which will help us choose between them.

Let's go with an example: Suppose that in a certain University there are courses for masters, postgraduate and undergraduate classes in different careers, in each classroom there is a number of students and we want to know if the number of students per class follows a normal distribution The results of the number of students for each classroom are shown below:

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The results of the number of students for each classroom are shown below:

Classroom No. (i)	Number of students
1	19
2	55
3	30
4	79
5	97
6	75
7	65
8	90
9	77
10	22
11	45
12	16
13	57
14	66
15	30
16	91
17	88
18	58
19	29
20	86

If we calculate the mean and the standard deviation, we obtain the following values:

= 58.75

= 26.83

We are going to calculate each of the columns of a table with the data that we will need to substitute in Anderson Darling's formula.

We will fill the first column with the first part of the formula which is: (2i-1).

In the second column we will place the data from our observations with the number of students per classroom, but in order from least to greatest and we will call it Yi. While the third column (Yn+1-i) will be made up of the same data as the second column, but ordered from highest to lowest, that is, in reverse order.

(2i-1)	Yi	Yn+1-i	Zi	F(Yi)	F(Yn+1-i)	1-F(Yn+1-i)	LnF(Yi)	Ln[1-F(Yn+1-i)]	S_i
1	16	97	-1,59	0,0559	0,9236	0,0764	-2,8842	-2,57177	-0,273
3	19	91	-1,48	0,0694	0,8849	0,1151	-2,6679	-2,16195	-0,724
5	22	90	-1,37	0,0853	0,8770	0,1230	-2,4616	-2,09557	-1,139
7	29	88	-1,11	0,1335	0,8621	0,1379	-2,0137	-1,98123	-1,398
9	30	86	-1,07	0,1423	0,8461	0,1539	-1,9498	-1,87145	-1,720
11	30	79	-1,07	0,1423	0,7734	0,2266	-1,9498	-1,48457	-1,889
13	45	77	-0,51	0,3050	0,7517	0,2483	-1,1874	-1,39312	-1,677
15	55	75	-0,14	0,4443	0,7291	0,2709	-0,8113	-1,30601	-1,588
17	57	66	-0,07	0,4721	0,6064	0,3936	-0,7506	-0,93242	-1,431
19	58	65	-0,03	0,4880	0,5910	0,4090	-0,7174	-0,89404	-1,531
21	65	58	0,23	0,5910	0,4880	0,5120	-0,5259	-0,66943	-1,255
23	66	57	0,27	0,6064	0,4721	0,5279	-0,5002	-0,63885	-1,310
25	75	55	0,61	0,7291	0,4443	0,5557	-0,3159	-0,58753	-1,129
27	77	45	0,68	0,7517	0,3050	0,6950	-0,2854	-0,36384	-0,877
29	79	30	0,75	0,7734	0,1423	0,8577	-0,2570	-0,15350	-0,595
31	86	30	1,02	0,8461	0,1423	0,8577	-0,1671	-0,15350	-0,497
33	88	29	1,09	0,8621	0,1335	0,8665	-0,1484	-0,14329	-0,481
35	90	22	1,16	0,8770	0,0853	0,9147	-0,1312	-0,08916	-0,386
37	91	19	1,20	0,8849	0,0694	0,9306	-0,1223	-0,07193	-0,359
39	97	16	1,43	0,9236	0,0559	0,9441	-0,0795	-0,05752	-0,267
									-20,52

A fourth column Zi must be calculated through the formula:

$$Zi = \frac{Yi - \mu}{\sigma}$$

For example, for the first values we have:

Z1 = (16- 58.75) / 26.83 = -1.5933

Z2 = (19-58.75) / 26.83 = -1.4815

In this way we will be calculating each value of Z for the rest of the rows, it is important to emphasize that the value is close to two decimal places since then we must look for the value in tables of F (Yi) as we have done on other occasions and remember, that it is only needed to enter tables the whole number and the first decimal of Z that the left column of the table is searched for and the second decimal, it is found in the upper columns of the table, the intersection of both values will give us as a result the numbers to be placed that will make up the column of F (Yi). As we can see, only two decimal places are needed and that is why the value of Z is close to the two required decimal places.

On the other hand, the fifth column F(Yn+1-i) is configured by the same values of the fourth column, but in the opposite direction and the sixth column is formed simply by the subtraction of the fifth column to unity, that is,1- F(Yn+1-i). All these calculations are made in order to facilitate the values that we need to substitute in the final formula, which we remember is:

$$A_n^2 = -\sum_{i=1}^{N} \frac{(2i-1)}{n} [lnF(Y_i) + \ln (1 - F(Y_{n+1-i}))]$$

We can realize that the only thing missing for the calculation of this formula is to extract the natural logarithm of both F (Yi) and 1- F(Yn+1-i) and it is precisely with these calculations that we will fill in the octave and ninth column. For example for the eighth column:

Ln F (Y1) = ln (0.0559) = -2.88419 -2.8842

Ln F (Y2) = ln (0.0694) = -2.66786 -2.6679

While for the ninth column we must extract the natural logarithm to the values found in the sixth column, for example, for the first two rows we have:

Ln [1-F(Yn+1-i)] = ln (0,0764) = -2,57177

Ln (0.1151) = -2.16195

Thus we are calculating the values for each of the columns until the 20 rows are completed and once we have the entire table complete, we can now apply Anderson Darling's formula to obtain the values of the last column, that is, the tenth. If we realize, in order to apply the formula:

Ln [1-F(Yn+1-i)] = ln (0,0764) = -2,57177

We only have to divide the first column (2i-1) by the number of data (n) and then multiply the result, by the sum of the values obtained in the eighth lnF (Yi) + ninth column ln(1-F(Yn+1-i))], for example, we will do this calculation for the first two rows:

$$S_1 = \frac{1}{20} * [-2,8842 + (-2,57177)] = -0,27279 \cong -0,273$$

$$S_2 = \frac{3}{20} * [-2,6679 + (-2,16195)] = -0,724$$

And so on, once we have completed the 20 rows corresponding to the last column, we must add all their values to obtain the final sum, which as we can see we obtain a value of:

$$S = \sum_{i=1}^{20} S_i = -20,526.$$

The next step is to apply Anderson Darling's first formula:

A2= - N – S = -20 –(-20,526)= 0,526

This value is the one that we are going to compare with the Anderson Darling critical value, which, as we can see for a normal distribution:

Case	Adjusted test statistic	$1-\alpha$ 0.900	0.950	0.975	0.990
All parameters known	A_n^2 for $n \geq 5$	1.933	2.492	3.070	3.857
$N(\overline{X}(n), S^2(n))$	$\left(1+\frac{4}{n}-\frac{25}{n^2}\right)A_n^2$	0.632	0.751	0.870	1.029
Expo($\overline{X}(n)$)	$\left(1+\frac{0.6}{n}\right)A_n^2$	1.070	1.326	1.587	1.943
Weibull($\hat{\alpha}$, $\hat{\beta}$)	$\left(1+\frac{0.2}{\sqrt{n}}\right)A_n^2$	0.637	0.757	0.877	1.038
Log-logistic($\hat{\alpha}$, $\hat{\beta}$)	$\left(1+\frac{0.25}{\sqrt{n}}\right)A_n^2$	0.563	0.660	0.769	0.906

Equivalent to: A2crítico = 0,751

According to the decision rule, if the calculated Anderson Darling value is less than the critical value, then the null hypothesis is not rejected and we can realize that this is precisely the case for this example, since:

0.526 <0.751

We can then conclude that as the calculated value is less than the critical value, the null hypothesis is not rejected and this implies that the observed data have a normal distribution.

Before studying other verification methods for a normal distribution, we must know the term kurtosis, since we will have to use it to find the formulas that we will need to apply in the following methods

21.1 Kurtosis

The statistical measure that is capable of determining the concentration levels of the values of a variable, which is located in the vicinity of the central zone of its frequency distribution, is called kurtosis. Some authors call kurtosis as a targeting measure.

In general, when we measure a certain random variable in those results that have a higher frequency, they are around the mean of the distribution. Suppose we are measuring the height of the students in a classroom, when calculating the class average we obtain the result that it is 1.72 cm. The most logical thing is that the heights of the other students continue around this average, yes, with some degree of variability but without too much difference. When this happens, the random variable can be considered to have a normal distribution, however, in view of the large number of variables that can be measured, this is not always the case.

The truth is that there are certain variables that have a higher level of concentration or rather, less dispersion of their values around the mean. On the contrary, it can also be the case of some variables that present a greater dispersion, that is, a lower level of concentration of their values around their central value and that is why kurtosis is important, since this value gives us It gives information on how concentrated (targeted) or perhaps how flattened a distribution is (this means that it has a lower concentration).

21.2 Types of kurtosis

There are three types of distributions that are classified depending on their degree of kurtosis.

1- When the values are concentrated around their mean, it is called a leptokurtic distribution and this happens when the kurtosis has a value greater than 3.

2- In the case that there is a normal concentration around the mean, it was called a mesocúrtic distribution, in this case the kurtosis has a value equal to 3.

3- When the values are in low concentration around their mean, it is called platicúrtic and the value of its kurtosis will be less than 3.

Depending on how the data is grouped, the kurtosis is calculated with a different formula. But we are going to do an example to calculate the kurtosis of a group of ungrouped data. Let's suppose that we have the following data distribution: 8, 5, 9, 10,12, 7, 2, 6, 8, 9, 10, 7, 7

The first thing we have to do is calculate the arithmetic mean, so we add all the data and divide it by the amount of data and this gives us an average of:

= 7.69

The second step is to calculate the standard deviation, for this it will be necessary to square the subtraction of the data minus the arithmetic mean and the sum of these calculations must be divided by the number of observations minus the unit and finally, the root is extracted square. After all these calculations we obtain a deviation of:

= 2.43

To facilitate calculations, it is recommended to use the following formula for each of the data (Xi-)4 and place the result in a table:

Xi	$(Xi - \mu)^4$
8	0,01
5	52,36
9	2,94
10	28,47
12	345,07
7	0,23
2	1048,21
6	8,16
8	0,01
9	2,94
10	28,47
7	0,23
7	0,23
Total	1517,34

The formula for calculating kurtosis on ungrouped data is:

$$g_2 = \frac{\sum(Xi-\mu)^4}{N\,\sigma^4} = \frac{1517,34}{13*2,43^4} = 3,34$$

We can realize that in this case the kurtosis is greater than 3, so that we would be in the presence of a leptokurtic distribution and, as we already know, it has a greater aim than the normal distribution has.

21.3 Excess kurtosis

Some authors call the excess kurtosis the difference between the value obtained and the kurtosis of a normal distribution, so that:

Excess kurtosis = g2 - 3 = 3.34 - 3 = 0.34

If this difference or excess kurtosis is greater than zero, we are in the presence of a leptokurtic distribution. Given the case that it is equal to zero, the distribution would be normal or mesocúrtic and if it is less than zero, the distribution would be platicúrtic.

21.4 Asymmetry

As we already know, most of the simplistic models assume that they have a normal distribution and this implies that their distribution is symmetric around the mean, therefore, a normal distribution has absolutely zero skewness and it is important to emphasize that for sample sizes very large, any population tends or a symmetric distribution. When we speak of a positive asymmetry, this implies that there are more values to the right of the mean, while we speak of a negative asymmetry, on the contrary, there is a greater number of values to the left of the mean.

In general, both skewness and kurtosis are often used to test whether or not a statistical distribution is a normal distribution and it is necessary to know both values Jarque Bera test

This is another of the goodness of fit tests and is used to check if any sample has the kurtosis and symmetry of a normal distribution. Its name comes from its creators Carlos Jarque and Anil Bera. This statistical test is defined by the formula:

$$\mathrm{JB} = \frac{n}{6}\left[A^2 + \frac{1}{4}(K-3)^2\right]$$

Where n is the number of observations, K is the kurtosis of the sample and A is the sample skewness.

If we can observe, within the formula is the term (K-3) which is ultimately what we saw previously as excess kurtosis.

The asymmetry coefficient is the third moment with respect to the mean and is responsible for measuring the degree of symmetry that the probability distribution has, that is, how balanced or balanced the distribution is and is represented by the letter (A) . If this coefficient is greater than zero, we can conclude that the distribution is skewed to the right.

The skewness can be calculated through the following formula:

$$\mathrm{A} = \frac{\Sigma\frac{u^3}{n}}{\left(\Sigma\frac{u^2}{n}\right)^{\frac{3}{2}}}$$

Where u is the residual and n the number of observations

To find the kurtosis we will use the following equation:

$$K = \frac{\sum \frac{u^4}{n}}{\left(\frac{u^2}{n}\right)^2}$$

With the asymmetry and kurtosis values calculated, we are going to substitute them in the Jarque Bera formula and the value obtained is the one that we are going to contrast with the critical value obtained in the Chi square tables. This table is entered with the significance value, which is generally used 0.05 and always for this type of method a degree of freedom equal to two (2) will be used.

Let's go with an example of the Jarque Bera test:

Suppose we have the information on advertising and sales of a certain company.



We want to know if the residuals of the model follow a normal distribution, for this we have the following data:

X	Residual (u)	u^2	u^3	u^4
9	6	36	216	1296
12	3,25	10,56	34,33	111,57
6	-1,25	1,56	-1,95	2,44
10	-10,25	105,06	-1076,89	11038,13
9	-6	36	-216	1296
10	10,75	115,56	1242,3	13354,69
7	1,5	2,25	3,38	5,06
8	-4,75	22,56	-107,17	509,07
12	-5,75	33,06	-190,11	1093,13
6	-0,25	0,06	-0,02	0
11	2,5	6,25	15,63	39,06
8	4,25	18,06	76,77	326,25
	0	387	-3,75	29071,41

To facilitate the calculations of the formulas, we include in the table the residuals squared to form the third column, cubed to form the fourth column and raised to four to form the fifth column. Once we have the table full, we can perform the sums of each of the columns, it is important to take into account that the sum of the remainder is zero and we can then calculate the coefficient of asymmetry and the kurtosis through the formulas:

$$A = \frac{\Sigma\frac{u^3}{n}}{\left(\Sigma\frac{u^2}{n}\right)^{\frac{3}{2}}} = \frac{\frac{-3,75}{12}}{\left(\frac{387}{12}\right)^{3/2}} = -0,0017063$$

$$K = \frac{\Sigma\frac{u^4}{n}}{\left(\frac{u^2}{n}\right)^2} = \frac{\frac{29071,41}{12}}{\left(\frac{387}{12}\right)^2} = 2,32929$$

Now we go on to substitute both values in Jarque Bera's formula:

$$JB = \frac{n}{6}\left[A^2 + \frac{1}{4}(K-3)^2\right] = 12/6*[(-0,0017063)^2 + \frac{1}{4}(2,32929 - 3)^2] = 0,1874965$$

We have already calculated the Jarque Bera value to contrast with the critical value obtained in the Chi square table. As always, we are going to use a significance value equal to 0.05 and we already know that for this type of method a degree of freedom equal to 2 is always used. We go to the table: in order to perform statistical contrasts.

TABLA 3-Distribución Chi Cuadrado χ^2

P = Probabilidad de encontrar un valor mayor o igual que el chi cuadrado tabulado, ν = Grados de Libertad

ν/p	0,001	0,0025	0,005	0,01	0,025	0,05	0,1	0,15	0,2	0,25	0,3	0,35	0,4	0,45	0,5
1	10,8274	9,1404	7,8794	6,6349	5,0239	3,8415	2,7055	2,0722	1,6424	1,3233	1,0742	0,8735	0,7083	0,5707	0,4549
2	13,8150	11,9827	10,5965	9,2104	7,3778	5,9915	4,6052	3,7942	3,2189	2,7726	2,4079	2,0996	1,8326	1,5970	1,3863
3	16,2660	14,3202	12,8381	11,3449	9,3484	7,8147	6,2514	5,3170	4,6416	4,1083	3,6649	3,2831	2,9462	2,6430	2,3660
4	18,4662	16,4238	14,8602	13,2767	11,1433	9,4877	7,7794	6,7449	5,9886	5,3853	4,8784	4,4377	4,0446	3,6871	3,3567
5	20,5147	18,3854	16,7496	15,0863	12,8325	11,0705	9,2363	8,1152	7,2893	6,6257	6,0644	5,5731	5,1319	4,7278	4,3515
6	22,4575	20,2491	18,5475	16,8119	14,4494	12,5916	10,6446	9,4461	8,5581	7,8408	7,2311	6,6948	6,2108	5,7652	5,3481
7	24,3213	22,0402	20,2777	18,4753	16,0128	14,0671	12,0170	10,7479	9,8032	9,0371	8,3834	7,8061	7,2832	6,8000	6,3458
8	26,1239	23,7742	21,9549	20,0902	17,5345	15,5073	13,3616	12,0271	11,0301	10,2189	9,5245	8,9094	8,3505	7,8325	7,3441
9	27,8767	25,4625	23,5893	21,6660	19,0228	16,9190	14,6837	13,2880	12,2421	11,3887	10,6564	10,0060	9,4136	8,8632	8,3428
10	29,5879	27,1119	25,1881	23,2093	20,4832	18,3070	15,9872	14,5339	13,4420	12,5489	11,7807	11,0971	10,4732	9,8922	9,3418
11	31,2635	28,7291	26,7569	24,7250	21,9200	19,6752	17,2750	15,7671	14,6314	13,7007	12,8987	12,1836	11,5298	10,9199	10,3410
12	32,9092	30,3182	28,2997	26,2170	23,3367	21,0261	18,5493	16,9893	15,8120	14,8454	14,0111	13,2661	12,5838	11,9463	11,3403
13	34,5274	31,8830	29,8193	27,6882	24,7356	22,3620	19,8119	18,2020	16,9848	15,9839	15,1187	14,3451	13,6356	12,9717	12,3398
14	36,1239	33,4262	31,3194	29,1412	26,1189	23,6848	21,0641	19,4062	18,1508	17,1169	16,2221	15,4209	14,6853	13,9961	13,3393
15	37,6978	34,9494	32,8015	30,5780	27,4884	24,9958	22,3071	20,6030	19,3107	18,2451	17,3217	16,4940	15,7332	15,0197	14,3389
16	39,2518	36,4555	34,2671	31,9999	28,8453	26,2962	23,5418	21,7931	20,4651	19,3689	18,4179	17,5646	16,7795	16,0425	15,3385
17	40,7911	37,9462	35,7184	33,4087	30,1910	27,5871	24,7690	22,9770	21,6146	20,4887	19,5110	18,6330	17,8244	17,0646	16,3382
18	42,3119	39,4220	37,1564	34,8052	31,5264	28,8693	25,9894	24,1555	22,7595	21,6049	20,6014	19,6993	18,8679	18,0860	17,3379
19	43,8194	40,8847	38,5821	36,1908	32,8523	30,1435	27,2036	25,3289	23,9004	22,7178	21,6891	20,7638	19,9102	19,1069	18,3376
20	45,3142	42,3358	39,9969	37,5663	34,1696	31,4104	28,4120	26,4976	25,0375	23,8277	22,7745	21,8265	20,9514	20,1272	19,3374
21	46,7963	43,7749	41,4009	38,9322	35,4789	32,6706	29,6151	27,6620	26,1711	24,9348	23,8578	22,8876	21,9915	21,1470	20,3372
22	48,2676	45,2041	42,7957	40,2894	36,7807	33,9245	30,8133	28,8224	27,3015	26,0393	24,9390	23,9473	23,0307	22,1663	21,3370
23	49,7276	46,6231	44,1814	41,6383	38,0756	35,1725	32,0069	29,9792	28,4288	27,1413	26,0184	25,0055	24,0689	23,1852	22,3369
24	51,1790	48,0336	45,5584	42,9798	39,3641	36,4150	33,1962	31,1325	29,5533	28,2412	27,0960	26,0625	25,1064	24,2037	23,3367
25	52,6187	49,4351	46,9280	44,3140	40,6465	37,6525	34,3816	32,2825	30,6752	29,3388	28,1719	27,1183	26,1430	25,2218	24,3366
26	54,0511	50,8291	48,2898	45,6416	41,9231	38,8851	35,5632	33,4295	31,7946	30,4346	29,2463	28,1730	27,1789	26,2395	25,3365
27	55,4751	52,2152	49,6450	46,9628	43,1945	40,1133	36,7412	34,5736	32,9117	31,5284	30,3193	29,2266	28,2141	27,2569	26,3363
28	56,8918	53,5939	50,9936	48,2782	44,4608	41,3372	37,9159	35,7150	34,0266	32,6205	31,3909	30,2791	29,2486	28,2740	27,3362
29	58,3006	54,9662	52,3355	49,5878	45,7223	42,5569	39,0875	36,8538	35,1394	33,7109	32,4612	31,3308	30,2825	29,2908	28,3361

As we can see, the critical value obtained in the Chi square table is equal to: 5.99. We must then use the decision rule, where it is established that if the criterion obtained in Jarque Bera's formula is less than the critical value obtained in the Chi square table, then the null hypothesis is not rejected, where it is established that the errors of the model have a normal distribution.

We can realize that this is precisely the case in which we find ourselves, since:

0.1874965 < 5.99

Therefore we can conclude that the errors or residuals of the model do indeed have a normal distribution.

21.5 Chi Square Test

The statistic called Chi square, also have a probability distribution with the same name and this test contrasts the expected frequencies with the observed frequencies, according to the null hypothesis. This test is used to evaluate how good a theoretical distribution can be when it comes to representing the real or true distribution of the data of a certain sample and this is precisely what is called evaluating the goodness of fit, that is, that both the observed data fit those of an expected or theoretical distribution.

The first thing we will do is use the Chi square statistic to check the possible association that exists between two variables, and then evaluate the extent to which the distribution of frequencies obtained from the sample adjusts to the theoretical distribution

We are going to establish the necessary steps to apply this test in an illustrative example: Suppose that a certain researcher wants to evaluate the association that may exist between the use of the seat belt used in private vehicles and the degree or socioeconomic level of the driver of the vehicle.



To do this, the researcher takes a sample of some drivers and classifies them in the following association table

Belt use	low socioeconomic status	Middle socioeconomic level	High socioeconomic status	Total
Yes	8	15	28	51
No	13	16	14	43
Total	21	31	42	94

We will use a level of significance = 0.05

The steps to follow in the Chi squared test are the following:

1- The first thing we must do is raise the hypotheses: Ho = Seatbelt use does not depend on the driver's socioeconomic status Ha = The use of the seat belt will depend on the economic level of the driver

2- The second step is to calculate the expected frequencies that can be obtained from the frequency distribution of the total number of cases, that is, 51 people use the belt out of a total of 94 and 43 of these 94 do not use it, we must use the same proportion that each of the socioeconomic groups have, so we must make a simple rule of three, so that if 51 people use a seatbelt out of those 94, out of 21 people, how many people should use a seatbelt?

The calculation of the rule of three for the low socioeconomic level would be: (21x51 / 94) = 11.4 - (21x43 / 94) = 9.6

The calculation for the average socioeconomic level is: (31x51 / 94) = 16.8 - (21x43 / 94) = 14.2

The same procedure for the high socioeconomic level: (42x51 / 94) = 22.8 - (42x43 / 94) = 19.2

These calculations indicate the frequencies given the case that the null hypothesis is true and therefore, if the variables are independent.

We can now make the table of expected values:

Belt use	low socioeconomic status	Middle socioeconomic level	High socioeconomic status	Total
Yes	11,4	16,8	22,8	51
No	9,6	14,2	19,2	43
Total	21	31	42	94

3- The third step is to calculate the test statistic

As we know, the statistic will be Chi square, whose formula is:

$$X^2 = \sum \frac{(oi-ei)^2}{ei}$$

Being oi the value of each observed frequency

ei represents the value of the expected frequency

Let us then calculate the value of the test statistic:

$$X^2 = \sum \frac{(oi-ei)^2}{ei} = \frac{(8-11,4)^2}{11,4} + \frac{(13-9,6)^2}{9,6} + \frac{(15-16,8)^2}{16,8} + \frac{(16-14,2)^2}{14,2} + \frac{(28-22,8)^2}{22,8} + \frac{(14-19,2)^2}{19,2} = 5,23$$

Once we find the value of the test statistic, we must compare it with the Chi square table in which we must enter with the degrees of freedom and the level of significance. In this case the degrees of freedom are calculated as follows:

DF = (no Rows - 1) x (no Columns - 1) = (3 -1) x (2 - 1) = 2 x 1 = 2

It is important to emphasize that the rows and columns of totals should not be taken into account With a significance level of = 0.05 and with a degree of freedom = 2 we enter the table:

TABLA 3-Distribución Chi Cuadrado χ^2

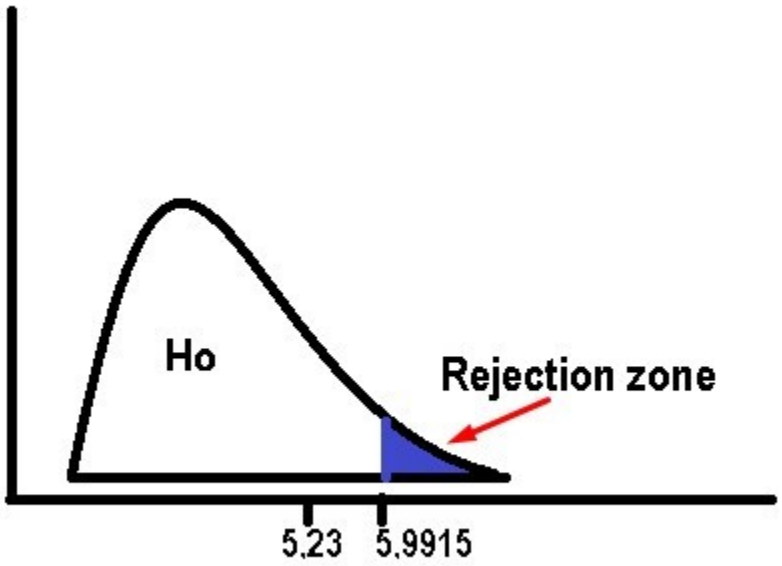
P = Probabilidad de encontrar un valor mayor o igual que el chi cuadrado tabulado, ν = Grados de Libertad

ν/p	0,001	0,0025	0,005	0,01	0,025	0,05	0,1	0,15	0,2	0,25	0,3	0,35	0,4	0,45	0,5
1	10,8274	9,1404	7,8794	6,6349	5,0239	3,8415	2,7055	2,0722	1,6424	1,3233	1,0742	0,8735	0,7083	0,5707	0,4549
2	13,8150	11,9827	10,5965	9,2104	7,3778	5,9915	4,6052	3,7942	3,2189	2,7726	2,4079	2,0996	1,8326	1,5970	1,3863
3	16,2660	14,3202	12,8381	11,3449	9,3484	7,8147	6,2514	5,3170	4,6416	4,1083	3,6649	3,2831	2,9462	2,6430	2,3660
4	18,4662	16,4238	14,8602	13,2767	11,1433	9,4877	7,7794	6,7449	5,9886	5,3853	4,8784	4,4377	4,0446	3,6871	3,3567
5	20,5147	18,3854	16,7496	15,0863	12,8325	11,0705	9,2363	8,1152	7,2893	6,6257	6,0644	5,5731	5,1319	4,7278	4,3515
6	22,4575	20,2491	18,5475	16,8119	14,4494	12,5916	10,6446	9,4461	8,5581	7,8408	7,2311	6,6948	6,2108	5,7652	5,3481
7	24,3213	22,0402	20,2777	18,4753	16,0128	14,0671	12,0170	10,7479	9,8032	9,0371	8,3834	7,8061	7,2832	6,8000	6,3458
8	26,1239	23,7742	21,9549	20,0902	17,5345	15,5073	13,3616	12,0271	11,0301	10,2189	9,5245	8,9094	8,3505	7,8325	7,3441
9	27,8767	25,4625	23,5893	21,6660	19,0228	16,9190	14,6837	13,2880	12,2421	11,3887	10,6564	10,0060	9,4136	8,8632	8,3428
10	29,5879	27,1119	25,1881	23,2093	20,4832	18,3070	15,9872	14,5339	13,4420	12,5489	11,7807	11,0971	10,4732	9,8922	9,3418
11	31,2635	28,7291	26,7569	24,7250	21,9200	19,6752	17,2750	15,7671	14,6314	13,7007	12,8987	12,1836	11,5298	10,9199	10,3410
12	32,9092	30,3182	28,2997	26,2170	23,3367	21,0261	18,5493	16,9893	15,8120	14,8454	14,0111	13,2661	12,5838	11,9463	11,3403
13	34,5274	31,8830	29,8193	27,6882	24,7356	22,3620	19,8119	18,2020	16,9848	15,9839	15,1187	14,3451	13,6356	12,9717	12,3398

We can see that the critical value obtained is: 0.59915

In the same way that we have been doing in previous exercises, we must compare the test statistic with the value obtained in the Chi square table. We must note that the critical values in the table are all positive, since as its name indicates, when raising the square term we will always obtain positive values. This implies that the zone to reject the null hypothesis will always be on the right side of the curve.

As we can see in the following graph, the value of the test statistic is to the left of the probability associated with the significance = 0.05, which obtained in tables has a value of 5.9915. So the rejection zone will be on the right side of the curve and the value of 5.23 is within the acceptance zone of the null hypothesis. This directly implies that we must accept the null hypothesis, that how we established previously determines that the use of the seat belt will not depend on the socioeconomic condition of the driver.



On the other hand, the Chi-square statistic can also be used to evaluate the goodness of fit of a theoretical distribution when representing the real distribution formed by the data of a certain sample, that is, if the data of the observations are adjusted to a certain expected or theoretical distribution. Suppose that we classify the individuals of a population according to their blood group and according to the studies carried out in that population, the distribution in percentages is expected to be:

Blood type	Expected frequency
AB	2%
A	30,5%
B	9,3%
O	58,2%

For a sample of 150 blood donors, the following distribution was obtained:

Blood type	Expected frequency
AB	4
A	48
B	15
O	83

The hypotheses regarding the problem are as follows:

Ho = The sample data fit the expected or theoretical distribution

Ha = The sample data does not fit the expected or theoretical distribution

This time the level of significance is set at = 0.01



We must calculate with the percentages applied to the sample, our expected frequencies

Blood type	Frequency (oi)	Frequency (ei)
AB	4	3
A	48	45,75
B	15	13,95
O	83	87,30

$$X^2 = \sum \frac{(oi-ei)^2}{ei} = \frac{(4-3)^2}{3} + \frac{(48-45,75)^2}{45,75} + \frac{(15-13,95)^2}{13,95} + \frac{(83-87,3)^2}{87,3} = 0,73$$

The degrees of freedom are obtained by subtracting the unit from the number of rows: 4 - 1 = 3

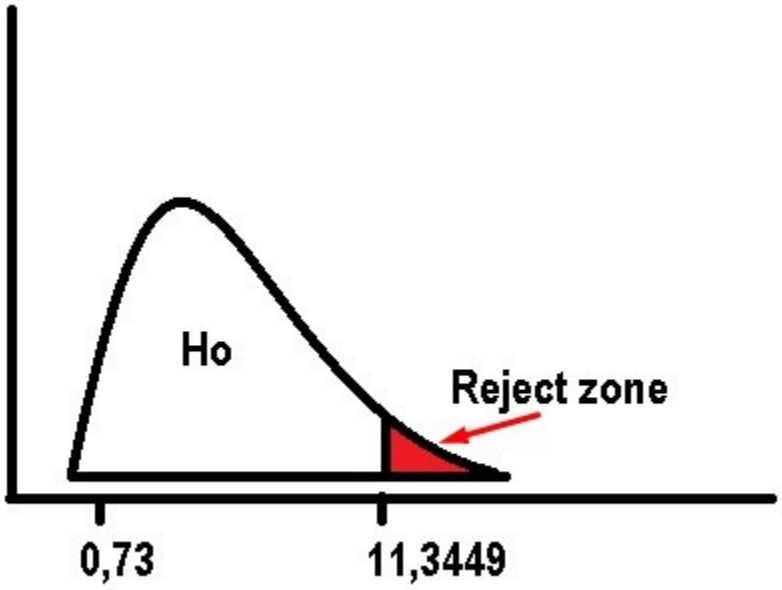
We repeat the procedure and enter the Chi square table with 3 degrees of freedom and = 0.01:

TABLA 3-Distribución Chi Cuadrado χ^2

P = Probabilidad de encontrar un valor mayor o igual que el chi cuadrado tabulado, v = Grados de Libertad

v/p	0,001	0,0025	0,005	0,01	0,025	0,05	0,1	0,15	0,2	0,25	0,3	0,35	0,4	0,45	0,5
1	10,8274	9,1404	7,8794	6,6349	5,0239	3,8415	2,7055	2,0722	1,6424	1,3233	1,0742	0,8735	0,7083	0,5707	0,4549
2	13,8150	11,9827	10,5965	9,2104	7,3778	5,9915	4,6052	3,7942	3,2189	2,7726	2,4079	2,0996	1,8326	1,5970	1,3863
3	16,2660	14,3202	12,8381	11,3449	9,3484	7,8147	6,2514	5,3170	4,6416	4,1083	3,6649	3,2831	2,9462	2,6430	2,3660
4	18,4662	16,4238	14,8602	13,2767	11,1433	9,4877	7,7794	6,7449	5,9886	5,3853	4,8784	4,4377	4,0446	3,6871	3,3567
5	20,5147	18,3854	16,7496	15,0863	12,8325	11,0705	9,2363	8,1152	7,2893	6,6257	6,0644	5,5731	5,1319	4,7278	4,3515
6	22,4575	20,2491	18,5475	16,8119	14,4494	12,5916	10,6446	9,4461	8,5581	7,8408	7,2311	6,6948	6,2108	5,7652	5,3481
7	24,3213	22,0402	20,2777	18,4753	16,0128	14,0671	12,0170	10,7479	9,8032	9,0371	8,3834	7,8061	7,2832	6,8000	6,3458
8	26,1239	23,7742	21,9549	20,0902	17,5345	15,5073	13,3616	12,0271	11,0301	10,2189	9,5245	8,9094	8,3505	7,8325	7,3441
9	27,8767	25,4625	23,5893	21,6660	19,0228	16,9190	14,6837	13,2880	12,2421	11,3887	10,6564	10,0060	9,4136	8,8632	8,3428
10	29,5879	27,1119	25,1881	23,2093	20,4832	18,3070	15,9872	14,5339	13,4420	12,5489	11,7807	11,0971	10,4732	9,8922	9,3418
11	31,2635	28,7291	26,7569	24,7250	21,9200	19,6752	17,2750	15,7671	14,6314	13,7007	12,8987	12,1836	11,5298	10,9199	10,3410
12	32,9092	30,3182	28,2997	26,2170	23,3367	21,0261	18,5493	16,9893	15,8120	14,8454	14,0111	13,2661	12,5838	11,9463	11,3403
13	34,5274	31,8830	29,8193	27,6882	24,7356	22,3620	19,8119	18,2020	16,9848	15,9839	15,1187	14,3451	13,6356	12,9717	12,3398
14	36,1239	33,4262	31,3194	29,1412	26,1189	23,6848	21,0641	19,4062	18,1508	17,1169	16,2221	15,4209	14,6853	13,9961	13,3393
15	37,6978	34,9494	32,8015	30,5780	27,4884	24,9958	22,3071	20,6030	19,3107	18,2451	17,3217	16,4940	15,7332	15,0197	14,3389
16	39,2518	36,4555	34,2671	31,9999	28,8453	26,2962	23,5418	21,7931	20,4651	19,3689	18,4179	17,5646	16,7795	16,0425	15,3385
17	40,7911	37,9462	35,7184	33,4087	30,1910	27,5871	24,7690	22,9770	21,6146	20,4887	19,5110	18,6330	17,8244	17,0646	16,3382
18	42,3119	39,4220	37,1564	34,8052	31,5264	28,8693	25,9894	24,1555	22,7595	21,6049	20,6014	19,6993	18,8679	18,0860	17,3379
19	43,8194	40,8847	38,5821	36,1908	32,8523	30,1435	27,2036	25,3289	23,9004	22,7178	21,6891	20,7638	19,9102	19,1069	18,3376
20	45,3142	42,3358	39,9969	37,5663	34,1696	31,4104	28,4120	26,4976	25,0375	23,8277	22,7745	21,8265	20,9514	20,1272	19,3374
21	46,7963	43,7749	41,4009	38,9322	35,4789	32,6706	29,6151	27,6620	26,1711	24,9348	23,8578	22,8876	21,9915	21,1470	20,3372
22	48,2676	45,2041	42,7957	40,2894	36,7807	33,9245	30,8133	28,8224	27,3015	26,0393	24,9390	23,9473	23,0307	22,1663	21,3370
23	49,7276	46,6231	44,1814	41,6383	38,0756	35,1725	32,0069	29,9792	28,4288	27,1413	26,0184	25,0055	24,0689	23,1852	22,3369
24	51,1790	48,0336	45,5584	42,9798	39,3641	36,4150	33,1962	31,1325	29,5533	28,2412	27,0960	26,0625	25,1064	24,2037	23,3367
25	52,6187	49,4351	46,9280	44,3140	40,6465	37,6525	34,3816	32,2825	30,6752	29,3388	28,1719	27,1183	26,1430	25,2218	24,3366
26	54,0511	50,8291	48,2898	45,6416	41,9231	38,8851	35,5632	33,4295	31,7946	30,4346	29,2463	28,1730	27,1789	26,2395	25,3365
27	55,4751	52,2152	49,6450	46,9628	43,1945	40,1133	36,7412	34,5736	32,9117	31,5284	30,3193	29,2266	28,2141	27,2569	26,3363
28	56,8918	53,5939	50,9936	48,2782	44,4608	41,3372	37,9159	35,7150	34,0266	32,6205	31,3909	30,2791	29,2486	28,2740	27,3362
29	58,3006	54,9662	52,3355	49,5878	45,7223	42,5569	39,0875	36,8538	35,1394	33,7109	32,4612	31,3308	30,2825	29,2908	28,3361

According to the table, the critical value obtained is: 11.3449. We can see that the value of the test statistic is to the left of the value obtained in the table.



So the null hypothesis will be accepted and this implies that the data fit the theoretical distribution and that the observed

differences are not statistically significant.

21.6 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

TWENTYTWO

ANALYSIS OF VARIANCE ANOVA FOR ONE FACTOR AND TWO FACTORS

22.1 ANOVA for a single factor

The analysis of variance is a statistical method capable of palpating the differences that exist between the means of 3 groups or more and is used when we have a single independent factor or a single variable. The idea is to try to find out if the variations of different levels of this factor can have a measurable consequence in the dependent variable.

But this method has certain limitations, since the analysis of variance can only be used when studying only one factor with a single dependent variable. On the other hand, if we compare the means between three or more groups, the method can indicate whether there is at least one pair of means that are significantly different, but it cannot specifically indicate which of the pairs it is. In addition, the method requires that the dependent variable have a normal distribution for each of the groups and also that the variability that exists within each group is similar among all groups.

The analysis of variance of a factor is a test that focuses on the differences that exist between the group means. It is a method that helps us to verify or reject the null hypothesis (Ho) between three population means or more, but yes, they are the same with respect to their alternative hypotheses (Ha), where even one of those means is different. The formal nomenclature of statistical hypotheses would be:

`Ho = 1 = 2 =  = k Ha = The means are not all the same`

Where i is the mean of the value of the i-th level of the factor to be considered

`K = The number of means`

The analysis of variance compares the averages of each level with the general average and this is called "Between treatments". The ANOVA method between the different levels obtains two estimates of variance and with them a quotient is calculated, so that if the quotient is approximately equal to 1, it can be said that the two variances are similar and the factor will not have any impact on the answer.

This method can be of great help when we suspect that an independent variable is a determining factor in the outcome of a certain process. For example, suppose we have a factory whose production process is being affected by some factor and we want to find out what it is that is decreasing performance. To do this, you want to run this method, using three or more variations or levels reached by this factor or independent variable. After counting the results of the observations in each run, see if any difference is found when we compare the means for each group of observations using analysis of variance. It is then when we will have the evidence that the investigated factor may have some influence on the result.

Now let's go with an illustrative example of the analysis of variance of a factor: Let us suppose that a certain factory produces an adhesive gel that is sold in small jars. The gel has an important property, which is its viscosity, since if it is too liquid its adherence is affected, while if it is too thick, it ends up being very difficult to apply.



Lately the factory has received complaints from some customers, who are dissatisfied as the gel is not as consistent as usual. The plant manager is concerned and decides to investigate the matter, so he begins by examining the viscosity of the five most recent batches of production. In this way, if he manages to find any difference between the viscosity of any of the batches, this would mean the real problem. He can even help you formulate hypotheses about the factors that could cause inconsistencies between batches. The way to measure the viscosity is using an instrument that has a rotor that is submerged inside the jar of adhesive gel. This is how the mean value of resistance to torsion can be measured and this procedure is carried out with five jars from each of the 5 batches and they are chosen at random. In turn, each batch has five levels, this implies that the test is repeated five times per batch and is what is called "one factor design". The results obtained are expressed below:

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Now we are going to build what is called the ANOVA table, where we must be clear about the nomenclature to use:

```
ni = Represents the number of observation i in batch i
N = is the number of total observations
Yij = The j-th observation of the i-th treatment,
Y i = The mean of the i-th treatment
Y  = The global mean of all observations
```

We are now going to build the ANOVA table, and then look for the values of the sum of its squares. This allows us to quantify the variability of a group of data, in addition to knowing the mean of each of the data in the set. The following formula is responsible for dividing the global variability into 2 parts. The first is the variability with respect to the factor levels and the second is the variability that refers to random errors.

When building the ANOVA table we must specify the elements that it includes: The examined factor and the sources of variation must be defined, which in our case are: the batch, the total and the error.

The degrees of freedom must be established for each source of variation.

Calculate the sum of squares (SS) for each source of variation and also the total of all sources.

When we add the squares and divide it by the corresponding degrees of freedom, we get the mean of the squares.

If we divide the specific mean of squares of the batch factor by the mean of squares of the error, we obtain the ratio F.

The formulas and nomenclature to be used are the following:

`SS (Total) = SS (Factor) + SS (Error)  _(i=1)^a_(j=1)^ni( Yij-Y  )^2 = _(i=1)^ani(Y i- Y )^2 + _(i=1)^a_(j=1)^ni(Yij-Y i)^2`

Where each of the sums corresponds one by one to the sum of squares of the previous equation. While it is true that this formula can be seen as somewhat complicated, if we focus on each element individually, it becomes much easier to understand. In the following table we are going to build each of the elements that make up the formula, where the first column is made up of the measurements that we obtained of tensile strength.

If we realize in the formula, the sum of `(Y i- Y )^2= SS (Factor)`, while that of `(Yij-Y i)^2 = SS (Error)` and `(Yij-Y )^2 = SS (Total)`

We are now going to show how the degrees of freedom that indicate the amount of independent data used to calculate the sum of squares are calculated. When we are designing a factor of k levels, which in this case is five batches and each batch has five jars, this indicates that `k = 5` and `N = 25`, so the degrees of freedom are obtained as follows :

We must now obtain the mean of squares (MS) and the ratio F, for this we must divide each sum of squares by its corresponding degrees of freedom.

Sum of squares Degrees of freedom Mean squares Reason F

We can now pour the data into a summary table:

When the means are equal, the null hypothesis is true and both the square means of the factor (batch) and the error are very similar and as for the ratio F, it would have a value very close to 1. On the contrary, when rejects the null hypothesis, the mean square of the factor will be greater than the mean square of the error and for this case, the ratio F is greater than one.

Therefore, for the previous example we can see that the ratio F has a value of 6.90 and this already provides us with very significant evidence rejecting the null hypothesis, that is, the means are not equal. On the other hand, we can see that the ratio F is significantly greater than 1.

It is important to take into account that the ratio F is obtained by dividing the mean square of the factor by the mean square of the error.

Once we have an idea of how the ANOVA table is calculated, we can skip these steps and let Excel perform the above calculations. To do this, we simply have to go to "Data" → "Data analysis" → Search in the "Analysis of variance of a factor" display and a new window opens, where we must go to the "Input range" and choose all the data that we obtained from the measurements of all the batches, that is, the initial table, but yes, without placing the calculations

of the average that we include in this table. In that window, by default it shows us an alpha value of 0.05 which is the pre-set value to compare the p value, therefore, if the p value is less than this alpha value, the null hypothesis can be rejected. Subsequently, we must mark the "Output range" round and choose a cell to show us the result of the ANOVA table. After performing the previous steps, Excel shows us in the summary, certain relevant calculations:

22.2 VARIANCE ANALYSIS

It is important to emphasize that the alpha value cannot be compared with the F ratio, since the alpha value is only compared with the value of p and in this case, we can realize that this value is 0,0012 which is ultimately significantly less than 0,05 this indicates that the null hypothesis can be rejected.

We can also observe that the ratio F can be compared with the critical value of F, we must take into account that the fact that the ratio F is greater than 1 is not a reliable indication, since this can happen thanks to chance. However, if the ratio F is greater than its critical value, it is a comparable indication that a value of p is less than alpha and both results mean that the null hypothesis must be rejected.

In this case we can realize that not only is the value of p less than alpha, but that the ratio F is significantly greater than the critical value, so there is no doubt that for this example, the null hypothesis is rejected, so We can assure you that when we refer to torsional strength, not all averages are the same, so there will be a difference in one or more of the batches.

If we look at the means of each of the lots

Based on the results of the averages of each batch, we can see that batch three has a torsional strength of 26.77 that compared to the other four batches we can see that its average is lower, so it is recommended to investigate Bottom batch 3 to find out what is the factor that affects the viscosity of that batch and try to correct it, since the adherence of the gel is being affected.

22.3 Analysis of variance for two factors

We are now going to show a solved exercise with two factors: the environmental protection agency requires to determine the effect of two water treatment methods with respect to the absorption of magnesium.



For this, magnesium levels are measured in grams per cubic centimeter (gr / cc) and all different levels of time are incorporated into the experiment, which yields the following data:

In this exercise, as we can see, we have two factors that can intervene in the absorption of magnesium, the first factor is time and the second factor is the treatment. The idea is to try to find out if the time influences the absorption of magnesium, the treatment used or both factors. The statement of the null hypotheses for each of the factors is as follows:

```
Factor A: Time
Factor B: Treatment
HoA: there is no difference between the time and the absorption of magnesium
HoB: there is no difference between magnesium absorption treatment
HoAB: there is no interaction between time and treatment
```

To find the sum of squares of the factor a, the factor of, of the error and the sum of total squares we must apply the following formulas:

```
SSA = ni(y i-y..)^2  SSB = ni(y j-y..)^2  SSE = sij^2 (nij-1) SST= S_Total^2 (N-1)
```

The nomenclature to use in each of these formulas is the following:

```
y .. = total average
yi = row average
yj = column average
nj = number of data in a column
ni = number of data in a row
nij = number of data in a cell
sij = the variance of each cell
```

(continues on next page)

(continued from previous page)

```
a = number of rows
b = number of columns
N = total number of data
```

We are defining for our exercise the values of:

N = 12 Since the total number of data supplied is 12

ni = 6 This is the number of data per row, but we must assume as a row, all the data that correspond to the time of 1 hour, that is, both treatment one and treatment two for the first time, have six data.

nj = 6 This number corresponds to the number of data per column, assuming as a column all the data from treatment 1, both for time 1 and time 2

Now we are going to find the averages corresponding to the rows, the columns and the total average. We will start by making a table with the averages of each time with each treatment.

If, in turn, we average each of the rows and each of the columns, we will obtain the following averages:

```
Time average 1 (y 1) = 2,095
Average of time 2 (y 2) = 1,955
Average of treatment 1 (y 1) = 2,095
Average of treatment 2 (y 2) = 1,955
```

If we average these four values, we will obtain the total average

```
y .. = 2,025
```

We now go with the sum of squares of the time factor

```
SSA = ni(y i-y..)^2  = 6 [ (2,095 - 2,025)^2 + (1,955 - 2,025)^2] = 0,0588
```

If we look carefully, for this particular exercise the values of the averages are the same for the rows (time) as for the columns (treatment), therefore, for the calculations of the sum of squares of both factors, we will obtain the same results.

```
SSB = ni(y j-y..)^2  = 0,0588
```

To calculate the sum of squares of the interaction between both SSAB factors, we must perform the following procedure:

1. Calculate the sum of values of each treatment for each of the times, for example, for time 1 there are 3 tests of treatment 1, these three data are the ones to be added and the same for the 3 data that represent the measurements of treatment 2 for time 1. In the same way, the pertinent summations are made for time 2 with respect to treatments 1 and 2.



The sum of each row and column is also calculated

Each sum of the 4 intersections of values is squared and divided by the number of data included between those intersections, in this case it is 3. To then subtract the sum of the rows and columns divided in turn by the number of data that involve that it is 6 for both the rows and the columns and finally the 2 values of the summations of rows or columns are added (The calculation is the same), but it is divided again by the number of values involved totals, which is 12.

SSAB = ([6,5^2+ 6,08^2+ 6,08^2+ 5,65^2)])/3- ((12,58^2+11,73^2+ 12,58^2+ 11,73^2))/6+ 24,31^2/12 =0,000033

We are now going to calculate SST, for this we must first have what is called the variation factor that is not more than the last term of the previous equation:

Fv = 24,31^2/12 = 49,2075

Now I square all 12 data

Calculate the sum of all the data in the previous table:

Squared data = 49,3334 SST = Squared data - Fv = 49, 3334 - 49,2075 = 0,1259

We are going to make a table with the data obtained:

The error is calculated = SSA + SSB + SSAB - SST

SSE = 0.0588 + 0.0588 + 0.000033 - 0.1259 = 0.008267

A is the number of rows and b the number of columns, it is important to remember that there are only 2 rows, one for each time.

With the data in the previous table we can already find the mean of squares and the ratio F, remember that to calculate these values it is enough to divide the sum of squares by its corresponding degree of freedom.

```
MSA = 0.0588 / 1 = 0.0588
MSB = 0.0588 / 1 = 0.0588
MSAB = 0.000033 / 1 = 0.000033
MSE = 0.008267 / 8 = 0.001033375
```

Now let's calculate the value of F of each of the values and for this I will have to divide the mean of squares by the mean of squares of the error (MSE)

```
FA = MSA / MSE = 0.588 / 0.001033375 = 56.9
FB = MSB / MSE = 0.588 / 0.001033375 = 56.9
FAB = MSAB / MSE = 0.000033 / 0.001033375 = 0.0319226
```

The next step is to find the different critical Fs to be able to make the relevant comparisons and for this it will be necessary to use the following format:

Critical F (Degrees of freedom Factor; Degrees of freedom Error; Significance level that we establish)

It is very clear which are the degrees of freedom for each factor and the degree of freedom of the error, the level of significance established is generally 0.05 and for this there is a specific table to find the critical value of F, for this significance level. We are going to substitute the data for each critical value of F for each factor:

```
Critical F A (1, 8, 0.05)
Critical F B (1, 8, 0.05)
Critical F A B (1, 8, 0.05)
```

As we can see, in this case the critical values of each factor are the same, but we must take into account that this does not happen in all cases.

We go to the table of critical values of the distribution of F with a significance level of 0.05 and we must intercept the degree of freedom of each factor that is located in the columns of the table, with the degree of freedom of the error it is represented in the table by the rows.

The value obtained in the table is 5,318 and for this case we are going to compare each of the values of each factor with the critical value. Given the case that the value of F of a factor is greater than the critical value of F, we will reject the null hypothesis, while if it is less, the null hypothesis will not be rejected.

If we compare the value of F with the critical value specifically for the time factor (Factor A) $\rightarrow$ 56.9 > 5.318, the null hypothesis will be rejected and this implies that our null hypothesis is that time does not influence the absorption of magnesium, but calculations indicate that time does indeed influence magnesium absorption.

If we review the same previous process by the Treatment factor (Factor B) we obtain exactly the same result $\rightarrow$ 56.9 > 5.318 and therefore, the null hypothesis proposed for this factor is also rejected and then we can say that the treatment factor also influences the absorption of magnesium.

However, when we carry out the same previous process for the interaction between factors A and B, we note that $\rightarrow$ 0.0319 < 5.318, so that here the null hypothesis cannot be rejected and then we can conclude that the interaction that exists between the time and treatment does not influence magnesium absorption.

22.4 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

TWENTYTHREE

BAYES THEOREM

In the calculation of probabilities we can use Bayes' Theorem by applying the following formula:

$$P[A_n/B] = \frac{\mathrm{P}[B/A_n] \,.\, \mathrm{P}[A_n]}{\sum \mathrm{P}[B/A_i] \,.\, \mathrm{P}[A_i]}$$

Being B the event for which we have previous information An represents the different conditioned events The denominator of the formula simulates the total probability The numerator symbolizes the conditional probability Now, we will use a certain example to demonstrate how the Bayes Theorem formula applies, but instead of using, A1, A2 y A3 we will change them to A, B and C.

23.1 Exercise 1

Suppose that a factory has three machines that produce containers where the orange juice they produce is poured, we will call these three machines A, B and C.



We are aware that machine A is capable of producing 50% of the total amount of packages, while machine B produces 30% and machine C only 20%. On the other hand, we also know that each of the machines produces defective packaging. As we know that machine A is the most efficient of all, it only produces 2% of the defective containers, machine B 3% of the total of imperfect containers and finally machine C that generates 5% of this type of containers.

```
P(A) = 0,50      P(D/A) = 0,02
P(B) = 0,30      P(D/B) = 0,03
P(C) = 0,20      P(D/C) = 0,05
```

Now let's see how we can calculate the probability that a container produced by this juice factory is defective and we will apply the total probability formula. Being P (D) the probability that a container is defective.

```
P[D] =[ P(A) x P(D/A) ] + [ P(B) x P(D/B) ] + [ P(C) x P(D/C) ] = [ 0,5 x 0,02 ] + [ 0,3␣
↪x 0,03 ] + [ 0,2 x 0,05 ] = 0,029
```

If we express the result in percentages, we can say that the probability of a package being defective is 2.9%. Now, if we want to know when we obtain a defective container, what probabilities we have that it has been manufactured specifically by machine A, by machine B or by C. This is when we use Bayes' Theorem, since knowing that a container is defective, we already have prior information. Now we only have to calculate the probability that it has been produced by which of the machines that exist in the factory.

```
P[A/D] = (P[A].P[D/A])/(P[D])=  [0,50 x 0,02] / 0,029 = 0,345
P[B/D] = (P[B].P[D/B])/(P[D])= [0,30 x  0,03] / 0,029 = 0,31
P[C/D] = (P[C].P[D/C])/(P[D])= [0,20 x 0.05] / 0,029 = 0,344
```

When adding all the results we should obtain the unit, representing all the defective containers, but we realize that when adding 0.345 + 0.31 + 0.344 = 0.999, which as we observe is almost equal to 1, we then understand that there is a minimum loss per the rest of the decimals not used in the summation.

On the other hand, when interpreting the results, we can conclude that the defective packaging has a 34.5% probability of having been produced in machine A, 31% of having been produced in machine B and 34.4% that it was produced on machine C.

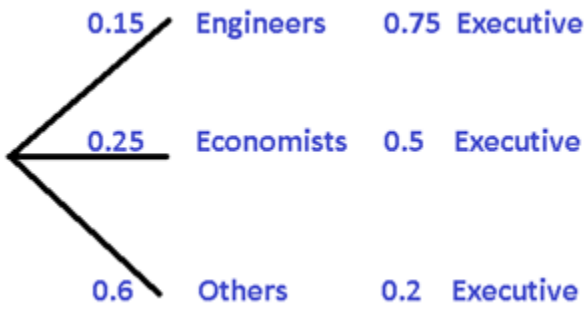
It is important to emphasize that the summation term that exists in the denominator of Bayes' Theorem, we calculate it in advance and call it P[D].

23.2 Exercise 2

Let's assume that 15% of the employees of a company are engineers, while 25% of the employees are economists. But 75% of engineering employees hold some managerial position, with respect to economists, 50% of them also have a managerial position. On the other hand, the rest of the managers who are neither engineers nor economists represent 20%. If we want to know the probability that a manager is an engineer, economist or any other profession, it is advisable to use Bayes' Theorem.



To understand a little better we are going to make a tree diagram



```
P[Engineer / Executive] = (0,15 .0,75)/(0,15 .0,75 + 0,25 .0,5+ 0,6 .0,2) = 0,314
P[Engineer / Executive] = (0,25 .0,5)/(0,15 .0,75 + 0,25 .0,5+ 0,6 .0,2) = 0,349
P[Other / Executive] = (0,6 .0,2)/(0,15 .0,75 + 0,25 .0,5+ 0,6 .0,2) = 0,336
```

23.3 Exercise 3

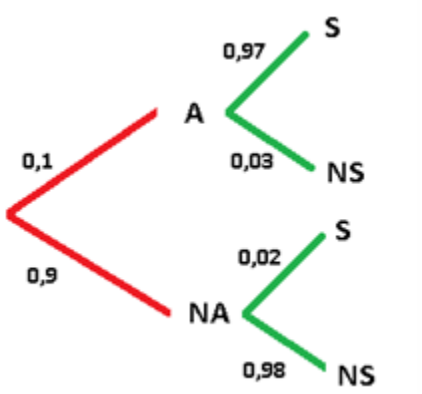
A certain factory has an alarm to alert about accidents and has only a 0.1 probability that an incident of this type will occur. Now, if an accident occurs, it has a probability of 0.97 that the alarm will sound and with a probability of 0.02 that the alarm will be activated even without any incident having occurred.

Suppose the alarm goes off at some point, what is the probability that the alarm has been activated without an accident occurring?

Let's now determine the variables involved:

```
A = An accident occurs
NA = No accident occurs
S = Sound Alarm
NS = Do not sound alarm
```

Again we will make an enlightening diagram




```
P[NA/S] = (0,9 .0,02)/(0,1 .0,97 + 0,9 .0,02) = 0,157
```

As we can see, the probability that the alarm sounds without an accident having occurred is 15.7% As we can see, applying Bayes' Theorem does not have major complications. But if after seeing each and every one of these exercises you have any concerns, please do not hesitate to ask, which I will gladly try to answer as soon as possible.

23.4 About the Author

Graduated in Mechanical Engineering, and a master's degree in teaching component, I gave classes in several institutes of mathematics and physics, but I also dedicated several years of my life as a television producer, I did the scripts for mikes, the camera direction, editing of video and even the location. Later I was dedicated to SEO writing for a couple of years. I like poetry, chess and dominoes.

CHAPTER

TWENTYFOUR

BLOCK DESIGN

24.1 Random block design

Experimental designs are one of the most useful tools for the study of applied science. The use of experimental designs is closely related to all types of research, from studies carried out in a laboratory to its application in different areas of knowledge and allows the researcher to obtain valid deductions and satisfactory results, with respect to the established problem.



An experimental unit is usually considered as part of a set of elements that in principle are equivalent and each of its elements is subjected to experimental treatment, that is, it is the smallest unit subjected to a treatment. The experimental unit is not only observed with respect to its behavior with respect to the treatments, but also responds to other external factors that produce extra variability and manage to obscure the effect produced by the treatments. These what is called the experimental error.

Ideally, the experimental units should be homogeneous, so that after applying different treatments the difference can be observed (if it exists) only in the effect produced by these treatments and not in those generated by the other disturbing factors.

The study of the behavior of random phenomena by means of statistical models, in addition to the variation parameters that are relevant in the behavior both outside and within the population to be studied, leads us to delve into the basic concepts and the methodology to be used in the study random block design.

In this type of design, two classification criteria are used, since they have two sources of variation, which are the blocks and the treatments. In this type of statistical model, the experimental units are distributed in blocks or groups, but

with the condition that the experimental units that are within a block are homogeneous, the experimental units that are within a block are equal to the quantity treatments to be investigated. On the other hand, the treatments are randomly assigned to the experimental units found within each block. It should be taken into account that there are factors that produce some fluctuation and are uncontrollable.

What is a block?

When a categorical variable is able to explain the variation that exists in the response variable, but in some way we can control the interference caused by the disturbing factors, it is what we call a block. For each measurement it is important to take into account consistent experimental conditions, this implies that the measurements must be carried out separately, in those factors that change the response as part of the experiment and this is not always possible.

In any investigation, the variability that comes from a noise factor can affect the results and that noise factor has an answer, which we are ultimately not interested in studying.

Blocks are used in those experiments that are designed and analyzed in advance, to minimize both the bias and the variance of the error when there are disturbing factors. For example, if you want to evaluate the quality of a certain new press, but it takes several hours to prepare the press and this can be done only four times a day. This brings a drawback and it is that the design of this experiment requires at least eight hours running and then it takes at least 2 days to be able to test the press. It is then necessary to explain the different conditions that exist between one day and another, in addition, a block variable that can be called "day" must be used and thus distinguish the incidental differences or any block effect between the days, including the effects in the block that may be caused by experimental factors such as humidity, temperature and the operator's handling of the press. It is also necessary to use a random order of the runs that are made within the blocks.



Designing an experiment can give us the necessary information when measurements are very expensive or difficult to perform, or simply minimize that unwanted variability in terms of the interference of unwanted factors in the treatment. The random block design is frequently used when you want to minimize the variability associated with discrete units such as the lot, the operator, the location, the time, among others. It consists of randomly distributing a replica for each combination of the treatments found within each block. In general, there is no interest in blocks and these blocks are

also considered to be random factors. The most usual thing is to suppose that the block per interaction in the treatment is zero, this interaction is going to be the error term, in order to check the effects of the treatment.



In other words, when we study the influence of a certain factor on a quantitative variable, it is most likely that other factors or variables will emerge that also influence and therefore should be controlled. These so-called block variables are characterized by not being precisely the reason for the study, but rather they arise in an obligatory or natural way within the investigation. On the other hand, these block variables have no interaction whatsoever with the factor to be studied. For example, suppose we want to study 10 people with respect to the number of calories consumed per second. Of course, the results will vary according to the individual considered and the factor to take into account is the activity carried out considering three possible levels: doing sports, walking or eating.

Suppose that each person is assigned a different activity, but it may be that we observe a variability between the different activities that is due to the differences that exist between the individuals themselves. A possible solution is that each individual performs the three activities, this is how each type of person will be a block variable. In this case, each of the three factor levels is applied to each person (block), in random order.

Following the nomenclature:

G - gymnastics

W - walk

E - eat

Person 1	Person 2	...	Person 10
G	E		W
W	G		E
E	W		G

Important observations: It should be remembered that the block variable does not interact with the factors under study. It can be determined that the model is of absolute random blocks, when in each block all possible treatments are considered (it can also be a multiple of that number) and treatments are randomly assigned within each block. Many times all the treatments cannot be assigned in each block and that is when we find incomplete random block designs. It is assumed that the number of experimental units for each block must coincide with the number of treatments multiplied by the number of blocks, this implies that there is an observation corresponding to each level crossing between the block and the factor.

Completely random block design

This type of randomized complete block design is used when the researcher has the need to exercise local control with respect to variation and because there is a material that is experimentally heterogeneous, since otherwise (when it is homogeneous) uses completely randomized design (blocks are not required). The steps to be followed by the researcher for the completely randomized block design are:

- The researcher must use some criterion for grouping those homogeneous experimental units to generate the blocks, for example, they can be grouped by: methods, age, race, weight, sex, are the, litters, country, among others.

- Once the blocks have been formed, the treatments are randomly assigned to the experimental units in each block. In this way, a treatment is randomly assigned to each experimental unit.

- The blocks must be defined according to homogeneous experimental units, but which are within themselves, while they must be heterogeneous between one block and another.

- All treatments must be represented in the blocks and the idea is to minimize the variation within each block and maximize the inequalities between blocks.

Advantages of the randomized complete block experimental design

1. It increases the precision of the test since it eliminates one of the sources of variation of the error and that precision is measured by means of a coefficient of variation.
2. If the treatments are equal to the experimental units (or a multiple of them), this design allows great flexibility if there is no relationship between treatment and block.
3. In case of loss of information either by treatment or by block, in the same way the statistical analysis is not difficult.
4. The “principle of confusion” can be applied by matching the variables that have an influence on the response, but are ultimately not part of the interest of the researcher.

Disadvantages of the random full block design

1. It is not advisable for a large number of treatments, the recommendation ranges between 6 and 24 treatments.

2. It is also not recommended if there is a great variation in the experimental material, that is, when there is more than one variable.
3. When the effect of the block is not very significant, the degrees of freedom with respect to the error are unnecessarily decreased and it leads to a decrease in precision.
4. In the event that there is an interaction between treatment and block, the F test must be invalidated and this design cannot be applied.

Regarding the disturbing factor, we can say that the design most likely has an effect on the response that does not interest us and this disturbing factor can be in several ways:

1. Unknown disturbing factor and also not controllable, this factor can have different levels of variables while we carry out the experiment. The solution to this problem is randomization, since in this way the levels and possible effects of this factor are distributed in all the experimental units.
2. Disturbing factor that is known but not controllable, in this case a compensation can be made through the analysis of covariance, but only in the case that it can be observed in each run of the experiment, the value that this disturbing factor takes.
3. Known and controllable disturbing factor, in this case the solution may be the formation of blocks and in this way, statistical comparisons in the treatments are eliminated.

The completely randomized block design is one of the simplest to work in research and we will use it when we have at least 3 treatments, since if we only have two treatments, it is best to use a completely random design and the blocks do not they are necessary, since what is required is only a comparison between two groups.

We now go to the statistical model for the completely randomized block design, whose formula is the following:

Yij = μ + ti + ßj + ij

The nomenclature to use is:

Yij = Observations obtained with the i-th treatment in the j-th repetition of the experiment.

μ = It is the general mean

ti = The effect of the i-th treatment

ßj = It is the effect of the j-th block

ij = The experimental error of the i-th treatment in the j-th repetition

In a previous article we found the usefulness of analysis of variance (ANOVA). Where we can obtain results given by the sources of variation, the sums of squares, the degrees of freedom, the squares of the means of each component, as well as the value of F.

Variance analysis

Variation sources	Degrees of freedom (Df)	Sum of squares (SS)	Mean square (MS)	Value of F
Blocks	r - 1	$\sum_{j=1}^{r} \frac{Y_{.j}^2}{t} - \frac{Y_{..}^2}{t*r}$		
Treatments	t - 1	$\sum_{i=1}^{t} \frac{Y_{i.}^2}{r} - \frac{Y_{..}^2}{t*r}$	$\frac{SSTreat}{DFTreat}$	$\frac{MSTreat}{MSEE}$
Experimental error	(t – 1)(r – 1)	SSTotal-(SSTreat + SSB)	$\frac{SSEE}{DFEE}$	
Total	t*r - 1	$\sum_{i=1}^{t} \sum_{j=1}^{r} Yij^2 - \frac{Y_{..}^2}{t*r}$		

Let's go with an illustrative example: Let us suppose that we have a field and according to the characteristics of the place and the environment where the research is going to be carried out, it is that we are going to use a completely random design or a completely random block design.

Given the case that we are in an absolutely controlled, closed laboratory environment, such as a greenhouse and we have all the experimental units, we can use a completely randomized and balanced design (without blocks). But if we have lost some experimental units, we must work with a completely random but unbalanced design.



What happens if on my land I have a gradient, soil effect, terrain topography or simply certain conditions surrounding the investigation that can directly affect the final results, in this case we must use a completely block design at random, since it is specifically the blocks that will allow me to develop the research successfully, since they are capable of

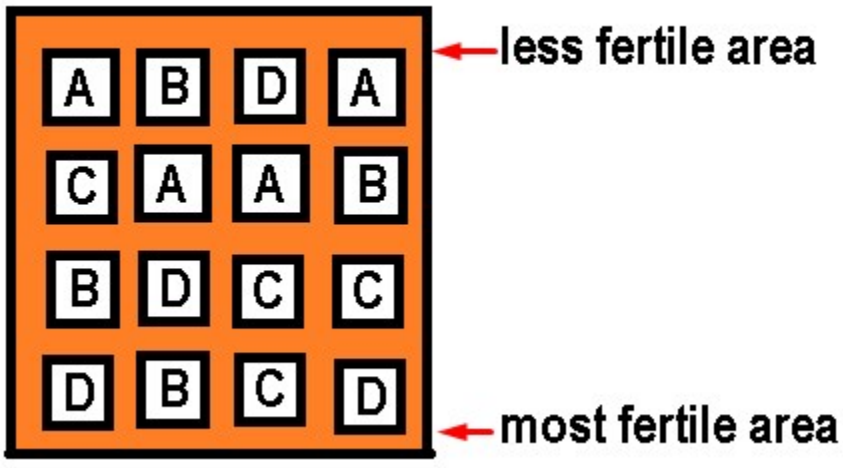
removing those disturbing factors that may be affecting the study.

Suppose we do a soil analysis and we realize that one part of the land of our research has less phosphorus, potassium, nitrogen and therefore is less fertile than the other and also, we are going to plant corn and we are going to apply a fertilizer in different doses, to see what is the amount of fertilizer that generates greater productivity.





But in this case, there is a serious disadvantage if we intend to use the completely random design when measuring the productivity of corn plants, since as each of the variables (treatments) is going to be placed at random, we can face a big problem. Because if precisely by chance of fate one of the treatments or doses of fertilizer is concentrated in the area of less fertility, our conclusions will be affected. We are now going to show a design where several treatments have been applied at random, to clarify the aforementioned.



As we can see, we could come to the conclusion that treatment A does not generate higher productivity, but if we realize that treatment A is concentrated in the area with fewer nutrients and in reality its lack of productivity may not be due

to the treatment in yes, but because of the soil where it was planted, so the results will be altered by that disturbing factor, which in this case is the level of soil fertility. For this reason, this type of design cannot be applied in this case, because it does not correct the factor of the difference in fertility in different areas of the same soil.

Of course, the ideal would be for all the land to have the same fertility conditions, but since this is not the case, we must use a completely random block design to try to block this disturbing factor, which does not allow us to know exactly which of the Fertilizer dose is the one with the highest productivity.

For this, the first thing we must do is have my general linear model of the completely random block design well defined and for this the following formula is used:

Yij = μ + ti + ßj + ij

Where we know that Yij is the response variable that will be a function of the general mean (μ) + the effect of the treatments (ti) + the effect of the block (ßj) + the experimental error associated with each experimental unit.

Yij In this case, it will be the performance of the corn plant that will depend on each of these elements, being the sources of variation in my research those that are established in the previous formula.

The general mean (μ) that production capacity of the corn plant, regardless of the amount of fertilizer applied to it, is what the plant produces under natural conditions and without treatments.

The effect of the treatment (ti) will be the doses of fertilizer that are expected to be tested in the corn plant, to increase its yield and in this case, in each treatment it is established as:

- A = 2gr
- B = 4gr
- C = 8gr
- D = 10gr

Bj is the effect of the j-th block

Eij is the experimental error, since no matter how controlled the environmental conditions are at the laboratory level and foci with adequate light have been provided, humidity is intervened, etc. there will always be an experimental error. For example, if doses of hormones are applied, by human error a very small portion of difference can be introduced or perhaps a data taken in a wrong way and each of these factors are part of the experimental error.

The next step is to try to remove the disturbing effect and for this we will use a systematic randomization, the ideal would be that all the treatments are homogeneously concentrated in the whole field, that is, that one treatment is not more concentrated than another in the areas of higher or lower fertility. Ideally, the four treatments are evenly disaggregated in both areas, to be able to measure each of them under equal conditions and for this, it will be necessary to use a formula to find the number of repetitions. In the experimental design that we showed previously as an example of a completely random design (without blocks), we established 4 repetitions of each treatment, solely for a didactic purpose and because it is a simpler representation. But the number of repetitions (r) in the completely randomized block design must be calculated.

On the other hand, we already know that the number of treatments (t) is 4 and the formula for the degrees of freedom of the error (DFE) is given by:

DFE = (t - 1) (r - 1)

The degrees of freedom of the error will indicate the value in which I am going to dilute all the variations of my investigation and as a general rule the number 12 is established as a minimum. So that in this way the variation of the results can be divide effectively, so in general we will always work with this value when assuming the degrees of freedom of the error, although it is true that you can work with values greater than 12, here we are going to limit ourselves to this number.

Substituting the values in the formula, we can solve for the number of repetitions:

12 = (4 - 1) (r - 1)

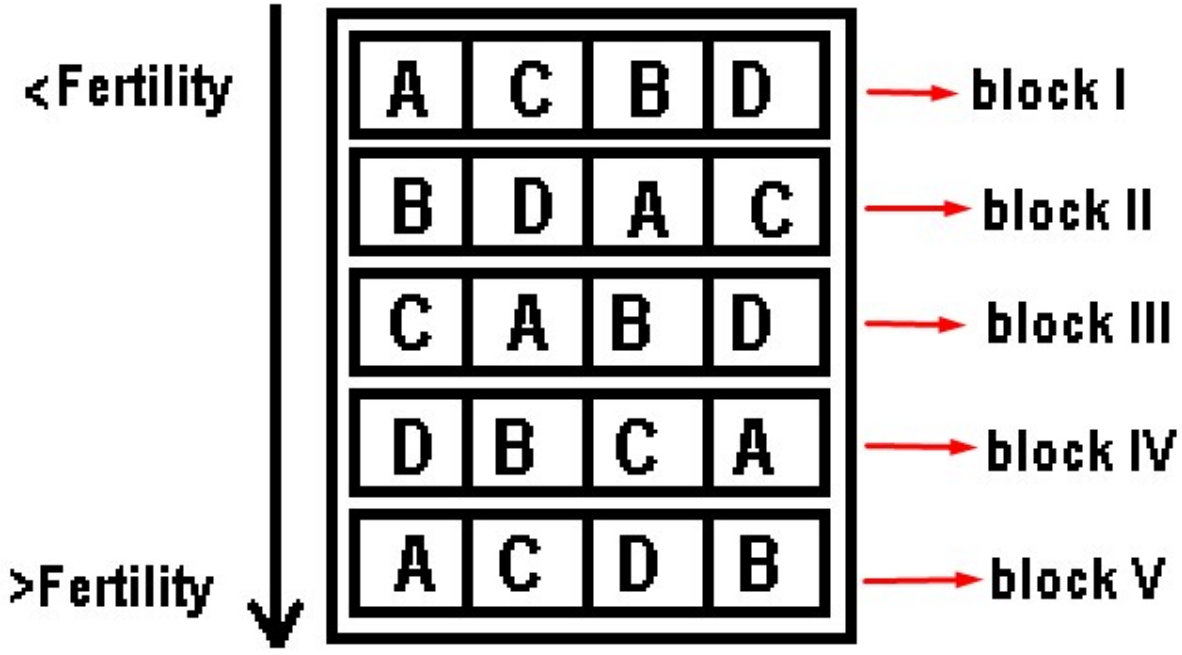
12 = 3 (r - 1)

12 = 3rd - 3

r = 15/3 = 5

The experimental units, for this case, will be 5 repetitions multiplied by 4 treatments, that is, 20 experimental units.

Once we know the number of repetitions, we can plan the design of blocks completely at random, if there are 5 repetitions and they must be homogeneously distributed in each of the areas from lowest to highest fertility, we can establish a gradient in this sense and the Blocks must be oriented perpendicular to the direction of the gradient. So there should be one block for each repetition and 4 treatments in each block.



This time randomness will be in the arrangement of the treatments in each block, unlike the figure that represented the completely random design, where the treatments were randomly scattered throughout the field. With this block design, we correct the perturbation factor so that it does not affect the results of our experiment. This is because each level of the soil is fertile or not, there will be each of the treatments and then we can measure the effect of the treatments eliminating the disturbing factor, since there will be the same number of treatments for each level of the land and you will be able to measure how each of the treatments works in each of the different fertility zones.

We now go with a second example where we are going to use the ANOVA table to reach definitive conclusions.

An experimental study was carried out to observe the dry matter yield in kg / ha with different contributions of N2 in the form of urea. The doses used were: 0 (as control doses), 75, 159, 126 and 300 Kg / ha and the study was carried out in different areas, in which different yields could be expected for climatic reasons. Importantly, the zones in this case acted as blocks.

The results obtained by treatment and by block are presented below:

Urea (Kg/ha)	Block I	Block II	Block III	Block IV
0	2010	1832	2170	1879
75	2915	2175	2610	2294
150	3049	2908	2964	2971
225	3199	3235	3003	2937
300	3381	3270	3129	3171

The null hypothesis is stated as that there are no significant differences between the treatments, that is, that all the treatments are the same, while the alternative hypothesis, in contrast to the null hypothesis, is stated as that at least one of the treatments has significant differences with the rest or rather, not all treatments are the same.

Ho = t = ti

Ha = t ti

Applying the formula for the randomized complete block design we have:

Yij = μ + ti + ßj + ij

The ANOVA table will be as follows:

Variance analysis

Variation sources	Degrees of freedom (Df)	Sum of squares (SS)	Mean square (MS)	value of F
Blocks	r - 1	$\sum_{j=1}^{r} \frac{Y_{.j}^{2}}{t} - \frac{Y_{..}^{2}}{t*r}$		
Treatments	t - 1	$\sum_{i=1}^{t} \frac{Y_{i.}^{2}}{r} - \frac{Y_{..}^{2}}{t*r}$	$\frac{SSTreat}{DFTreat}$	$\frac{MSTreat}{MSEE}$
Experimental error	(t – 1)(r – 1)	SSTotal-(SSTreat + SSB)	$\frac{SSEE}{DFEE}$	
Total	t*r - 1	$\sum_{i=1}^{t}\sum_{j=1}^{r} Yij^{2} - \frac{Y_{..}^{2}}{t*r}$		

Being “r” the number of repetitions, which in this case is equal to 4 (one for each block) and “t” the number of treatments that are 5.

We are going to find the elements that make up the sum of squares formula and show where they come from.

Urea (Kg/ha)	Block I	Block II	Block III	Block IV	Yi.	$Yi.^2$
0	2010	1832	2170	1879	7891	62267881
75	2915	2175	2610	2294	9994	99880036
150	3049	2908	2964	2971	11892	141419664
225	3199	3235	3003	2937	12374	153115876
300	3381	3270	3129	3171	12951	167728401
Y.j	14554	13420	13876	13252	55102	
$Y.j^2$	21181896	18009600	192543376	175615504	Y..	

As we can observe:

Y.j = It is the sum of the treatments in each block

= Are the values of Y.j squared

Yi. = It is the sum of all the blocks for each treatment

= They are the values of Yi. squared

Y.. = It is the sum of all the treatments in each block with all the blocks in each treatment (it is underlined in yellow) and it is equivalent to the number of experimental units.

We are going to make the calculations of the sum of squares of both treatments and blocks, the experimental error and the totals, whose formulas come from the analysis of variance to be able to calculate the mean of the squares of the treatments and the experimental error. Once calculated, we can get to obtain F, which is a value that I can compare and will allow us to make a decision.

SSB = = 203319

SSTreat = = 4291444

SSTotal== 4804480

SSEE= SSTotal-(SSTreat + SSB) = 4804480 – 4291444 – 203319 = 309717

MSTreat = = 1072861,08

MSEE = = 25809,7

F = = = 41,57

Variation sources	Degrees of freedom (Df)	Sum of squares (SS)	Mean square (MS)	value of F	Critical F value table
Blocks	4	4291444,3	1072861,0	41,51	3,49
Treatments	3	203319			
Experimental error	12	309717	25809,7		
Total	19	4804480			

We are going to summarize the results of the analysis of variance in a table

We look for the critical value of F in tables where the numerator is the degree of freedom of the treatments = 3 and the denominator is the degree of freedom of the experimental error = 12

As we can see, according to the table the critical value of F = 3.49 with a significance level of 0.05 (which is the one usually used).

To make the decision, it is necessary to compare the obtained value of F with the critical value of F, if the value of F> critical value of F, the null hypothesis is rejected, in this case:

41.51> 3.49

This implies that the null hypothesis is rejected and therefore the alternative hypothesis is validated

Conclusions: According to the calculations, there is sufficient evidence that indicates a significant difference in terms of the yield of dry matter in at least one of the treatments, so it is recommended to evaluate which or which of the treatments are the ones that are presenting significant differences.

Other random block designs

Regarding the randomized block design, there are other types of designs, in addition to the completely randomized block design, where each treatment is applied in each block only once, it is important to mention that there is also the generalized randomized block design, where at As in the previous design, all treatments appear in each block, but in this design they can occur more than once.

It should be noted that there is also the incomplete block design, which is characterized in that not all treatments occur in each block and these in turn can be classified into:

- Balanced incomplete block design

- Partially balanced incomplete block design

- Incomplete block design with balanced treatment

- Latice design

- Extended block design: when each block has the same number of experimental units and is also greater than the number of treatments.

- Trend Free block design.

Generalized Randomized Block Design

This type of design is considered as an extension of the randomized complete block design and its difference with the previous one is that treatments are repeated in the same block, while in the previous design, the treatments occur only once per block.

It is also used when a disturbing factor is detected in the experimental units, but it is also applied when a treatment block interaction cannot be considered.

Advantages of this design

In addition to having all the advantages that the randomized complete block design has, it has the advantage that it is not required to have an independence between blocks and treatments.

Disadvantages

In the same way as the advantages, this design has the same disadvantages as the randomized complete block design, but also has an alternative restriction, which is that the number of repetitions within each block of the different treatments must be the same for all blocks, since otherwise, we could be within what is considered an unbalanced complete block design.

The model in this case is defined as:

Yijk = + ti + j + TBij + Eijk

Where:

Yijk = this value corresponds to the i-th treatment of the j-th block that belongs to the k-th observation

 = It is the general average that is common to all observations

ti = It is the effect produced by the i-th treatment

j = Is the effect produced by the j-th block

TBij = The effect produced by the interaction of the block per treatment

Eijk = The experimental error

CHAPTER

TWENTYFIVE

THE BLACK SHOLES MODEL

The Black Sholes model has had a great influence when it comes to evaluating financial options and was created by Fisher Black, Myron Sholes and Robert Merton in the year 1973. In fact, Myron Scholes and Robert Merton thanks to this model were awarded the Prize Nobel Prize in economics of the year 1997, unfortunately Fisher Black had died in 1995 and could not receive the award together with his colleagues.

We will give some basic notions before delving into the Black Scholes model, which will help us to better understand the model and its application.

An “asset” is any property that produces economic benefits, while a set of assets is what we call a “portfolio”, these assets can be bonds, stocks, derivatives, etc.

On the other hand, there are certain costs to be able to carry out financial operations and these transaction costs will depend on whether it is an underlying or derivative asset, whether it is a purchase or a sale, etc.

What is an underlying asset? In finance there are products that are not actually assets in themselves, since they depend on the price, quotation and evolution of another specific asset, this type of product is called an underlying asset and it is precisely from where the value of instruments or instruments is derived. financial contracts.

Suppose a farmer wants to buy corn and his neighbor has exactly what he needs, which is a corn plantation, so the farmer makes an agreement with his neighbor. He is going to pay you $ 1,100 for the corn crop, which is currently worth $ 1,000, and this entitles the farmer to purchase the crop within six months.



Corn, in this case, would be the underlying asset and the agreement reached by the farmer with his neighbor would be the derivative contract. A financial derivative is a product, the value of which is based on the price of another underlying asset.

In this option to buy, the farmer can sell it to a third party at the price he wants, especially if he thinks that within six months the corn may become more expensive and thus obtain a profit.

Another concept that we must be clear about is volatility, so that if the price of an asset fluctuates a lot and also very fast, that price can be considered as very volatile. Typically, the standard or standard deviation is used to measure the volatility of an asset.

It is important to take into account that volatility only measures the past behavior or behavior of an asset, so it should never be confused with future risk. Of course, most of the prices that have been volatile in the past, it is very possible that they will continue to be so in the future.

The Black Sholes equation is based on stochastic processes and let's remember that a stochastic process is not predictable for sure, since it is influenced by a series of variables that move randomly. However, unlike non-stationary stochastic processes, stationary stochastic processes have certain characteristics that make them somewhat predictable.

In non-stationary stochastic processes the probability distribution varies constantly and the indicators behave in an absolutely chaotic way, while the stationary stochastic processes have values that are repeated and therefore can be predicted.

The Black Scholes model was devised to estimate the present value of a European "Call" option for the purchase, but also for the sale of future "Put" shares. In both cases, the model works to calculate the fair price of the premium to be paid by the buyer to the seller, to have the right to decide whether to buy the asset in the case of the Call option or to sell it, in the case of the option. Put.

A Call option is a financial derivative (its value is determined by changes in the underlying asset) that gives the buyer a right (but without forcing him) to acquire or purchase an asset in the future, at a price previously determined with the seller.

The buyer of a call option benefits when the underlying asset raises its price at the expiration date agreed with the seller. In that case, the owner of the call option may exercise his right by buying the asset and selling it at the market price, so that thanks to the rise in the share, he will keep a profit.

Otherwise, when the price of the share decreases in the future with respect to the price of the purchase option (known as the exercise price or strike price). The buyer may not exercise his right to buy the asset and will lose the premium that he had to pay in order to acquire the option. The buyer in that case must evaluate whether he prefers not to buy and only pay the premium.

That is why the buyer's profit can be very high, while his loss will always be limited to the premium he paid. The Black Scholes model defines a fair price for the premium to be paid, which gives the right to buy the share in the future, but as we specified previously, the buyer may not want to buy the option, if it does not suit him.

The Call option for the purchase is determined by the European style, where the buyer can only exercise the right to it, in case the date agreed with the seller has expired. While the US options can be exercised at any time from the date of the purchase option contract, until its expiration.

Now, in the Black Scholes model we will use what is called a "safe investment", that is, whose interest rate is risk-free. For example, when we analyze assets or derivatives but in short periods of time (quarters) and we are taking into account a state bond that is 20 years, it is of course a safe investment and we can assume constant (in the short term) the rate of that bond, for such a short time. This implies that the proportional changes in the share price for a short period of time have a normal distribution.

Let us remember that a normal distribution is based on a theoretical model, which satisfactorily approximates the value of random variables to an ideal situation, that is, the normal distribution is capable of adapting a random variable to a function that will depend so much on the standard deviation as the mean. In other words, the random variable and the function will have roughly the same representation, but with small differences.

On the other hand, when we buy a good at a lower price to sell it at a higher price in order to benefit thanks to the price difference, it is what we call "arbitrage", but as we know, there is no investment with the possibility to earn money without any risk. However, with a risk-free rate, we can minimize the levels of insecurity.

That is why there are agents specialized in minimizing the risks when investing and these agents avoid exposing the values of the assets to all the adverse changes that they may suffer.

In general, investment agents have portfolios whose assets are in a position that can be buy or sell, but they always try to place a derivative in the other position, so that if the price of the asset falls unfavorably , always have the option of cushioning that loss in this way.

The Black Scholes model in its beginnings tried to value options in order to calculate the price that the buyer had to pay for the premium of a European option (Call) for the purchase or sale (Put), but then the model began to be used in shares that produce dividends, not only in the European ones, but also in the North American ones and in the money market in general. Even today this model is used to value intangible assets, such as patents.

Considerations to take into account to apply the Black Scholes equation:

- Taxes or transaction costs are not taken into account in the model
- A risk-free and constant interest rate is assumed for the due date.
- Volatility is assumed to remain constant
- It should be based on the idea that there is no arbitration without risk
- The option does not bear interest
- Finally, it is also assumed that the probability distribution regarding the return is concerned, is a normal distribution.

Let's now go to the Black Sholes equation to find the price of a Call option:

```
C=SxN(d_1 )-X e^(-rT) x N(d_2)
```

Where the values of d_1 and d_2 are obtained from the following formulas:

```
d_1= lnS/X+ (r+ ^2/2)x T/( T)
```

```
d_2= d_1-  T
```

We are going to explain the nomenclature of each of the elements that make up the formulas:

```
T = Time expressed in years, for example:
3 meses = ((1 año x 3 meses)/(12 meses)) = 0.25 año

C = Represents the fair price of the premium that entitles the buyer to acquire the␣
↪asset in the future or purchase option, but which must be canceled at the time of␣
↪signing the option, that is, for a time T = 0
 = Standard deviation or volatility of the option or asset
r = Risk-free rate
X = Price of the option to buy or also called the exercise price
S = Current price of the option u asset, that is, for the initial time T = 0
```

N (d_1) and N (d_2) = Represent the values of the cumulative probability functions with a normal distribution, that is, it is assumed that the mean is zero (0) and the standard deviation is one (1) for both functions.

Let's go with the first example:

Suppose I want to calculate the fair value of a Call option with three months expiration, whose strike price is € 40. The share is priced at € 50 and its annual volatility is 30% (0.3), its risk-free interest rate being 10% (0.1) at three months and we know that in that period of time, the share does not pay dividends.

We break down the information in the terms we need to apply the Black Scholes equation:

```
T = 3 months, that is, 0.25 years
r = The risk-free interest rate that equals 10% (0.1)
 = The volatility or standard deviation is 30% (0.3)
X = € 40
S = € 50
```

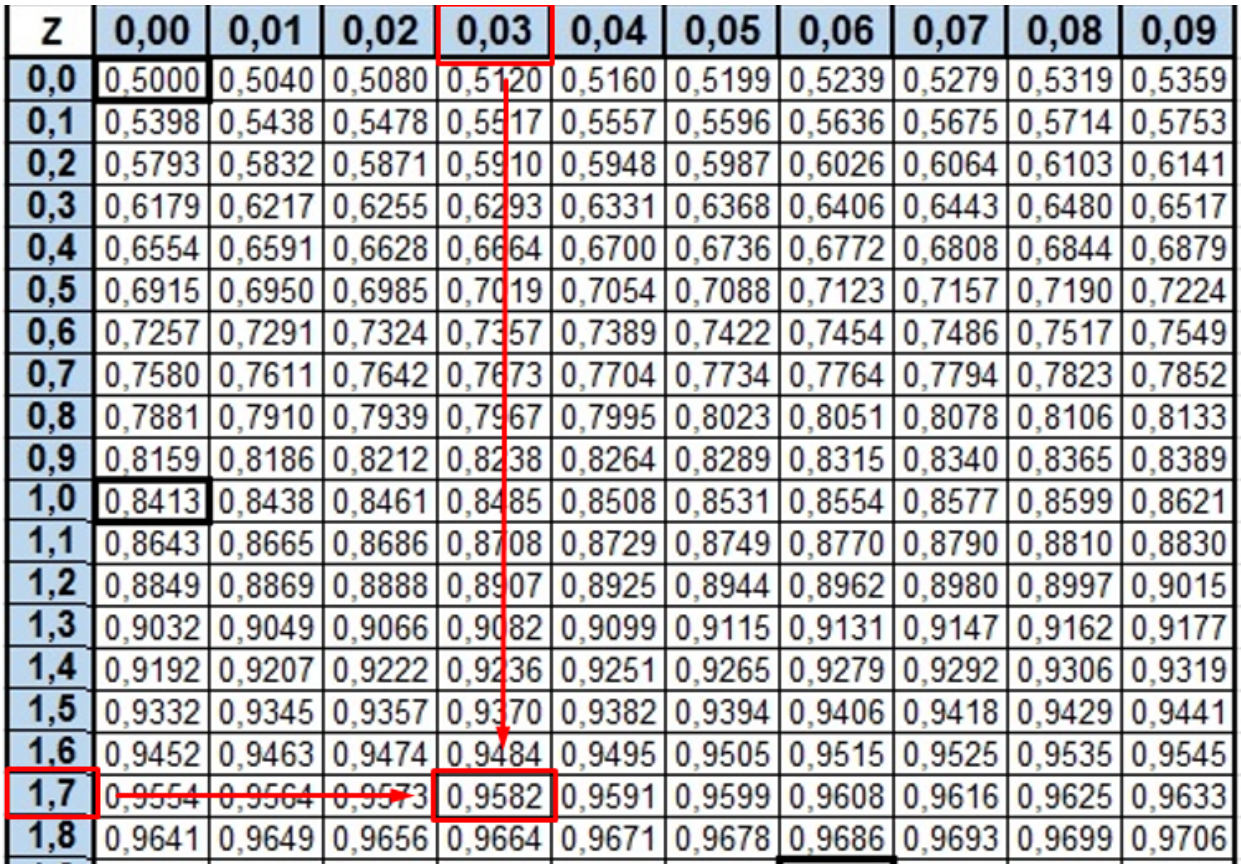
We are going to calculate both d_1and d_2

`d_1= ln50/40+ (0.1+ 0.3^2/2) 0.25/(0.3 0.25) = 1.72`

`d_2= d_1-  T = 1.72 - 0.30.25 = 1.57`

In order to evaluate the cumulative probability function of a normal distribution, where it is assumed that its mean is zero (0) and its standard deviation is one (1), we must go to the tables of that normal distribution, with the data obtained from `d_1= 1.729290342.`

As we can see, on the left side of the table we can only find the number that represents the units and tenths of d_1, that is: 1.7; while in the upper part we are going to approximate the hundredths (which in this case are 0.029290342) to 0.3 and the intersection of both values in the table, will give me as a result the specific normal distribution of our d_1



z	0,00	0,01	0,02	0,03	0,04	0,05	0,06	0,07	0,08	0,09
0,0	0,5000	0,5040	0,5080	0,5120	0,5160	0,5199	0,5239	0,5279	0,5319	0,5359
0,1	0,5398	0,5438	0,5478	0,5517	0,5557	0,5596	0,5636	0,5675	0,5714	0,5753
0,2	0,5793	0,5832	0,5871	0,5910	0,5948	0,5987	0,6026	0,6064	0,6103	0,6141
0,3	0,6179	0,6217	0,6255	0,6293	0,6331	0,6368	0,6406	0,6443	0,6480	0,6517
0,4	0,6554	0,6591	0,6628	0,6664	0,6700	0,6736	0,6772	0,6808	0,6844	0,6879
0,5	0,6915	0,6950	0,6985	0,7019	0,7054	0,7088	0,7123	0,7157	0,7190	0,7224
0,6	0,7257	0,7291	0,7324	0,7357	0,7389	0,7422	0,7454	0,7486	0,7517	0,7549
0,7	0,7580	0,7611	0,7642	0,7673	0,7704	0,7734	0,7764	0,7794	0,7823	0,7852
0,8	0,7881	0,7910	0,7939	0,7967	0,7995	0,8023	0,8051	0,8078	0,8106	0,8133
0,9	0,8159	0,8186	0,8212	0,8238	0,8264	0,8289	0,8315	0,8340	0,8365	0,8389
1,0	0,8413	0,8438	0,8461	0,8485	0,8508	0,8531	0,8554	0,8577	0,8599	0,8621
1,1	0,8643	0,8665	0,8686	0,8708	0,8729	0,8749	0,8770	0,8790	0,8810	0,8830
1,2	0,8849	0,8869	0,8888	0,8907	0,8925	0,8944	0,8962	0,8980	0,8997	0,9015
1,3	0,9032	0,9049	0,9066	0,9082	0,9099	0,9115	0,9131	0,9147	0,9162	0,9177
1,4	0,9192	0,9207	0,9222	0,9236	0,9251	0,9265	0,9279	0,9292	0,9306	0,9319
1,5	0,9332	0,9345	0,9357	0,9370	0,9382	0,9394	0,9406	0,9418	0,9429	0,9441
1,6	0,9452	0,9463	0,9474	0,9484	0,9495	0,9505	0,9515	0,9525	0,9535	0,9545
1,7	0,9554	0,9564	0,9573	0,9582	0,9591	0,9599	0,9608	0,9616	0,9625	0,9633
1,8	0,9641	0,9649	0,9656	0,9664	0,9671	0,9678	0,9686	0,9693	0,9699	0,9706

Then our value of N (d_1) = 0.9582

We are going to carry out the same method to obtain the evaluation of the cumulative probability function, but this time with d_2, in the same way we can observe that both the units and the tenths of d_2 are equal to 1.5; while the hundredths can be approximated from 0.079 to 0.08.Likewise, we intercept both values in the probability table:

Z	0,00	0,01	0,02	0,03	0,04	0,05	0,06	0,07	0,08	0,09
0,0	0,5000	0,5040	0,5080	0,5120	0,5160	0,5199	0,5239	0,5279	0,5319	0,5359
0,1	0,5398	0,5438	0,5478	0,5517	0,5557	0,5596	0,5636	0,5675	0,5714	0,5753
0,2	0,5793	0,5832	0,5871	0,5910	0,5948	0,5987	0,6026	0,6064	0,6103	0,6141
0,3	0,6179	0,6217	0,6255	0,6293	0,6331	0,6368	0,6406	0,6443	0,6480	0,6517
0,4	0,6554	0,6591	0,6628	0,6664	0,6700	0,6736	0,6772	0,6808	0,6844	0,6879
0,5	0,6915	0,6950	0,6985	0,7019	0,7054	0,7088	0,7123	0,7157	0,7190	0,7224
0,6	0,7257	0,7291	0,7324	0,7357	0,7389	0,7422	0,7454	0,7486	0,7517	0,7549
0,7	0,7580	0,7611	0,7642	0,7673	0,7704	0,7734	0,7764	0,7794	0,7823	0,7852
0,8	0,7881	0,7910	0,7939	0,7967	0,7995	0,8023	0,8051	0,8078	0,8106	0,8133
0,9	0,8159	0,8186	0,8212	0,8238	0,8264	0,8289	0,8315	0,8340	0,8365	0,8389
1,0	0,8413	0,8438	0,8461	0,8485	0,8508	0,8531	0,8554	0,8577	0,8599	0,8621
1,1	0,8643	0,8665	0,8686	0,8708	0,8729	0,8749	0,8770	0,8790	0,8810	0,8830
1,2	0,8849	0,8869	0,8888	0,8907	0,8925	0,8944	0,8962	0,8980	0,8997	0,9015
1,3	0,9032	0,9049	0,9066	0,9082	0,9099	0,9115	0,9131	0,9147	0,9162	0,9177
1,4	0,9192	0,9207	0,9222	0,9236	0,9251	0,9265	0,9279	0,9292	0,9306	0,9319
1,5	0,9332	0,9345	0,9357	0,9370	0,9382	0,9394	0,9406	0,9418	0,9429	0,9441
1,6	0,9452	0,9463	0,9474	0,9484	0,9495	0,9505	0,9515	0,9525	0,9535	0,9545
1,7	0,9554	0,9564	0,9573	0,9582	0,9591	0,9599	0,9608	0,9616	0,9625	0,9633

From the table we can extract the value of N (d_2)

`N (d_2) = 0.9429`

Now we can calculate the fair price that the buyer must pay to obtain the Call purchase option, by means of the Black Sholes equation:

`C=S .N(d_1 )-(X .e^(-rT) )N(d_2)`

Substituting the values:

`C=50 .0,9582-(40 .e^(-0,1 x 0,25) ) x 0,9429`

`C=11,1226 €`

Of course, we can also do the calculations in Excel and instead of using the probability tables when evaluating the normal distribution, we can simply give the following instruction in the cell: NORM.S.DIST (place the cell where it is located calculated the value d_1; TRUE). When one places the word “true” after the (;) the NORM.S.DIST function returns the cumulative normal distribution which is the same as using the probability tables.

As we can see, in both ways we obtain that the fair price of the Call option is € 11.12

Although this model offers us on a silver platter an absolutely brilliant solution to calculate the appropriate price to be paid to obtain an option in the future, we also know that it has some limitations, since it works with a series of assumptions that are not perfectly adapted to reality. For example: the risk-free rate and volatility are constant in this equation and it also assumes that the option does not pay dividends. It is no secret to anyone that not only are there stocks that pay dividends, but risk-free rates and volatility change over time, so these assumptions are ultimately not real.

On the other hand, the Black Scholes model focuses on assets or options, which can only be settled or exercised on a certain expiration date, and for example, North American options can be exercised or settled before their expiration date.

Just as this model offers us a suitable price for the European Call option (for the purchase), it also gives us an idea of the appropriate price for the sale of this European option (Put), so that our second example will be focused in this sense.

Exercise 2:

Suppose that the shares of a company are priced at $ 45 and we want to know the price of an option for the sale (Put) of 100 shares, if its exercise price (also called strike) is $ 48 per share, the date of maturity is 6 months, with a risk-free rate of 2.8% and has an annual volatility of 9%. Let's apply the Black Scholes equation!

For greater comfort when performing the calculations, it is advisable to use Excel and we realize that the value of all the actions at present is:

```
S = $ 45 x 100 = $ 4500 and in the same way X = $ 48 x 100 = $ 4800
```

We must express time in years, therefore:

```
T = 6/12 = 0.5
```

The Black Scholes equation for the advisable price of the put option is:

```
P=X. e^(-rT).N(-d_2 )-S.N(-d_1)
```

It is important to take into account that for the put option when evaluating the normal distribution we must use the calculation of d_1but with the sign changed, that is: N (- d_1) and the same for the calculation of the normal distribution of d_2, in the formula is also used is N(- d_2).

Once we carry out all the calculations in Excel we are left with:

To clarify a bit the difference between the Call option and the Put option, in the former, the buyer must pay a premium to have the right, but not the obligation, to buy an underlying asset and the seller has the obligation to sell the asset, if the buyer wants to exercise his right to purchase.

For the Put option, the buyer is the one who sells the asset and in this option the buyer has the right to sell or not the underlying asset, because it is he who pays the premium, while the seller has the obligation to buy in case that the buyer decides to sell.

In both cases, the seller always keeps the premium regardless of whether or not the transaction is carried out and it is the buyer who decides whether to exercise his right or not, since he is the one who pays the premium.

So the price that the buyer must pay for the premium if he wants to sell the underlying asset is $ 268.9. The Black Sholes model

Exercise 3:

This exercise is intended to teach how to graph in Excel the relationship between the intrinsic value and the listing price of a Call option, since the relationship between the two is what can determine whether or not the underlying asset should be bought or not.

The intrinsic value of an underlying asset can be defined as the value in the present, of the cash flows of that action in an established future, that is, the current value of the money that we can earn with this asset, but in a future.

To calculate the intrinsic value of a Call option, we must subtract the price of the underlying asset minus the strike price:

```
Intrinsic value Call = S - X
```

Now, to calculate the intrinsic value of a Put option, we must subtract the price of the underlying asset from the exercise price.

```
Intrinsic value Put = X - S
```

In order not to go into details, we are simply going to place improvised values of each of the variables that are required to calculate the appropriate value of the premium of a certain option and according to the Black Scholes equation, we will obtain the result for both the call option to buy as for the Put option.

We carry out the pertinent calculations in Excel and obtain the values:

Now we are going to make a data table with the possible prices quoted at the expiration date of a Call purchase option and we will place them in column “D” (in this case we will establish that they range between € 20 and € 50). It is important to leave the first row of this item completely blank.

Of course, it does not reach the value 22 until 50 . . .

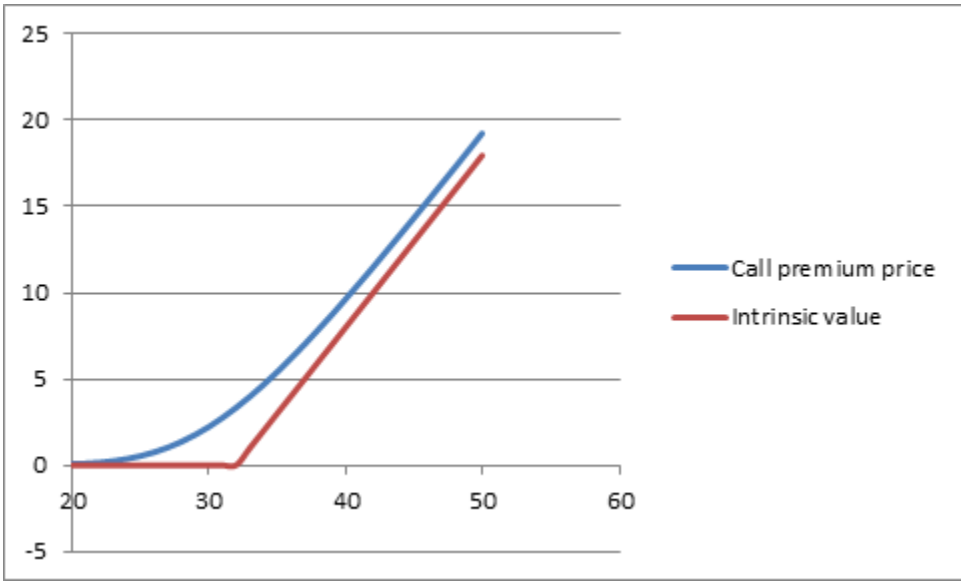
In the second column “E” we will assign the price of the Call premium and in the first row of this column, we will simply place the value obtained by means of the Black Scholes equation, which in this case is in cell B17, that is to say:

```
= 2.2100264.
```

The third column “F” is intended for the calculation of the intrinsic value, which in order to find it, it will be necessary to give the following instruction in the first row of this column: = MAX (the value of S - the value of X; 0). As we can see the value of S that we have in cell B2 we will subtract the value of X that is in cell B3 and after the (;) we must place zero (0), since this value tells us that if the value of S is less than the value of X, it gives us zero (0) as a result, so that we realize that in that case, it is not worth buying since the option would be giving losses.

Later we must choose all this table including its blank values and go to the upper part of Excel and choose “Data”, and then display the “Analysis what if” menu that is in the upper right, then we choose the option “table of data ”and a box will appear, with two possibilities that are: input cell (row) and input cell (column), we position ourselves in the second option (column) and there we choose with the mouse the cell that corresponds to the value of “S”, that is, cell B2 and we click “accept”, in this way the rest of the data in our table will be automatically filled out as follows:

It is then when we choose the whole table, we go to the upper part of our Excel in “Insert”, we display the “Dispersion” menu and we choose the third option which is “Dispersion with smoothed lines” and in this way we will obtain the expected graph.



If we look at the table, we can realize that profits are obtained from € 33, because from that cell onwards, the intrinsic value is different from zero (0), but in the graph we can visualize this same behavior, because from of that same value (€ 33) is that the function that represents the intrinsic value begins to rise, giving us a positive response when buying the underlying asset, for the previous values, the intrinsic value found in the graph, we can observe that it is null.

25.1 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

TWENTYSIX

THE MOST COMMON STATISTICAL ERRORS USED BY RESEARCHERS IN THEIR STUDIES

Most of the people when applying the statistics for a study or research, in general, they make certain mistakes that we will and we will try to focus on, in order to avoid them.

The first thing a researcher does is design a plan, with a hypothesis and a defined objective, then he plans how to collect the data and get it, analyze the information, and then reach conclusions regarding the data obtained through experimentation. empirical.

In this process, it is when statistics become an important part of the investigation and it is important to know how to use it, so as not to make mistakes that divert the researcher from achieving their goal.

1. The first error is not knowing how to distinguish the typology of each of the variables. Most likely, the researcher's data is organized in a database or table, where each variable is specified in a column. While each individual is usually placed in a row.

   For example:

Top Scorers in The Rugby Championship 2020

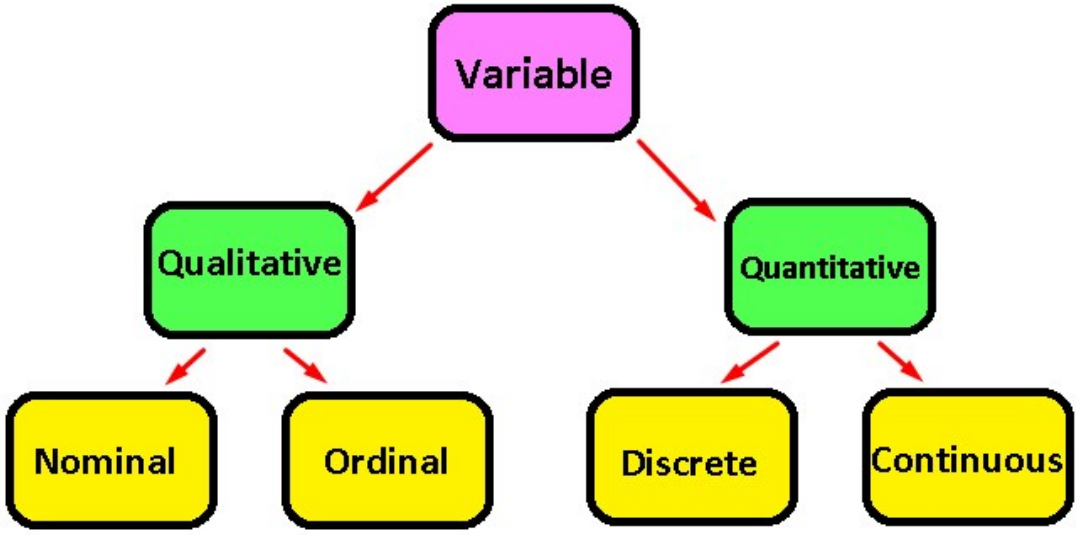
Player	Rank	Team	Points
Dan Carter	1	New Zealand	554
Morné Steyn	2	South Africa	390
Nicolás Sánchez	3	Argentina	329
Andrew Mehrtens	4	New Zealand	328
Beauden Barrett	5	New Zealand	288
Matt Burke	6	Australia	271
Matt Giteau	7	Australia	266
Bernard Foley	8	Australia	233

   It is important to identify the class of variables that are present in the informational table or database, since it is necessary to be able to statistically analyze them and differentiate their typology will allow you to choose the ideal method to evaluate and visualize each of the variables in the way more correct.

   The most common classification that you can find are only variables of two types:

   - Quantitative: They are those that are accompanied by their corresponding units and are subdivided in turn into whole numbers (discrete) and decimal numbers (continuous)
   - Qualitative: These types of variables are usually identified by groups that have a certain characteristic and are subdivided into the qualitative nominal ones: Which are, for example, a group of individuals with a

certain hair color, or of a certain sex, types of patients, and so on. But there are also the ordinal qualitative ones: Which are identified by measuring a qualitative state and have a sense of scale. To better exemplify we will have measures such as: Very bad = 1, Bad = 2, Normal = 3, Good = 4 and Very good = 5.



Now, once you have identified the typologies of the variables, you will avoid many planning errors when making your statistical analyzes.

2. The # 2 most common mistake is not being able to visualize and understand your data, which is ultimately essential. Before starting to perform statistical tests, it is important to understand not only what data you have, but also how they behave according to some descriptive techniques.

   Descriptive techniques allow you to visualize graphs and convert your data table, which at first glance does not communicate anything, into understandable numbers and graphs. This stage of the research is called "exploratory data analysis" and it should be noted that it is a very important phase in deciding what type of statistical analysis you are going to use. You will also be able to see broadly, if your hypothesis has enough evidence, if your data has the ideal quality or if you have enough information to verify your study.

   The most used descriptive techniques are:

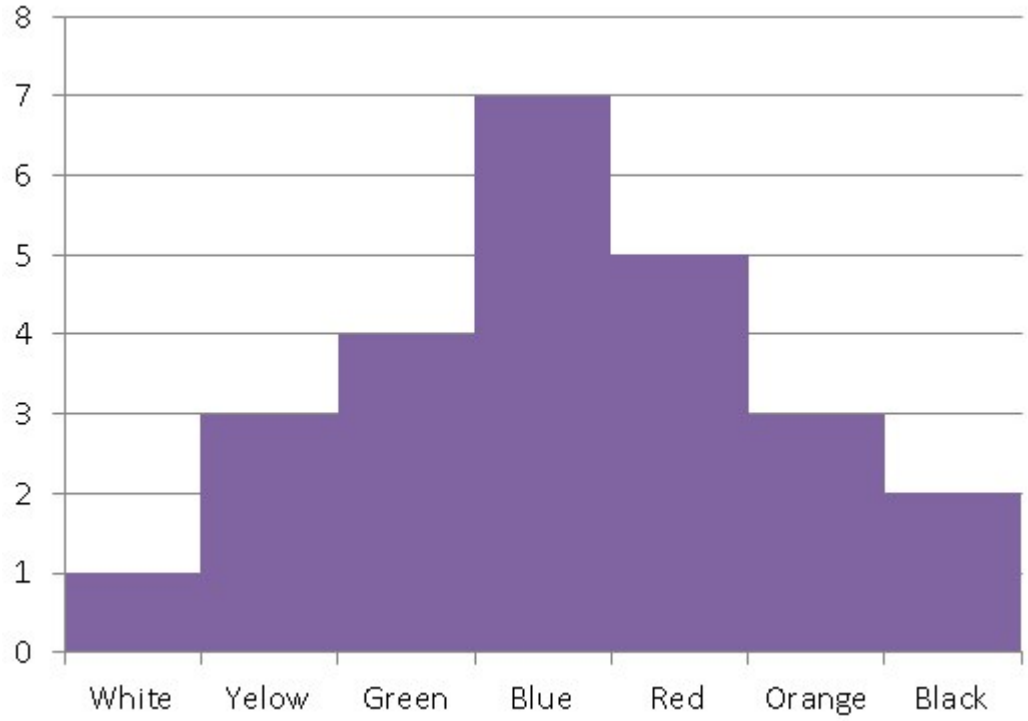
   - The box plot: It is usually used for the purpose of comparing groups of numerical variables.
   - The histogram: It is used to evaluate the distribution of data that have numerical variables.
   - Contingency tables: They are used to compare qualitative or categorical variables.
   - Scatter diagrams: They are used to compare the numerical variables with each other.
   - Numerical summary: Here you enter the standard deviation, the mean, etc. and they are used to be able to mathematically analyze numerical variables.

   To give you an idea of what you can do with these descriptive techniques, once visualized you will be able to answer questions such as: Among the following numerical variables, can we conclude that there is a normal distribution? For this we will use the histogram

   Example: Let's suppose that we ask each of the 25 workers in an office which of these seven colors they prefer and we obtain the following frequency table:

White	1
Yelow	3
Green	4
Blue	7
Red	5
Orange	3
Black	2

With this frequency table, we will build our histogram, where we place the variable (in this case the taste for colors) on the "x" axis and the response frequencies on the "y" axis.



It should be noted that if the data in a histogram are grouped around a central value and the values on the sides of the mean are approximately symmetric, it is said to have a normal distribution.

- Are there differences between the groups of this or that numerical variable, which are in my database? In this case it is best to use the box plot.

Box plot example: In the following table we will show the daily water consumption (ml) of 20 students who are in a class. We will call the minimum consumption (Min), the least amount of water that the student who drinks the least water ingests and the maximum consumption (Max), therefore, will be the one corresponding to the student who ingests the most water daily in that classroom.

William.	1300
Jack.	1450
Oliver.	1600
Ruby.	1650
Olivia.	1650
Joshua.	1700
Chloe.	1750
Thomas.	1800
Emily.	1900
Mia.	1900
John	1900
Amelia	2000
Lachlan.	2100
Cooper.	2100
Lilly	2100
Noah.	2200
Sophie.	2250
Ava	2300
Jacob	2350
Liam	2500

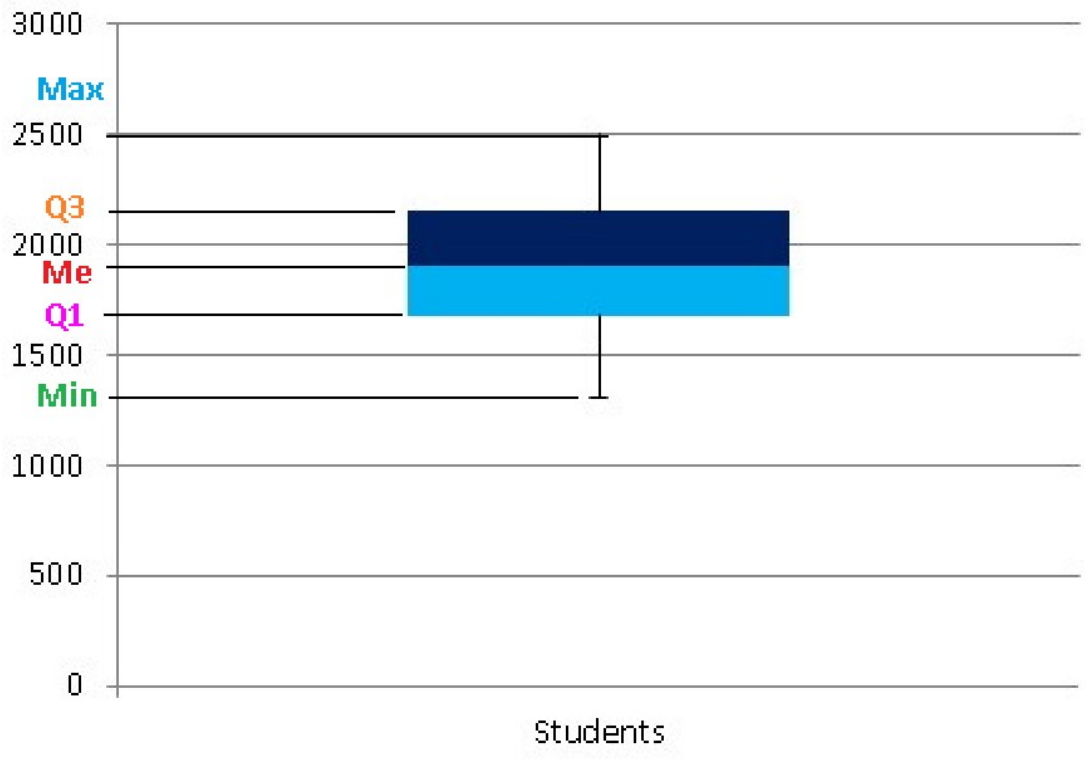
In order to make our box plot, we will divide the data set into quartiles to generate our graph and the quartiles are those values that divide our amount of data into 4 equal parts.

We will call the first quartile Q1 and therefore it is the value that comes from exceeding the data that represents 25% of all the data, that is, if there are 20 students, Q1 would be 20 x 0.25 = 5 (the data that is in the position 5) and is averaged with the following data, therefore the fifth data is 1650 and the sixth is 1700, its average will be:

Q1 = (1650 + 1700) / 2 = 1675 and we would already have our first quartile.

The second quartile is given by the median, which as we saw in the previous article, are the middle terms and in this case both are worth 1900, it is important to take into account that the median is also equivalent to the second quartile (Q2). While the third quartile is the one that represents the data that occupies the positions that constitute 75% of the data, yes, the data must be ordered from lowest to highest.

Q3 is given by 20 x 0.75 = 15, this implies that the data that occupies the fifteenth place are averaged with data number 16, so that Q3 = (2100 + 2200) / 2 = 2150. Now, as we see in the Table the Min = 1300 and the Max = 2500, we can now build our box plot.

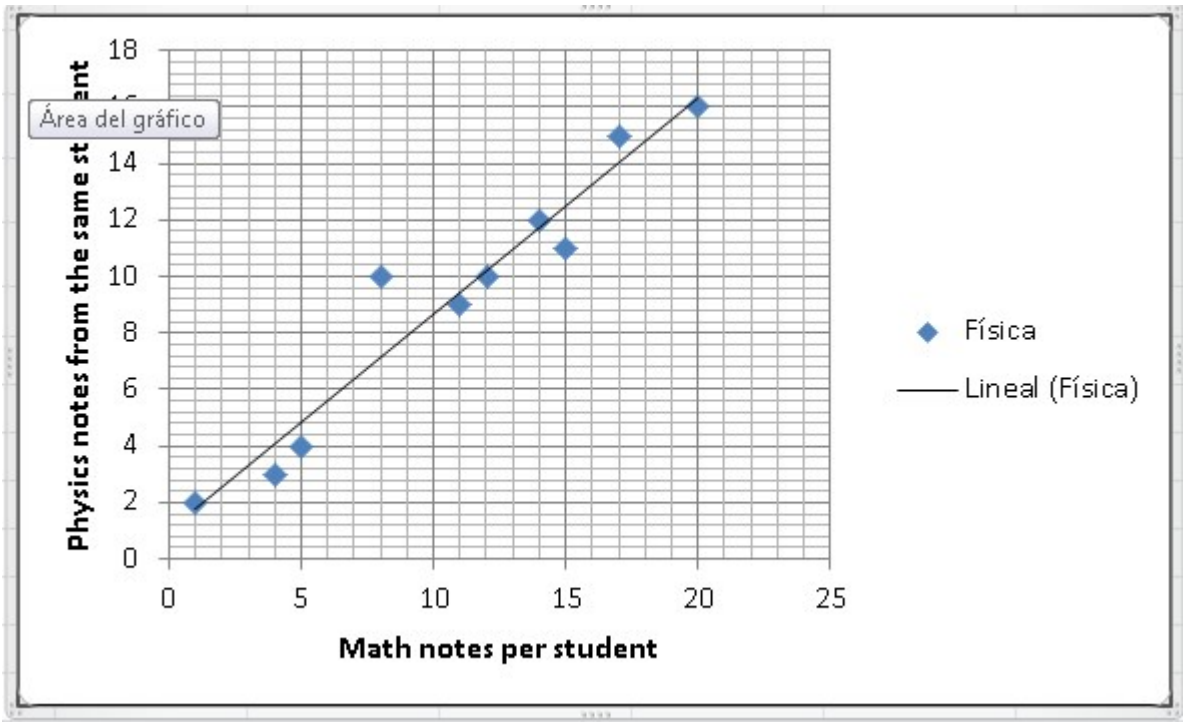


- Which numerical variables are related to each other? To answer this question it will be necessary to use a Scatter Plot.

Example: Suppose we take 10 students in a classroom and we want to know if there is any similarity between their grades in physics and mathematics, that is, if those students who do well in mathematics also do well in physics and vice versa, if those students who tend to do poorly in mathematics also do poorly in physics. Let's see a table with his grades in both subjects:

Matemáticas	Física
1	2
4	3
5	4
8	10
11	9
12	10
14	12
15	11
17	15
20	16

Let's now make a scatter plot:



- Are the groups that I have in my database very different with respect to the different qualitative variables? For this it will be necessary to use a bar diagram or contingency tables. We have already made at least one example of a bar chart, in a previous article.

As you can see, with these tools you can carry out an exploratory study of the information contained in your database and it will not be necessary to use very complicated mathematical analyzes, or statistical tests, to achieve

a rough understanding of where your research is headed. With these statistical contrast techniques, you will be able to know if you need a greater amount of data to be able to verify your hypothesis.

3. The third most common mistake made by researchers when using statistical data is to incorrectly interpret the value of "p" and not understand well what it is to test their hypothesis with the research.

   We will try an example to explain in a simple way what these two concepts consist of. Suppose you wake up one morning with chills, a headache, a heavy body, and a feeling of discomfort. The first thing that comes to mind is to rest and have a hot tea, but after a while, you just don't get better.

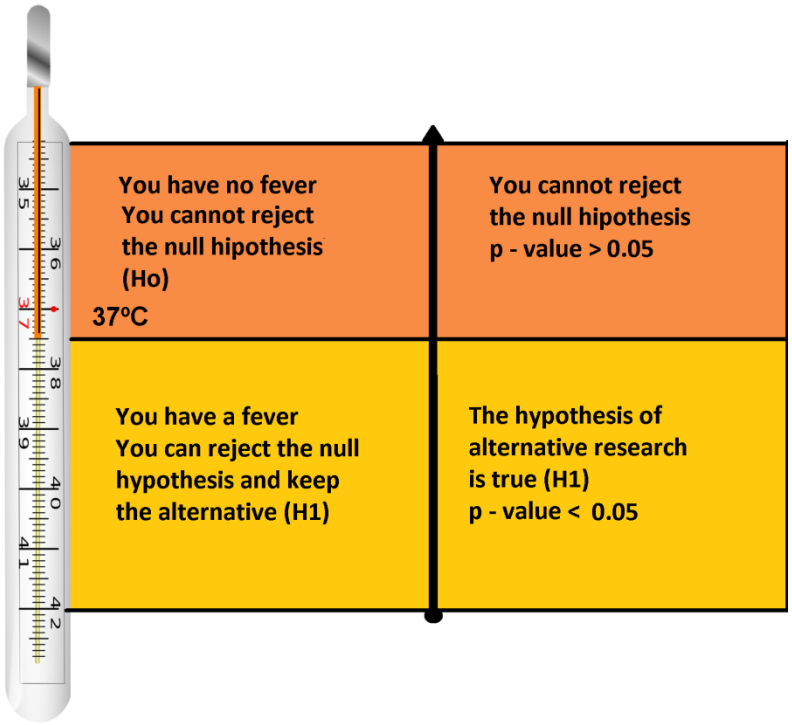
   It occurs to you then that you should take an Acetaminophen pill, since everything indicates that you must have a fever. But since you don't like to self-medicate like crazy, you need to check if you are right, so you go to the thermometer and it effectively tells you that you have 39 ° C. After confirming your assumption of having a fever, you take the Acetaminophen.

   Now, since you have that situation in mind, we can say that by placing the thermometer when you suspect that you may have a fever, it is very similar to testing a hypothesis within a scientific investigation, that is, it can be classified as a small investigation.

   In the same way as in the example mentioned, a study also assumes what is going to happen, a hypothesis that needs to be tested and in this case it is "I have a fever". You must take into account that the research hypothesis is not a frequent state and it is precisely what you are looking for.

   We must also fix the null hypothesis (Ho) which is nothing more than the opposite hypothesis to the alternative (H1) and it is Ho that we consider the most normal state, which in this case is "I have no fever".

   On the other hand, the statistical test to use in this case is the thermometer, which will determine which of the two options is the most likely? Where the mark of the thermometer is what we consider the value of "p".



   If the value of "p" is greater than 0.05, it is not advisable to reject the null hypothesis, which as we established previously is "I do not have a fever", therefore, you cannot assume that you do not have a fever. If, on the other hand, the value of "p" is less than 0.05, the most advisable thing is to reject the null hypothesis (Ho) and accept the alternative (H1), that is, "I have a fever". There is a small margin of error that allows you to leave some effects of chance, although it is true that levels higher than 37 ° C can be considered as fever, no one in their right

mind will think that if they have 37.1 ° C they will have a fever. The same happens when you contrast any type of hypothesis and that is why the value of "p" is a measure of uncertainty, which you can somehow use to regulate small differences that are not significant.

Summarizing, if the value of "p" is very small, that is, p-value <0.05, it can be concluded that the alternative hypothesis H1 is not a consequence of possible random deviations and you can come to accept it as true. In the same way, if the p-value is very large, that is, p-value> 0.05, we can conclude that the levels of chance are very high and you cannot reject the null hypothesis (Ho).

Suppose that the value of "p" is very close to 5%, for example, p = 0.049. The recommendation is that you can continue to maintain your research hypothesis, but yes, doubting the evidence or significance a bit, since You could end up making the mistake of refuting the null hypothesis and therefore conclude that you do not have a fever, which could become true and end up accepting the alternative hypothesis of "I have a fever", which is not true. In a few words, you could end up concluding that you have a fever, when in fact it is not true.

This potential error can be reduced although you can never eliminate it, since statistics is a science based on interpretations and therefore its conclusions will always be surrounded by uncertainty.

We have prepared some very simple steps to follow during the process when testing hypotheses:

- You must formulate both hypotheses, both the hypothesis of your research for anomalous or rare cases, which is the so-called alternative hypothesis (H1) and also the hypothesis for common or normal cases, that the so-called null hypothesis (Ho).
- Externally, you must establish the margin of error capable of rejecting the null hypothesis, this is also known as a Type 1 error and in general, an error of 5% (0.05) is taken for this.
- You must then make a decision, so that if the p-value <0.05, then you can reject the null hypothesis and keep your research hypothesis (H1).
- But if p - value> 0.05 you will not be able to reject the null hypothesis (Ho) and neither will you be able to assume that your research hypothesis has been proven. The only conclusion you must reach is that you cannot reject the null hypothesis, it is important to emphasize that if this situation arises, you do not have enough elements to say that the null hypothesis is true, only that you cannot reject it.

Recommendations:

When the value of "p" is very small, you will be able to accept very firmly that your research hypothesis (H1) has been verified. But if the value of "p" is very close to 0.05, you should not affirm anything at all, so you must be very careful in that case and look for more information to corroborate your hypothesis. You can also assume at that time that with the data you have, the hypothesis of your research may seem true, but that you need a greater number of cases to corroborate it. You must remember that the hypothesis of your investigation (H1) is always the unusual case, while the null hypothesis will always be the most "normal" case. It is necessary to take into account that a very small "p" value does not necessarily imply that it is too important a result, but that the hypothesis of your research may be accepted and that the results you have obtained are not the product of the random. It is therefore advisable never to place the word "important" in relation to the value of "p" in your conclusions.

4. Error # 4 in order of importance that many researchers make is not presenting the value of "p" in an adequate way. We are going to suppose that after carrying out the study you obtain a too small value of "p", being "p" almost zero. As we already know, this is great evidence when it comes to accepting the hypothesis of your research.

   This implies that when writing your conclusions regarding the investigation, it is necessary to take into account some additional tips:

   - When you use a statistical program that gives you an extremely small "p" value, for example, p = 0.000000154 or perhaps you obtain as a result that p = 0.0000, always represent it in your research as p <0.001, since a value of p = 0, it just doesn't exist.
   - On the other hand, it is recommended that you always use absolute values with at least two decimal places and also, when reporting your cutoff value, use the most common, which we already know is 0.05.

Presentation error	Correct presentation mode
p < 0.000000001	p < 0.001
p = 0.000	p < 0.001
p = 0.0000	p < 0.0001
p = 0.0108925	p = 0.011 or p = 0.01
ns (not significant) or p = ns	p = 0.14
p > 0.05	p = 0.28
p < 0.05	p = 0.035

5. The fifth most notable mistake is failing to justify the restrictions that statistical tests have. Before applying any type of statistical test, you must make sure that your data meets the minimum requirements that the test requires, to carry it out.

   We will try to illustrate the above, with an example. We begin by assuming that you want to see if you can improve a certain disease with a new treatment. For this, it will be necessary to use a group of patients to whom the standard treatment is applied, this will be your control group. On the other hand, you will have to use another group of patients in which you will provide the new treatment. It will also be necessary to use an indicator, capable of quantifying the potential effects of each of the drugs applied in each of your groups.

   In this case, you will have the opportunity to use two techniques that are capable of testing your hypothesis within the investigation. You can use a non-parametric test capable of comparing the two groups such as Man Whitney's U or a parametric test such as the student-test.

   You may wonder, what difference could there be between this pair of tests, if the two allow you to contrast the differences that exist between the two groups?

   The parametric test works with known distributions such as the normal distribution, while the non-parametric test does not usually work with known distributions. So that you can get a better idea, we anticipate that parametric tests have a greater strength than non-parametric tests. Not only are they much more powerful, but you can reach much more reliable conclusions, but yes, they are also more restrictive. So your data must meet a series of conditions to be able to carry them out.

   To use the parametric test, you must comply with certain restrictions such as: When you are comparing groups, you must be aware that their variances are equal, in addition, that the data must have a normal distribution and the sample size must not be less than 30 individuals.

   It is advisable that you use the parametric test whenever you can, but without forgetting to argue, how your data manages to overcome the restrictions required by the test you are going to use.

   Many times the data do not meet the minimum restrictions to apply a parametric test, but many scientists still insist on applying this type of test and that is where the error lies. In this case, they should apply non-parametric tests, which although it is true they are less powerful, their restrictions are also less.

   Now, depending on the existing equality of the variances between groups, the normality of the data and the groups or independent variables, we will select the most appropriate statistical test.

   With respect to one of the constraints, it is necessary to know if two groups are independent. Let's start by defining what an independent variable is: It is a characteristic that is usually measured in an experiment or

investigation and is not affected by any other variable. In an investigation, it is precisely the independent variable that the researcher changes, to see how the other variables are affected. That is, an independent variable is a cause, capable of producing an effect.

The dependent variable is the result or effect caused by the change in the independent variable. To clarify a bit, let's go with an example, imagine for a moment that a scientist studies a certain headache medication, headache relief after taking the medication is the dependent variable.

On the other hand, you must take into account that a dependent variable can never change to an independent variable. For example: "A 10 mg dose of the new drug causes immediate headache relief" this makes much more sense than saying "Headache relief can cause a 10 mg dose of the new drug."

In the case of dependent variables, you should use a test for dependent groups. But if the variables are not dependent, it is best to use some test for independent groups.

Researchers also apply tests capable of comparing two independent groups, when it turns out that they are actually related groups. That is why it is absolutely necessary to know the dependence or independence between groups, before applying any type of statistical test.

6. We now come to the sixth mistake mostly made by researchers who use statistics and that is to use linear regression, when it is not always applicable. Although it is true that one of the most widely used statistical analyzes is ultimately linear regression, we must bear in mind that it is not always recommended in all cases.

   This is because a linear regression is nothing more than a model capable of predicting the dependence between two variables, you will use this model to predict the values that you are going to obtain from one variable, based on the values of the other. variable. But one variable must be dependent on the other, otherwise this method is not the most suitable.

   For this we can generate a scatter diagram composed of these two variables and thus create a predictive model, since this type of diagram is capable of comparing two variables with each other and there you will be able to know at first glance if one variable depends on the other. If so, it is convenient to use linear regression.

   One last recommendation is that you should be aware of the units and the precision of the result. When dealing with very large or very small numbers, it is best to work with scientific notation and not with decimals.

26.1 About the Author

Graduated in Mechanical Engineering, and a master's degree in teaching component, I gave classes in several institutes of mathematics and physics, but I also dedicated several years of my life as a television producer, I did the scripts for mikes, the camera direction, editing of video and even the location. Later I was dedicated to SEO writing for a couple of years. I like poetry, chess and dominoes.

CHAPTER

TWENTYSEVEN

CONTINUOUS PROBABILITY DISTRIBUTION

Statistical models have been used in a great variety of situations, for example, to solve specific problems in engineering and in the field of different scientific areas. Currently, statistical models have all a technological and methodological support that help them enormously to adapt much better to the reality they want to model. Statistical models are Platonic and theoretical conceptions that, in some quite generic way, can be conceived as mental constructors with which one aspires to understand and study in a better way, the phenomena in which a certain cause-effect relationship underlies.

Today the concept of statistical models is constantly changing. In the past, the data were those that had to be adjusted or adapted to a specific and existing model, which was generally the Gaussian or normal model, and this model was used in almost all studies. However, at present what is intended is that each data set has its own model and therefore that it obeys the bimodality or asymmetry of the observations.

That is why the processes that involve the analysis of the distributions both in the control and the monitoring field, must be adjusted to the new trends, since these changes will help enormously to understand the phenomenon of study with greater precision.

When we are in the presence of a continuous variable, its probability distribution will also be continuous. If we have a random variable X whose distribution function is given by `f (x) = P (X x)`, this implies that we are in the presence of a continuous probability distribution, where it is true that for every real number "a" the probability will be defined by `P (x = a) = 0`, therefore, for any value of "a" the probability that the variable X takes that value of "a" will be zero. When the distribution of the function is continuous we call X as a continuous random variable in this type of probability distributions, we find the probability distribution as the integral of the density function and we can calculate it as follows:

`f(x) = P( X x ) = _(-∞)^xf(t)dt`

On the other hand, when we refer to a discrete probability distribution, there is no possibility of an event whose probability is zero, whereas that is not the case when we refer to a continuous random variable. To clarify a bit what it is about, let's suppose that we measure the width of the leaf of a tree, it is possible to obtain a result of 3.5 cm, however, the probability is zero in view of the fact that there are infinite values between 3 cm and 4 cm, each of these values having a probability of zero and of course, the probability that this interval has is not zero. To solve this paradox when the variable X acquires a certain value in an infinite set, it simply cannot be calculated through the sum of the probabilities of its individual values.

27.1 Characteristics of the continuous probability distribution

1. The variable can have integer values as well as fractional values: 1; 3.8; 5; 6.3; 7.2; 8, 8.4; 11.3; . . . , etc.
2. The continuous variable generates a continuous probability distribution
3. The probabilities that are associated with each value of x must be equal to or greater than zero, that is, the density function will only take values equal to or greater than zero and can only be defined for quadrants I and II:
4. The sum of all the probabilities associated with each of the values that x can take must be equal to unity. In other words, the area under the curve of the density function must equal 1.

f(x) = P(X x) = _(-∞)^xf(t)dt

Until now we had only considered those discrete probability distributions, where the random variable had a specific value and therefore, the value of the probability function could be assigned to it. But in the case of continuous variables we find a drawback and it is most likely that the data obtained are not totally exact, so that the only way to work with them is through intervals and then model a function, it can become a serious problem.

Although probability can be written by means of theoretical models and make good approximations where the graph is a continuous line, while we can observe that for discrete variables, the way to model them is through a histogram.

We are now going to explain each of the most used distributions in continuous random variables

27.2 Gamma Distribution

The gamma distribution is widely used to model the behaviour of those continuous random variables whose skewness is positive. Therefore, variables of this type have a density of events that are greater on the left of the mean than their graphical representation on the right side. In the expression of the gamma distribution, there are two parameters and that are always positive and that determine the shape and scope of the distribution on the right, the gamma function () is also responsible for the convergence of the distribution.

The first parameter of the distribution () is responsible for locating the maximum intensity of the probability and that is why many authors refer to it as "the shape" of the distribution, it is important to emphasize that when values close to zero are taken, the gamma distribution will be very similar to the exponential distribution, while when () takes larger values, the centre of the distribution is shifted to the right and its shape will resemble a little more the Gaussian bell, whose asymmetry is positive.

Referring now to the second parameter () we can say that it determines the extent of this positive asymmetry and shifts the probability density found in the right tail. When we find very high values of (), at the right end of the tail the distribution accumulates and we will find a higher probability density. This results in the curve lengthening and the probability dispersed in the plane, thus reducing the maximum height of the density. On the other hand, for smaller values of () we can say that the figure will be more concentrated, symmetric and with a higher peak in the probability density.

One of the ways to interpret () is going to be the "average time of occurrence between one event and another", it can be related to the Poisson parameter through = 1 / where is going to be the quotient of occurrence = 1 / . Given the case that () has high values while the values of () are small, we can observe that the gamma function will converge to a normal distribution, where the mean will be: = * and the variance It will be given by:

^2= *^2.

In the case that = 1 and = 0, we can observe that the gamma distribution will be exactly equal to the exponential distribution whose parameter is = 1. However, when there is a proportion between the parameters such that: = v/2 and = v, then we will realize that the random variable will have a Chi square distribution, whose degrees of freedom are equal to v.

When = 1, we are in the presence of a negative exponential distribution whose parameter will be equal to = 1 / .

27.3 Advantages Of Gamma Distribution

This type of distribution is quite flexible when it comes to modeling the shapes that have positive asymmetry, from those that are more pointed and concentrated, to the most accurate and dispersed. We can establish several examples of variables whose behavior can be modeled through the gamma distribution:

1. The number of people involved in traffic accidents in the urban area



2. The space or time required for the observation of X number of events that have a Poisson distribution.
3. The height where the precipitations begin: we can realize that the precipitations begin at a low altitude in a more usual way, than those that begin at a high altitude.



4. How the fibers of the wool are distributed: in this case we can realize that the wool is generally distributed, with a greater quantity of finer fibers than the cases in which the distribution is of few fibers, but thicker.



27.4 Disadvantages Of Gamma Distribution

This distribution can become somewhat difficult to calculate in the case that the parameter is not an integer value and the calculation of the estimation of sample parameters can also be complicated. However, these types of drawbacks can be remedied using computers when performing calculations.

The Gamma function is defined by:

```
() = _0^∞x^(-1) e^(-x)  (24&dx)
```

Since we know in advance that for any density function we must apply:

```
f(x) = _0^∞f(x) dx = 1
```

Actually the integral must be from -∞ to ∞, but in the gamma function only values that are positive or greater than zero are taken into account, so we ignore the part of the integral that goes from -∞ to zero. We must also apply that the sum of the probabilities is always equal to unity and that is why the integral is equal to 1.

This expression is a factorial that ends up extending to the field of complex numbers, but we are not going to extend much in this area. Once we know what the gamma function is and we substitute it in the integral of the density function, when performing the corresponding calculations, we can establish the gamma distribution that we can define as:

```
F(x) = {(1/(^ ))*x^(-1) e^((-x)/) @0;in the other case); if x > 0
```

On the other hand, we are going to establish the expected value of x from the gamma distribution:

```
E (x) =
```

Being the value of the variance:

Var(x) = ^2

Once the fundamental formulas have been defined, we are going to carry out several resolved examples:

Example 1 of gamma distribution: in a city there is a certain company that is responsible for measuring electrical energy consumption in millions of kilowatts per hour, it is also known that energy consumption follows a gamma distribution whose parameters are = 5 and = 8, in addition to being aware that the minimum energy required to supply the city is 1865 kW per hour. It is required to calculate the standard deviation and the mean of the electricity consumption of that city.



It is important to take into account that the mean is the same as the expected value of the gamma distribution and then remember that the formula to find it is:

 = E (x) = = (5) * (8) = 40

However, in order to find the standard deviation we must first calculate the variance, and for this it will be necessary to use the following formula:

Var (x) = ^2 = (5) * 8^2 = 320

Once the variance is found, we can now calculate the standard deviation, since the latter will be equal to the square root of the variance

^2 = Var(x) = (Var(x)) = 320 = 17,89

Example 2 of the gamma distribution: daily energy consumption in a city is measured in millions of kilowatts per hour, if we know that this random variable follows a gamma distribution whose parameters are = 3 and = 2 and we are also aware that the power plant that supplies the city has a capacity to generate a maximum of 12 million kilowatts per hour per day. It is required to know what probability there is that one day the power plant will not be able to meet the demand.



To answer this question, we must first calculate the gamma function, and how we expressed previously, it will end up being a factorial, so we define it as:

() = (- 1)! = (3 - 1)! = 2! = 2

Where the gamma distribution function is stated as:

f(x) = 1/(^ ())*x^(-1) e^((-x)/)

By substituting the values = 3, = 2 and () in the formula we have that:

f(x) = 1/(2^3.2)*x^(3-1) e^((-x)/2)

On the other hand, to know the probability that one day the power plant will not meet the demand, we must use the following formula:

P(x 1) = 1/(2^3.2) _0^1x^2 e^((-x)/2) dx

To calculate this integral, we know that it cannot be done by substitution and that we can use the integral by parts, but we are also aware that for this we would have to integrate three times and the process becomes very cumbersome, so it is best to use the method of integral by tabulation where we will call the first function of the integral as: a (x) = x ^ 2 and the second function of the integral as:

b(x) = e^((-x)/2).

Remember that to use the integral tabulation method we must derive the first function until it becomes zero, while the second function must be integrated up to the same step where the first function becomes zero, then:

	a(x) = x^2 and its derivatives	b(x) = $e^{\frac{-x}{2}}$ and its integrals
Step 1	x^2	$e^{\frac{-x}{2}}$
Step 2	2x	$-2e^{-x/2}$
Step 3	2	$4e^{-x/2}$
Step 4	0	$-8e^{-x/2}$

(+) (-) (+)

```
P(x 1) = 1/16 (-2x^2 e^(-x/2) - 4xe^(-x/2) - 16e^(-x/2))|(1@0) = 1/16-2e^(-x/2)
(x^2+4x+8)|(1@0) =
```

```
P(x 1) =1/16 [- 15,76-(-16)]=1/16 0,2302=0,1438
```

Therefore, the probability that one day the power plant will not be able to satisfy the city's energy demand will be 14.38%.

Example 3 of the gamma distribution: the daily electricity consumption of a certain city, measured in millions of kilowatts per hour, can be considered as a random variable whose distribution is gamma, its parameters being = 3 and = 0.5. It is known that the power plant has a capacity of 10 million kilowatts per hour per day and it is required to know:



1. What is the probability that the supply on any given day is insufficient?
2. What is the probability that the city consumes between 3 and 8 million kilowatts per hour in a day?

3. Find the expected value of the gamma distribution and its variance

Answer to question 1: as we know the probability function of the gamma distribution is found through the following formula:

```
f(x) = 1/(^ ())*x^(-1) e^((-x)/)
```

Many authors use the parameters and instead of and , but as we could see previously, we have a formula that is capable of relating the parameters and , which is: = 1 / , so that we can substitute this relation in the probability formula of the gamma distribution and we obtain the following equation that includes the new parameter:

```
f(x) = ^/(()) x^(-1) e^(-x)
```

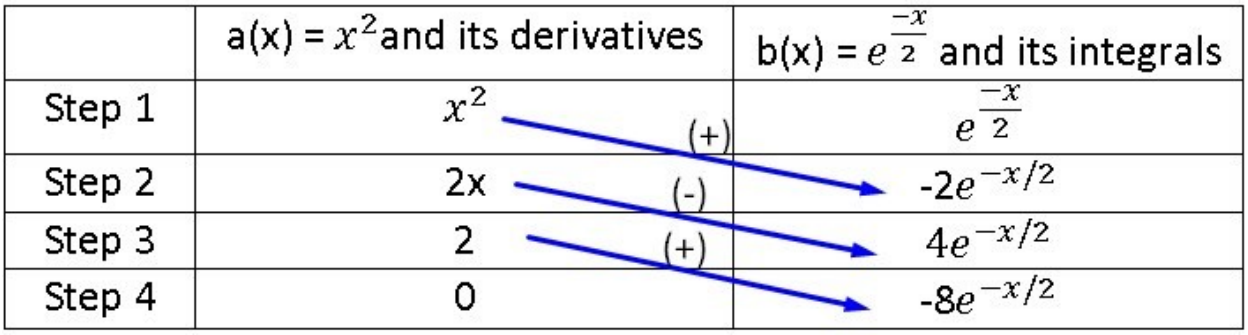
Again the value of the gamma function is:

```
() = ( - 1)! = (3 - 1)! = 2! = 2
```

Substituting = 3 and = 0.5 = 1/2 in the last formula we have that:

```
P(x 10) = 1 - P( x < 10) = 1 - 0,5^3/2 _0^10x^2 e^(-x/2) dx
```

We are going to calculate the probability of the gamma distribution, to solve the integral we are going to use the integral tabulation method again, as we already know, it can also be solved by the part integral method, but it would be more complicated and time consuming to calculate, so Again we are going to establish the first function of the integral as: `a(x) = x^2` and the second function will be: `b(x) = e^(-x/2)`, where for the first step we will place the functions without deriving or integrating, but for the second and the rest of the steps we will derive the first function until reaching zero and we will integrate the second function until the last calculated step of the first function. As we can see, we will obtain exactly the same values as in the previous exercise, so we will use the same image:




```
P(x 10) = 1 - P( x < 10) = 1 - 0,5^3/2 _0^10x^2 e^(-x/2) dx =
```

```
1 - P( x < 10) = 1 - 0,5^3/2(-2x^2 e^(-x/2) - 4xe^(-x/2) - 16e^(-x/2))|(10@0)
```

```
1 - P( x < 10) = 1 - 0,5^3/2 [2e^(-x/2) (x^2+4x+8)]|(10@0) = 0,124652
```

It is important to take into account that the result is not the same, since the integral is evaluated at two different points than those defined in the previous problem and we can reach the conclusion that the probability that the supply is not sufficient on any given day, is 12.46%.

Answer to question 2:

For the answer to the second question the process is very similar, with the difference that this time we are going to evaluate the integral between points 3 and 8, in addition to not having to subtract the probability to unity, so that when calculating the probability of the gamma distribution for this case we have:

```
P( 3 < x < 8) = 0,5^3/2 _3^8x^2 e^(-x/2) dx = 0,5^3/2 [2e^(-x/2) (x^2+4x+8)]|(8@3) = 0,
571
```

This is how we can conclude that there is a 57.1% probability that the city has an electricity consumption between 3 and 8 million kilowatts per hour in a day.

Answer to question 3:

To find the expected value of the gamma distribution and its variance, we will simply have to apply the formulas set out in advance:

```
E (x) =  = 3 .2 = 6
```

```
Var (x) = ^2 = 3. 2^2 = 12
```

27.5 Beta Distribution

The Beta distribution is allowed when we have a continuous random variable that also takes values in the interval (0,1), this makes it quite appropriate when it comes to modeling proportions. For example, in Bayesian inference it is widely used when the observations have a binomial distribution and it is established as an a priori distribution.

One of the major advantages of the Beta distribution is its ability to fit a wide range of empirical distributions, since it is capable of adopting very diverse forms that will depend on the values adopted by the parameters and , which are capable of define the distribution.

A bit of history regarding the Beta distribution

The Beta distribution originated in 1973 by the work of Ballestero and is related to a certain method that was used in the so-called "General Theory of Valuation" proposed by Caballer and Ballestero in 1982. This method managed to be extended to other different types of distributions such as the one proposed by Romero in 1977 called "Triangular and uniform", but also to the trapezoidal distribution of Callejón, Pérez and Ramos during 1996 but which was used by Gómez and García Evangelista in 1999, finally it was extended to the trapezoidal distribution of smithies and Cruz in the year 2000.

One of the advantages of the Beta distribution is that it can be used in the PERT method when adjusting the basic distribution of the method, since it is capable of extending to the subfamilies used in the PERT method of beta distributions, added to the mesocúrtics and of constant variance, which were introduced by Pérez, Herrerías and Callejón in 1999.

Main characteristics of the Beta distribution

1. The Beta distribution varies between 0 x 1
2. It depends on two parameters that are and , where both are greater than zero: > 0 and > 0
3. The density function of the random variable X is represented by: `f(x) {(x^(-1(1-x)^(b-1) )/(B(,))@0 ;in the other case) ; 0 < x < 1`
4. The Beta function is defined by: `B(,)= _0^1x^(-1) (1-x)^(-1) dx = (()())/((+))`
5. The variance and the mean of a Beta distribution are defined by:

```
= /((+ ))
```

```
Var(x) = /((+)^2 (++1))
```

27.6 Beta Distribution Applications

In engineering, project managers often use a method called the Program Evolution and Review Technique, which is abbreviated as PERT. This method is used to coordinate the different activities that are part of a large project, for example, the construction of the Apollo spacecraft launched into space, was one of its most successful applications.



In PERT analysis one of the most common assumptions is to know the time required to carry out any particular activity and once started, it can be considered to have a Beta distribution. In the case that everything goes well it is determined as A = optimistic time and if everything goes wrong it is determined as B = pessimistic time.

In general, the Beta distribution is used to model the variation in the percentage or proportion of any quantity that is present in the different samples. For example, the difference in the proportion of some chemical compound or the difference in the proportion of the number of hours that a certain individual sleeps.

We go with the first resolved exercise of beta distribution: suppose that a brand of televisions is going to require technical service during its first year of operation, if the proportion follows a random variable such as the Beta distribution where its parameters are = 3 and = 2. It is required to know what probability exists that at least 80% of the last models that were sold of this brand during this year, require technical service in this first year of operation.



The probability formula of the Beta distribution is given by:

```
f(x) = 1/(^ ())*x^(-1) e^((-x)/)
```

On the other hand, the Beta function is determined by the following formula:

```
B(,)= _0^1x^(-1) (1-x)^(-1) dx = (()())/((+))
```

If we substitute the Beta function in the distribution formula we have:

```
f(x) = ((+))/(()()) x^(-1) (1-x)^(-1)
```

Substituting the values of the data from the problem in the formula we have:

```
f(x) = ((+))/(()()) x^(-1) (1-x)^(-1) = ((3+2))/((3)(2)) x^(3-1) (1-x)^(2-1) = ((5))/
((3)(2)) x^2 (1-x)
```

As we can see, part of the Beta distribution formula is expressed as a function of gamma and remember that the gamma function is expressed as the factorial: (-1)! so:

```
f(x) = (5-1)!/(3-1)!(2-1)! x^2 (1-x) = 4!/2!1! x^2 (1-x) = 12x^2 (1-x) = 12x^2 - 12x^3
```

```
P(x > 0,8) = 1 - P(X  0,8) = 1 - f(0,8) = 1-_0^0,8(12x^2 - 12x^3)dx
```

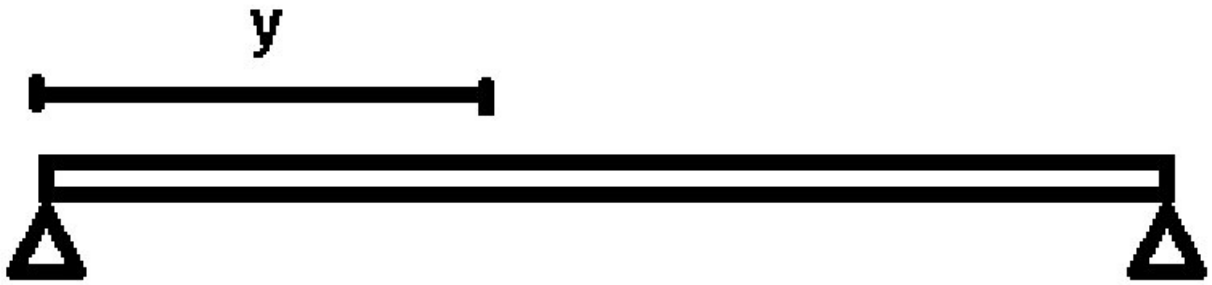
```
P(x > 0,8) = 1 - f(0,8) =1-[_0^0,812x^2  dx - _0^0,812x^3 dx]
```

```
P(x > 0,8) =1 - f(0,8) = ├ 1-((12 x^3)/3 - (12 x^4)/4)| (0,8@0) =1 - ├ (4x^3 - 3x^4 )|
(0,8@0)
```

```
P(x > 0,8) =1 - f(0,8) = 1 - 4( 0,8)^3- 3(0.8)^4 = 1 - 0,8192 = 0,1808
```

So we have an 18.08% probability that at least 80% of the latest models sold of this brand of televisions must enter the technical service during the first year.

Beta distribution example 2: suppose that a stress is applied to a 1 m iron bar, which is fixed at each of its ends, where y = “The distance from the point where the bar breaks to the extreme left expressed in meters ”and we know in advance that“ y ”has a Beta distribution, the expected value and its variance being equivalent to:



E (y) = 1/2 Var (y) = 1/28 y ~ Beta (,)

It is required to find:

1. The parameters of the Beta distribution
2. Calculate the probability that the bar will fragment or break more than 10 cm from where it was expected to break.

Answer to question 1:

Here we must find the parameters and , but we have the data of the mean and the variance, if we write both formulas and set them equal to the data values given in the problem we have:

=E(y)= /((+)) = 1/2

Var(y) = /((+)^2 (++1)) = 1/28

2= + (1)

 = If we substitute (1) in (2) we have:

^2/((2)^2 (2+1)) = 1/28

^2/(4^2 (2+1)) = 1/28 and eliminate the ^2

1/(4(2+1)) = 1/28

4(2+1) = 28

2+1 = 28/4

2+1 = 7

 = (7-1)/2

 = 3

But as we already calculated: = → = 3

Answer to question 2:

To calculate that the bar breaks 10 cm beyond what is expected, we must first calculate what the expected value is, for this we only have to substitute the value of the parameters found in the expected value formula:

E(y) = /((+)) = 3/(3+3) = 3/6= 1/2 = 0,5

Now we are going to calculate the probability that the bar will fracture after 0.5 m + 10 cm, we realize that we must change the units from centimeters to meters, so that the 10 cm will be 0.1 m, so the probability will be from:

```
P (y > 0.5 + 0.1) = P (x > 0.6)
```

In short, this means that we have to calculate the probability that the bar will fracture 0.1 m beyond the place where we expected and that breaking point will be according to the expected value formula at 0.5 m from the extreme left of the bar.

To find the probability we must first calculate the Beta function:

```
f(x) = ((+))/(()()) x^(-1) (1-x)^(-1) = ((3+3))/((3)(3)) x^(3-1) (1-x)^(3-1) = ((6))/
((3)(3)) x^2 (1-x)^2
```

```
f(x) = 5!/2!2! x^2 (1-x)^2 = 30x^2 (1 - x)^2 = 30x^2 ( 1 - 2x + x^2) = 30x^2 - 60x^3+
30x^4
```

Once we have the beta function defined, we are going to calculate the probability:

```
P(x > 0,6) = 1 - P(  0,6) = 1 - f(0,6) = 1 - _0^0,6(30x^2 - 60x^3+ 30x^4 )dx
```

```
1 - f(0,6) = 1 - [30_0^0,6x^2 dx - 60 _0^0,6x^3 + 30_0^0,6x^4 ]
```

```
1 - f(0,6) = 1 - ├ ((30x^3)/3- (60x^4)/4+ (30x^5)/5)| (0,6@0) = 1 - ├ (10x^3-15x^4+6x^5
)| (0,6@0)
```

```
1 - f(0,6) = 1 - (10(0,6)^3-15(0,6)^4+6(0,6)^5)=1- 0,68256 = 0,3174
```

We can conclude then that the probability that the bar breaks 10 cm beyond the expected place is 31.74%.

27.7 About the Author

Graduated in Mechanical Engineering, and a master's degree in teaching component, I gave classes in several institutes of mathematics and physics, but I also dedicated several years of my life as a television producer, I did the scripts for mikes, the camera direction, editing of video and even the location. Later I was dedicated to SEO writing for a couple of years. I like poetry, chess and dominoes.

CHAPTER

TWENTYEIGHT

WHAT IS A CORRELATION?

Correlation is a reciprocal or correspondence relationship between two or more variables. If we refer to statistics and probability, the correlation indicates the direction and strength of a linear relationship, in addition to the existing proportionality between two statistical variables.

If two variables are correlated, this implies that one of them changes in a certain sense and also in a systematic way, when the other variable changes. In short, if we have a variable A and another B, each time A changes in a certain direction, the variable B will change in the same direction and it can be the same direction or the opposite direction. But although it is true that one variable changes with the changes of the other, this does not mean that there is a causal relationship between both variables, since correlation does not mean causality. If it is true that the two vary together, this does not imply that one varies because of the other.

Another of the most common errors is to confuse correlation with regression, although it is true that they are two terms that are highly related, correlation tells us if there is indeed a relationship between two variables, while regression analysis goes a little further and is able to find a model that can predict the value of the dependent variable based on the value acquired by the independent or explanatory variable. What must be done is to know if there is any correlation, and then generate the regression model.

Simple correlation coefficients

Many of us like to quantify and measure, hence the importance of the so-called correlation coefficients, which exist in a more or less numerous way. So to calculate a correlation coefficient, it is necessary to have a parameter that is able to quantify this relationship. The covariance allows us to know the joint variation that exists in two random variables.

But we have a problem when implementing the covariance, since it depends on the scales with which the variables are measured and this prevents us from making direct comparisons between different pairs of variables. That is why we resort to a solution that is standardization, where precisely the standardization of the covariance is carried out through the correlation coefficients.

The value of these correlation coefficients oscillate between 1 and -1, those coefficients whose value are more than zero (0), are those that will have the greatest weight in the relationship. Given the case that these coefficients are positive, the correlation will be in the same direction, that is, if one variable increases the other also increases and vice versa, as it gets closer to 1, the correlation will have more weight or strength and if the value is 1, the correlation will be perfect. Positive correlations are also referred to as direct correlations.

For negative correlation coefficients, both variables will behave similar to that described above, only that the variables will go in the opposite direction, this indicates that as one variable increases, the other decreases and if the coefficient is equal to -1, we will have a perfect correlation, but in the opposite direction.

As the correlation coefficients approach zero (0), they will have less correlation between the variables and if the coefficient is null, we can say that there is no type of correlation between both variables.

On the other hand, the sign that accompanies the correlation coefficient determines another quality between the relationship of both variables, which is the sense. So when the correlation coefficient is positive, we find a direct correlation, that is, when one variable increases, the other variable also increases, in the same sense, in the same way, when one variable decreases, the other variable it also gets smaller.

Now, when the sign is negative in our correlation, it will be the inverse and this is the case when changing one variable, the other will change but in the opposite direction, that is, if one variable increases, the other decreases and if one variable decreases, the other will increase.

So far we have observed two important characteristics of the correlation that exists between two variables, which are the force that a variable has or rather, the weight and also the sense. However, there is a third variable, which is the shape, which will depend on the line to follow in order to decide the best adjustment model. So for this we are going to use the simplest form which is linear correlation, where the line of adjustment is going to be a straight line, but you must be aware, there are other types of adjustments that are not linear.

Pearson's correlation coefficient

Previously we explained that there is a whole range of correlation coefficients that can be calculated depending on the type of variables to be used in the research, but it will also depend on the probability distribution that the population has, from where we are going to obtain our sample.

Karl Pearson was a prominent mathematician who had many advances in mathematical statistics and developed extensive research regarding the application of statistics in biology, becoming the founder of the science called biostatistics.

Among his multiple contributions, he created the correlation coefficient that will later adopt his name, this coefficient is also called the product-moment linear correlation coefficient, which up to now is the most used among all linear correlation coefficients.

As we mentioned earlier, the Pearson correlation coefficient is nothing other than the standardized variance and when used in a population it is represented by the Greek letter "" and is called the Pearson coefficient for a population correlation be aware, there are other types of adjustments that are not linear.

Suppose we have two random variables (X, Y), the population correlation coefficient generated by Pearson, is denoted as (X, Y) and although it is true that there are many ways to calculate it, the equation is:

$$\rho_{X,Y} = \frac{\sigma\, XY}{\sigma X\, \sigma Y} = \frac{Cov\,(X,Y)}{\sqrt{Var\,(X) Var\,(Y)}}$$

In simple correlation, the covariance is found in the numerator and is divided by the product of both variances, with their respective root, in the denominator.

It is important to take into account that in order to use this population correlation coefficient, the two variables must be quantitative, but they must also have a normal distribution in the population, be linearly correlated and finally comply with the homoscedasticity assumption. In a nutshell, homoscedasticity means that the variance of our variable Y must remain constant throughout the variable X. To check this in a simple way, we must graph the scatter diagram and observe if the values are similarly dispersed. to the values of our variable X.

It must be taken into account that the presence of extreme values can bias the value of the population correlation coefficient.

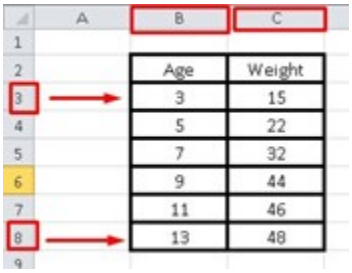
Before seeing the following correlation coefficient, we must remember the difference that exists between parametric and non-parametric statistics, in the first we have knowledge of the probability distribution, while in the non-parametric the distribution of the intended variable is unknown investigate.

Let's go with a simple example of two variables, suppose we have six children of different ages (3, 5, 7, 9, 11 and 13 years old) and we have information about their weight (15, 22, 32, 44, 46 and 48 kg respectively), we want to make a linear correlation between both variables, in order to find out the approximate weight of another 6 year old child, since we do not know that data.

We go to Excel and place the data in a couple of columns:

Age	Weight
3	15
5	22
7	32
9	44
11	46
13	48

Excel has a function that gives us the correlation coefficient directly, for this we must choose the cell where we want the result to appear where we will place the following command: = CORREL (here we will choose all the data of the first variable Age without including the name; we will choose all the data from the second variable):



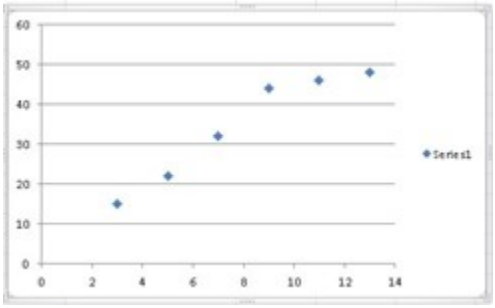
The instruction in Excel will be as follows: = CORREL (B3: B8; C3: C8)

For this case, the platform gives us a correlation coefficient:

Correlation coefficient
0,966853598

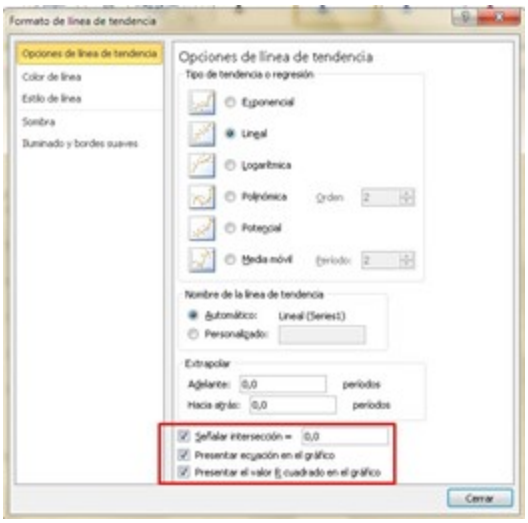
As we can see, it is a coefficient very close to 1, so the correlation between the two variables is very strong and that tells us that when the age variable increases, the weight variable increases, so we conclude that it is a direct correlation In any case, we are going to graph both variables to reinforce this conclusion.

To do this, it will be necessary to go to the top and choose the “Insert” tab, then choose “Dispersion” and take the first option which is “Dispersion only with markers”, a series of points will appear in an ascending and very close way each other, this implies a strong correlation between both variables.

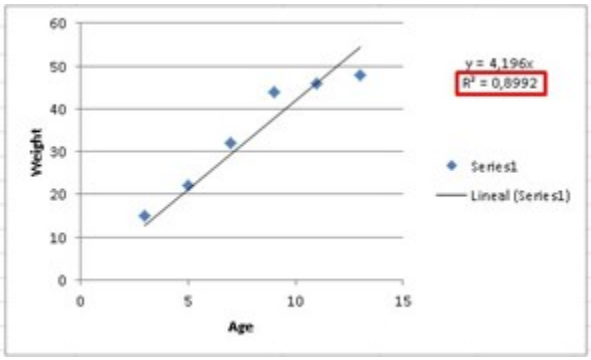


If we had a scatter plot with points far apart from each other, this would be an indication of a low correlation between both variables.

If we place the mouse pointer over any of the points and click on the right button of the mouse, a display will appear where one of its options is “Add trend line” that will open a new window, where it is advisable to mark the last three boxes corresponding to: “Indicate intersection”, “Present equation on the graph” and “Present the R-squared value on the graph”.

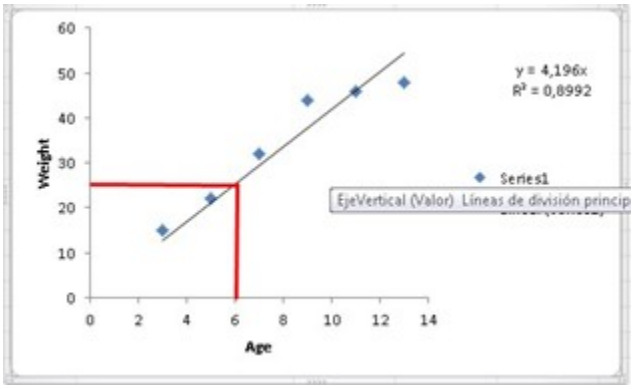


R is our correlation coefficient, but as we see in the graph it is squared, if we solve for R, we will have to take the square root of 0.8992 and we will obtain the same correlation coefficient that Excel gave us at the beginning, that is:



R = 0.966853598

Now, remember the question of how much a six year old should weigh? We can find out the answer through a graph, since if we draw a vertical line on the age axis until the function cuts and from that point we draw another horizontal line until it cuts the weight axis, we will realize that the child six year olds will weigh approximately 25 kilos.



The other way to answer this question, and in a much more exact way, is, if we look at the graph we obtain the function of the line which is:

y = 4.196 x

It is enough to substitute the age of 6 years in the variable x to obtain the weight (our variable y).

y = 4,196 x 6 = 25,176 Kg.

Spearman's correlation coefficient

There is another correlation coefficient, which is equivalent but not parametric to Pearson's coefficient. This coefficient does not use direct data for its calculation as occurs with other types of non-parametric techniques, but rather uses its transformation by ranges.

So they can be used when the variables are quantitative or ordinal, but they do not meet the normality distribution. However, at the time of its interpretation it is very similar to the other correlation coefficients and its condition of being calculated by ranges, ultimately makes it less sensitive to extreme values than the Pearson coefficient.

Another advantage over the Pearson coefficient is that it only makes the correlation between both variables monotonous, in other words, when one variable increases the other variable also increases and in the same way it happens when they decrease.

This allows the use of Spearman's correlation not only when there is a linear relationship, but also in those cases when the relationship is exponential or logistic.

Spearman's correlation coefficient is given by the following formula:

$$R_s = 1 - \frac{6 \sum d^2}{n\,(n^2 - 1)}$$

Where d is the difference between the range (x) and the range (y) and n is the number of observations. We now go with an example to illustrate the Spearman correlation coefficient: A researcher assumes that the performance of medical students could be similar in related subjects. To test his theory, he applied two tests to a group of 10 students. An examination of anatomy and the other of embryology, to calculate their performance in both subjects and find out if students with high scores in one subject also achieved high scores in the other and vice versa, if students obtained low scores in embryology, from the they would also have low scores in anatomy.

The data obtained by the researcher from the grades of each student is presented below:

Pupil	Anatomy	Embryology
1	65	74
2	72	61
3	75	69
4	82	90
5	50	51
6	95	79
7	87	95
8	53	52
9	83	77
10	64	63

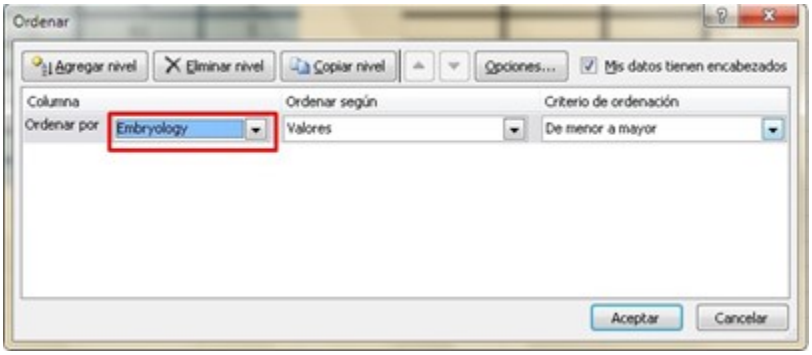
The students' grades do not present a normal distribution, that is why we must use Spearman's correlation coefficient and we cannot use Pearson's.

The first thing to do is order the data in the anatomy notes from smallest to largest. For this we must select both columns, so that the data does not lose its correspondence of ordered pairs, then we go at the top to "Data" and then select "Order" a window will open where we must choose the variable "Anatomy! and choose to order from least to greatest, they will be ordered in that way, but only the first column, since the second corresponds to the marks of the same student but for embryology and they do not have to coincide exactly in the order from least to greatest, since They are ordered by student and are ordered pairs that accompany each other.

Pupil	Anatomy	Embryology	Rank (x)
1	50	51	1
2	53	52	2
3	64	63	3
4	65	74	4
5	72	61	5
6	75	69	6
7	82	90	7
8	83	77	8
9	87	95	9
10	95	79	10

Now we are going to give an order to the range (x), for this we will assign numbers from 1 to 10. Given the case that two students have obtained the same grade in anatomy, when assigning the values in the range x we must place it at each student the average number. To clarify this issue a little more, if the student that we have initially assigned rank 3 and the next student (4) have the same grade, both will be left with rank 3.5.

The next step is to choose the three columns, that is, all the data from the anatomy notes, the embryology notes and the range x, but not including the cells where the names of the variables are found, only the data. To then repeat the previous procedure, from lowest to highest, but this time we are going to organize the column that contains the data from the embryology notes. Again we go to "Data" → "Order" and a window opens where we choose the variable we want to order (Embryology).



As we can see, the Embryology notes are the only ones that will be ordered from lowest to highest and both the anatomy notes and the x range have changed the order of their values because they continue to accompany their corresponding Embryology variable, since the rows always maintain the same order.

Pupil	Anatomy	Embryology	Rank (x)
1	50	51	1
2	53	52	2
3	72	61	5
4	64	63	3
5	75	69	6
6	65	74	4
7	83	77	8
8	95	79	10
9	82	90	7
10	87	95	9

Now, as the embryology notes were already ordered from lowest to highest, we can assign the values from 1 to 10 in the range (y) and both variables will already be ordered with their respective correspondence from lowest to highest.

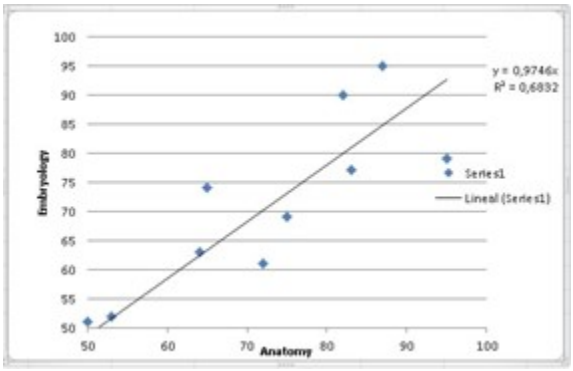
Then I calculate the column d that corresponds to the difference between the range (x) and the range (y), later I square those data to obtain the numbers that will make up the column d2 and finally added the data from d2 to get the sum of d2 what I need to plug into Spearman's formula.

Pupil	Anatomy	Embryology	Rank (x)	Rank (y)	d	d^2
1	50	51	1	1	0	0
2	53	52	2	2	0	0
3	72	61	5	3	2	4
4	64	63	3	4	-1	1
5	75	69	6	5	1	1
6	65	74	4	6	-2	4
7	83	77	8	7	1	1
8	95	79	10	8	2	4
9	82	90	7	9	-2	4
10	87	95	9	10	-1	1
					Sum	20
					n	10
					Spearman correlation	0,878787879

As we already know the number of students is 10 and therefore, that will be the value of n, we will choose a cell to obtain the result of the formula, which for this case will be as follows:

$$R_s = 1 - \frac{6 \sum d^2}{n\,(n^2-1)} = 1 - \frac{6*20}{10(10^2-1)} = 0{,}878787879$$

The result obtained in the Spearman correlation coefficient indicates that the relationship is direct and we can also notice it in the graph:



This indicates that the researcher was able to find a strong correlation between the grades obtained in anatomy and those of embryology, if they notice it, the correlation coefficient is close to 1, therefore, it can be said that the researcher's theory gains strength when he proposed that those students who are good at anatomy are also good at embryology and vice versa.

Kendall's tau coefficient

This is another coefficient that also uses the range of the variable, being better known as the Kendall coefficient, in addition to being non-parametric, it is also another alternative to the Pearson coefficient in those cases where the assumption of normality is not fulfilled. It is even more recommended than the Spearman coefficient, when the population sample is very small and has data that occupy the same position or rather, have the same value.

Kendall's correlation coefficient is ranged and used to study ordinal variables. The variables are distributed by categories and have several levels that, in turn, have an order.

It is widely used in the branch of social sciences, since it can be used in populations that do not have a normal distribution. Since this indicator is based on ranges and not on the original data, it is required that each of the values that

make up the ordinal variable be transformed into ranges.

The Kendall coefficient is little affected by a small number of extreme or outliers and adapts very well to those variables that behave in a moderate way with respect to skewness, that is, they are not exactly linear.

In this coefficient we can observe two types of variants:

1.- Kendall's partial correlation coefficient: this variant is used for those relationships between two variables, but in which a third variable also intervenes in their explanation. For example, the variable height in children and numerical ability can be said to have a strong correlation, since both are related to a third variable which is age, it is obvious that an adolescent will have greater numerical ability than a child small, of course, have different heights and both variables are related to age.

2.- Kendall's concordance coefficient: in the previous cases, such as the rank coefficient and the partial correlation coefficient, they are used exclusively for the relationship between two variables, however, this coefficient is capable of measuring the correlation that it exists between "n" associated variables.

What conditions are required for its application:

- Can only be used starting from square boards
- The variables that allow for their use are of the interval, ordinal or ratio type.
- Your results are always between the values 1 and -1.
- As we said before, this coefficient is used in those variables that do not have a normal population distribution, therefore when we want to determine the degree of correlation that may exist between two quantitative variables that do not follow normal behavior, this alternative is one of the more viable.

Procedure to apply this correlation coefficient:

It is important to take into account that there are two different formulas, the first one that we are going to explain can only be used in those variables that are all different from each other, that is, none of them is repeated. While the second formula is intended for those variables made up of some equal elements.

The formula that explains the Kendall correlation for those variables that do not repeat is:

$$\tau = \frac{S}{\frac{1}{2}n(n-1)}$$

As we can see, Kendall's correlation coefficient is denoted by the Greek letter Tau ().

As on other occasions, "n" is the number of pairs of variables that make up our sample.

To calculate , the following steps must be followed:

1.- Values will be assigned to the range (x) starting from 1 to n that will be anchored as a new ordered pair to accompany the independent variable (x) and that in turn, will have their corresponding value in the dependent variable (y).

2.- The values of the variable (x) are ordered from lowest to highest and both the variable (y) and the range (x) will move together with the variable (x), without losing the initial accompaniment order, that is that is, they will maintain their anchor by holding on to their corresponding value of x.

3.- To calculate the value of S we must know the difference between the concordant and the discordant data. We are going to obtain the concordant data by comparing the data that are greater than "y" and that are in the cells subsequent to the value of "y" that we are considering at that moment. While the discordant ones will be those values less than the value of "y" that are found in subsequent cells, therefore, once we have found the discordant or concordant values of the first value of "y", it will no longer be more taken into account, and we will proceed to evaluate the next value of "y" that is in the cell below, regardless of the cells that are above the value we are considering. That is, the cells above are no longer compared, only those below the value of "y" that we are evaluating.

4.- As we have already been able to calculate S and n is simply our number of observations, we can now apply the formula, either for when all the values of x are different or the formula for when there are some equal data.

Let's go with an example for the first case, that is, when all the values of x are different from each other.

A researcher wants to verify that stress levels have a direct impact on job performance, through reliable indicators he was able to measure both variables in 9 workers of a certain company and obtained the following data:

Stress level (x)	Labor performance (y)
2	8
6	1
4	7
8	6
10	2
1	9
3	3
9	5
5	4

If we follow the recommended steps for the calculation, the first thing we must do is assign consecutive values from 1 to 9, to make up the range of our independent variable x (stress level).

Stress level (x)	Labor performance (y)	Rank (x)
2	8	1
6	1	2
4	7	3
8	6	4
10	2	5
1	9	6
3	3	7
9	5	8
5	4	9

Then we must order the values of our independent variable (x), from lowest to highest and for this we choose all the values of our three columns: the one with the stress level, the work performance data and the range (x) and we We go in Excel to the "Data" tab, we click on "Sort" and a window will open where we must choose the stress level, in order to choose that the values are ordered from lowest to highest in that same window.



How can we tell, both the dependent variable (y) and the range (x) were out of order, since both values always accompany the independent variable (x).

In other words, if we look at the initial table of values where we assign the range (x) and compare it with this last table, we will realize that the rows remain intact, only that they have a new order governed by the variable (x).

We are now going to calculate S, for this we must compare our values of "y" to see which of the subsequent values (below it) that are in the same column, are greater or less than that value. Those that are greater than the value of "y" that we are considering at that moment, will be our concordant data, while those less than "y" will be our discordant data.

To better clarify what has been said above, we will make a table with each value of "y" to compare it with the values of the lower cells, discarding the values of the upper cells.

For example, if we take the first value which is 9, the next value in the bottom cell is 8 and since 8 <9 it is a discordant value; the next value is 3 <9 which implies that it is also discordant. The same for the one that follows and the rest of the other values, so below 9 we will have 8 discordant values and no matching values.

In the same way we will carry out this action with the next lower value which is 8 and we will compare it with the rest of the values of the lower cells and discarding the first value (9), because we will not take into account the cells higher than the number we are considering , in this way we will observe that all subsequent values are also less than 8, so we will have 7 discordant values and none concordant.

The next value less than 8 is 3, so we will repeat the previous procedure and we realize that in the lower cells both 1 and 2 are less, so we will have 2 discordant values, while the rest of the values (7 , 4, 6 and 5) are greater than 3, so the number of concordant values is 4, if we continue like this with the rest of the values (one by one) we can make a table of concordant and discordant values for each value of "And" being as follows:

Labor performance (y)	greater values or Concordant	lower values or Discordant
9	0	8
8	0	7
3	4	2
7	0	5
4	2	2
1	3	0
6	0	2
5	0	1
2	0	0
Sum	9	27
	S	-18

To calculate the value of S, we will simply have to add all the concordant values and all the discordant values, and then subtract the sum of the concordant values minus the discordant ones:

$$\sum Concordantes = 9$$

$$\sum Discordantes = 27$$

$$S = 9 - 27 = -18$$

Now we can apply the formula for when all the data is different:

$$\tau = \frac{s}{\frac{1}{2}n(n-1)} = \frac{-18}{\frac{1}{2}\,9\,(9-1)} = -0{,}5$$

Kendall's correlation coefficient is interpreted in the same way as Pearson's, so a coefficient of -0.5 indicates that the variables have a median and inverse correlation, we say that it is a median correlation because it is in a equidistant point between 0 and -1. If the coefficient were closer to -1, the inverse correlation between the two variables would be much higher, while if it were closer to 0, the correlation would be weaker between both variables.

Now, the correlation is inverse because it is negative and this implies that as one variable increases, the other decreases. Of course, it is reasonable to think that as stress rises, work performance decreases.

28.1 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

TWENTYNINE

1 MATHEMATICAL CURIOSITIES

29.1 1) Kaprekar's constant is a mysterious number

This constant is named after an Indian-born mathematician named Dattatreya Ramachandra kaprekar, who discovered the wonders of the number 6174 and presented it in Madras in 1949, specifically at the Mathematics Conference that was held in this Indian city. Kaprekar was dedicated to recreational mathematics and made several contributions in this regard, not only with this constant, but also with self-numbers, Karshad numbers, and Kaprekar numbers.

Let's now play with this constant 6174:

- Choose any four-digit number, for example, 2431
- Now you must order their figures in descending order, if we do it with the previous example we would have: 4321
- Then order the same number, but this time in ascending order and in our case it will be: 1234
- Subtract the largest number from the smallest: 4321 - 1234 = 3087
- You must repeat the previous steps with the new number, first we order it in descending order: 8730
- Ascending: 0378
- We subtract them: 8730 - 378 = 8352
- We repeat the operation with the last result
- 8532 - 2358 = 6174

Believe it or not, whenever we apply this method we will end up reaching the same number 6174. You can even loop with different numbers and you will always reach the same result, with certain exceptions. For example, when you have four equal digit numbers: 2222, since as you can see, when subtracting both numbers, its result will always be the number zero. It also does not work with four digits, when three of them are the same number, unless you add zeros to the largest number to the right, let's go with an example: 2223, when ordering it in descending order we have the number: 3222, then it We subtract from the previous one, which as you will notice is already ordered in ascending order: 3222 - 2223 = 999

This is when we must add a zero to obtain the number greater than four digits and repeat the operation: 0999, ordered in descending order: 9990 and remainder the previous number 9990 - 0999 = 8991 9981 - 1899 = 8082 8820 - 0288 = 8532 8532 - 2358 = 6174

It is important to take into account that all those numbers that come from subtraction, in addition to those numbers ordered in descending and ascending order, are divisible by 9.

29.2 2) Where does the sexagesimal system come from?

As we can see, a minute is the equivalent of 60 seconds and this explanation dates back thousands of years of history. This system comes from our hands, since more than 2,000 years ago, this system was used based on 60 and what we know as the sexagesimal system.

The origin of this system arises from counting with the thumb each phalanx of the fingers of the right hand, if you notice, each finger is subdivided into three phalanges and if you count them with the thumb, the count is: 3 x 4 = 12. Of course, the thumb is only used to count each of the three parts of each finger. However, until now we only have a dozen and if you look closely, that is why many of our products come in dozens, for example, the eggs that we buy in the market.



Now, if every time you count each of the phalanges of your right hand until you complete them all, you lift a finger of the left hand, you can have 12 phalanges five times, that is, 12 x 5 = 60, this is when we arrive to the number used so many times since that time, to the present day.



On the other hand, the number 60 also has many divisor numbers: 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 and 60.

As you can see, it is from there that our minutes are divided into 60 seconds and at the same time, that an hour is equivalent to 60 minutes. But also the sexagesimal system is the basis of astronomy, for the same reasons. Angles can even be measured in degrees, minutes, and seconds.

It is no secret to anyone that the circle is divided into 360 ° which is a multiple of 60 and is also closely linked to the lunar cycle. The year is made up of 12 months and you can get multiple examples, where we currently use this system.

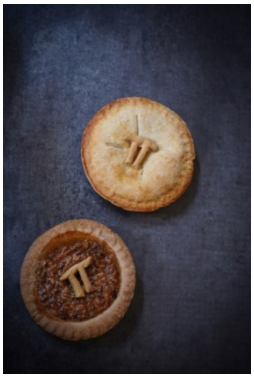
29.3 3) Some mathematical tips that may interest you

- Until the 16th century, multiplications were only taught in universities, because they were considered extremely difficult.
- The equality symbol (=) was invented by Robert Recorde more than 400 years ago, since “two things cannot be more equal than two parallel lines”.
- Negative numbers began to be used in the 7th century, specifically in India, to represent debts. However, it was not until the 18th century that negative numbers were universally accepted.
- The solution of equations of the first and second degree dates back to the third century.
- Lewis Carroll the author of “Alice in Wonderland” was a mathematician and this work is loaded with mathemat-



ical symbolic logic.

- In 1939, a certain graduate student was late for his statistics class at the University of Berkeley. In his rush, he saw two problems on the board and copied them, thinking they were homework, handed them over to his teacher a few days later and apologized for the delay, because they had seemed more difficult than usual. The funny thing is that the student had solved two famous theorems, which until that moment no one had been able to verify.
- The binary system used today for computer programming was invented by Gottfried W. Leibnitz more than 300 years ago.
- The decimal system comes from the number of fingers we have on our hands.
- Geometry originated in Babylon and ancient Egypt, to develop other sciences and be able to make the measurements they needed in construction.
- The day of Pi was created in honor of the widely used mathematical expression (3.1415826). To choose the day, the North American date format (month, day) was used, so that it is celebrated every year on March 14 and to be

more exact, specifically at 1:59 a.m. 

- Although there are very strange elements in mathematics, they can become useful at the least expected moment. For example, quaternions were discovered in 1843 and are currently used to describe how objects rotate in 3-D. While it is true they were considered very beautiful, but also useless, it was not until 1985 that scientists applied them in digital animation.

CHAPTER

THIRTY

9 DETERMINATION COEFFICIENT

The coefficient of determination is that part of the variance that can be explained through linear regression. Its nomenclature is R2 and its purpose is to be able to reflect how much a model fits to the dependent variable or to which it is intended to explain. To find the coefficient of determination we must use the following formula:

$$R^2 = 1 - \frac{Varianza\ Residual}{Varianza}$$

Substituting the values we have:

$$R^2 = \frac{\sum_{i=1}^{N} (\hat{y}_i - \bar{y})^2}{\sum_{i=1}^{N} (y_i - \bar{y})^2}$$

We are going to analyze the formula of the coefficient of determination, the first thing is to realize that the numerator is very similar to the formula of the variance, but as we can see there are two important differences. The first is that the "y" has a circumflex (y) which is that kind of little hat that is at the top. This means that the variable is not exactly its real value, but an estimate of "y". The second difference is that the N (which represents the number of observations) is missing in the denominator. This is because in the denominator of the determination coefficient we also have another variance, whose formula also includes the value of N, therefore, both cancel to simplify the expression. Another important aspect of the coefficient of determination is that its values range between 0 and 1, as this coefficient gets closer to 1 it indicates that it will fit more closely to the model of the variable that we are trying to explain. Conversely, as the coefficient of determination gets closer to zero (0), the model will be less fit and therefore less reliable. Let's suppose that we want to relate the number of goals that a certain soccer player makes to the number of games he plays. Of course, the more games he plays, the more goals he scores.



As this is a simple explanatory example, we are going to ignore the sample data and the calculations that led us to know the coefficient of determination, which in this case is R2 = 0.835. With this result we can realize that the relationship is positive, so how we assumed at the beginning, the more games played, the more goals he will score for this season. On the other hand, since the coefficient is much closer to 1 than to 0, since it is equal to 0.835. This indicates that it is a model that adjusts very well to reality and also that it is capable of explaining it with an 83.5% adjustment to the real variable. It is important to emphasize that the determination coefficient has a problem, since it is not capable of penalizing the inclusion of non-significant variables. For example, if the model includes 4 explanatory variables that actually have a poor relationship with respect to the goals scored by the soccer player in a season, the R2 will increase according to the number of variables. This is counterproductive, since we are including variables that bear very little relation to the model, but their very existence directly influences the coefficient of determination. That is why many mathematicians and statisticians oppose R2 as a truly representative measure of the real fit. Hence the need to generate a coefficient that better adheres to reality, which is what we call the adjusted coefficient of determination. This adjusted coefficient of determination (adjusted R2) is capable of measuring the percentage of the variance of the regression, with respect to the variance of the dependent variable. This adjusted coefficient of determination is very similar to R2 but it has a certain difference and that is that it penalizes the inclusion of independent variables, which have very little influence on the dependent variable. As we said before, the coefficient of determination increases even though the variables we use are not relevant and this is a problem, so to try to solve it, the adjusted R2 is created and its formula is:

$$\bar{R}^2 = 1 - \frac{N-1}{N-k-1}(1 - R^2)$$

Where R2 is the coefficient of determination, N is the number of observations in our sample and k represents the number of explanatory variables. By mathematical deduction, the higher the k values, the greater the difference between the adjusted coefficient of determination and the normal coefficient of determination. On the contrary, the lower the value of k, the closer the central fraction of value 1 will be and therefore, the more similar both coefficients of determination. Since k is the number of explanatory variables, we know that at least this value must be 1, since we must explain at least one variable as a function of the other and therefore, the adjusted coefficient of determination and the normal coefficient of determination cannot have the same value. In fact, the adjusted R2 will always be less than the normal R2. Let's go with an example, suppose that a researcher wants to calculate how much the heating cost can be and proposes that this cost will depend on the external temperature, the insulation of the walls and the age of the heater.



To check how much relationship all these variables have, the researcher makes the pertinent measurements and obtains samples from different rooms, obtaining the following data:

Heating cost ($)	Average external temperature (°F)	Isolation from environment (cm)	Heater age (years)
250	35	3	6
360	29	4	10
165	36	7	3
43	60	6	9
92	65	5	6
200	30	5	5
355	10	6	7
290	7	10	10
230	21	9	11
120	55	2	5
73	54	12	4
205	48	5	1
400	20	5	15
320	39	4	7
72	60	8	6
272	20	5	8
94	58	7	3
190	40	8	11
235	27	9	8
139	30	7	5

We are going to enter these data in Excel and we are going to analyze them to be able to find the values that help us to carry out the regression or the model that is capable of explaining the variable that concerns us, which in this case is the cost that we must pay for it heating service. To perform the data analysis in our Excel we must have the option activated, the way to do it is by going to "File" → "Options" → "Add-ins" → At the bottom of the window is "Manage" where in the arrow that opens the display you must choose "Excel Add-ins" and then click "Go". There again another box opens and we must check the box "Tools for analysis" and finally accept. To be sure, you should go to "Data" at the top and see if the "Data analysis" option appears on the right, if so, you have already activated the tool you need. We are then going to proceed with the "Data analysis" when pressing that option, a window opens with a display that contains the functions for analysis and you must choose "Regression" and then accept, this takes you to another window where in the "Range And from the start" you must choose the entire column that contains the data for your independent variable, which, as you already know, in this case is the cost of heating. Later, you will choose the "Input X Range" and for this you must choose all the data found in columns X1, X2 and X3, since the explained variable depends on it. Finally, you must choose an Output range and check this option, you will position yourself on the adjoining box and choose the cell where you want the analysis to appear, and then accept. Excel will automatically give you a summary with the required calculations, the first thing we are going to do is look for the coefficients that will lead me to carry out the linear regression model, which in the summary will be the following:

	Coeficientes
Intercepción	427,194
Variable X 1	-4,583
Variable X 2	-14,831
Variable X 3	6,101

With them we are going to generate the model that simulates how the cost of heating depends on the rest of the variables: y = 427,194 - 4,583X1 - 14,831X2 + 6,101X3 Where X1 = The external temperature in ºF X2 = The insulation of the enclosure in centimeters X3 = The years of use that the heater has Although it is true that the summary also reflects the coefficient of determination and also the adjusted R2, in the same way we are interested in understanding what each of the elements that make up its formulas means. When we refer to the estimation of the explained variable (y), It is simply to substitute each one of the data corresponding to X1, X2 and X3 in the linear regression model, in this way we obtain each of the and (y _i) we require for the formulas. To do this, we must go to Excel and generate a new column with the values of the coefficients and the data for each of the rows. In our case, the instruction would be:

= H18 + H19 *B2* + *H20* C2 + H21 * D2.

It is important to note that before and after the letter that defines the column of the cells that correspond to the value of the coefficients, the symbol of ($) must be placed, since these data are constant for all observations and is the way that Excel has to freeze the value, when dragging the command to the last row. The values for the estimation of “y” will be the following:

$\hat{y}$
258,9142
295,9835
176,705
118,1582
91,77261
246,0648
335,0892
307,8169
264,5915
175,9908
26,1638
139,1727
352,9017
231,8537
70,19334
310,1945
75,88643
192,3517
218,7924
216,403

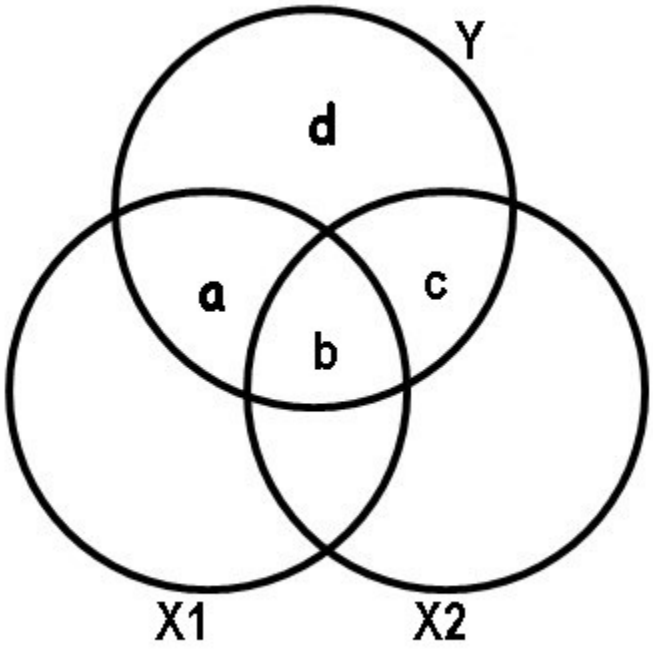
The other data reflected in the formulas such as (y) represents the average of all the data obtained from the dependent variable "y", for them we simply choose a cell and place the following command: = AVERAGE (we choose all the data in the column "Y" and it will give us the result, which for this case is 205.25. Being N the number of observations, which for this example N = 20 and to find the adjusted coefficient of determination, the value of k is also needed, which is the total number of variables that we are considering, in this case it is k = 4. We are now going to interpret the results that concern us in the summary of the data analysis, specifically the coefficient of determination R2, the multiple correlation coefficient and the adjusted R2. The values that Excel gives us are the following: Determination coefficient R2 0.804170066 Adjusted coefficient of determination 0.767451954 Multiple correlation coefficient 0.896755299 This coefficient of determination, whose value is 0.804, indicates that the three variables we chose are capable of explaining their behavior by 80.4%. We have approximately 20% left that we do not know what it is due to, this may be due to other variables that we are not considering in this multiple regression model or it may also be due to random variation, which happens simply because it does and escapes from our hands. The adjusted coefficient of determination is much more adapted to reality and in this case it can be stated with greater confidence that the variation in the cost of heating will depend on the other three variables by 76.74%. On the other hand, the multiple correlation coefficient is calculated by taking the square root of the coefficient of determination but without adjusting, if we realize: Multiple correlation coefficient = 0,804170066 = 0,896755 This multiple correlation coefficient is capable of measuring the correlation that exists between the independent variables with respect to the dependent variable. But like coefficient of determination, as more variables are added, this coefficient will adapt a little less to reality. In this case we can predict the correlation between the cost of heating with respect to the rest of the variables, in 89.67%.

30.1 Semi-partial correlation coefficients

While it is true that there is some similarity between partial correlation and semi-partial correlation, we can even realize that they have similar calculations, but their purposes are very different. When we refer to a semi-partial correlation, we must place ourselves in the context of a multiple regression with its inclusion of variables, in order to be able to see the contribution of the different regressors when explaining the dependent variable. In general, the independent variables have certain overlapping information, that is, they share that information with other variables and it must be verified that when the variable is included in the model, it can provide new information or simply its contribution can be completely redundant, if they are able to add some explained variability or if that information is already found in the variables that were included in advance. The idea is to try to find out the increment in R2 once one or more variables are added to it. For example, suppose we have a certain regression model where we have already included the variables X1 and X2, we want to know how much a third variable X3 is capable of contributing with respect to the previous ones. We will then have to calculate the difference that exists in R2 of these three variables and also calculate the R 2 of the first two variables, so that the increase in R2 thanks to the inclusion of X3 will be given by:

$$\Delta R^2 = R^2_{y.123} - R^2_{y.12} = R^2_{y(3.12)}$$

In a semi-partial correlation, the multiple correlation is proportional to the variation that is explained by the set of regressors, but in reality the specific contribution that each one of them makes is not expressed. However, the simple correlations (squared) that express each of the explanatory variables can be an indicator of their contributions and how much they influence the dependent variable. The problem we find is that many of the explanatory variables are correlated with each other and share variability or common elements. Therefore, it is not easy to find the original source of the shared items. Suppose that we have two explanatory variables X1 and X2, with a dependent variable Y, where we also know its correlation, that is, the variable X1 contributes with a proportion of ry12= 0.49 in the variability of Y, note the nomenclature used. While the variable X2 contributes a proportion of ry22 = 0.36. On the other hand, we also know that the proportion of the explained variation with respect to the variation of both variables is Ry122= 0.64. As you can see, the contribution of both variables is not equal to the sum of both contributions, therefore we can reach the conclusion that the two explanatory variables are not independent of variability, this implies that they share a part of it. There is then a redundancy between both variables and we can represent what we want to illustrate through a Venn diagram.



In this diagram we can see the contribution of each of the variables X1 and X2 in the dependent variable Y. For example, the variable X1 contributes with a + b and the notation used in this case is:

ry12 = a + b = 0.49

While X2 influences the variable Y through the areas b + c:

ry22 = b + c = 0.36

Of course the total contribution of both variables will be the sum of a + b + c and the part d is the variability that cannot be explained by the variables X1 and X2. The variation explained by X1 will be the intersection between the circle that corresponds to X1 and the circle that represents Y, in the same way it happens with X2. It should be noted that both variables are capable of explaining a proportion of 0.64, but as we saw previously X1 explains the variable Y in a proportion of ry12 = 0.49 so that if we subtract the contribution of the two variables Ry122 = 0.64 (which is represented in the Venn diagram by a + b + c) to the contribution that only X1 has which is 0.49 (indicated in the diagram by a + b), we will obtain c = a + b + c - (a + b) = 0.64 - 0.49 = 0.15. This number represents what the variable X2 adds to the contribution of X1, that is, when we include the variable X2, this represents an increase of 0.15 over the proportion previously contributed by X1. The formal way to express what has been said above is:

$$r^2_{y(2.1)} = R^2_{y.12} - r^2_{y1} = 064 - 0.49 = 0.15$$

$$r_{y(2.1)} = \sqrt{0.15} = 0.38$$

ry(2.1) is what we call the semi-partial correlation coefficient

In the same way, X1 adds to the contribution of the variable X2 what is represented in the Venn diagram by the letter a = a + b + c - (b + c) = 0.64 - 036 = 0.28. The formula indicated is:

$$r^2_{y(1.2)} = R^2_{y.12} - r^2_{y2} = 0.64 - 0.36 = 0.28$$

Solving for we obtain the second semipartial correlation coefficient

$$r_{y(1.2)} = \sqrt{0.28} = 0.529$$

The semipartial correlations are intended to know the contributions of the explanatory variables on the variable Y, but as we have already expressed previously, in general, the explanatory variables are overlapping and it is necessary to use some type of criterion that allows us to assign the shared areas to its specific variables. That is why it is absolutely necessary to establish a certain hierarchy between the variables, so that those variables that have a higher hierarchical order will have priority with respect to their shared variability. Suppose that X1 has higher priority than X2, then the total contribution of X1 will be added to the contribution of X2 (but after subtracting what X1 previously contributed). In a nutshell:

$$R^2_{y.12} = r^2_{y1} + r^2_{y(2.1)} = 0.49 + 0.15 = 0.64$$

But if X2 is set to take precedence over X1:

$$R^2_{y.12} = r^2_{y2} - r^2_{y(1.2)} = 0.36 + 0.28 = 0.64$$

As the independent variables are more intercorrelated, the less capacity they will have to explain the dependent variable. The importance given to each of the variables is subjective and depends on the judgment of the researcher, in addition to the dominance they may have over the matter, since there are no rigid rules when choosing the hierarchy between the variables. However, there is a certain criterion with respect to this and that is that the variables are generally ranked in order from highest to lowest. In this case, the variable X1 would enter first since ry1 is greater than ry2.

30.2 Partial correlation

But as for the partial correlation, what is interesting is not precisely the contribution of a certain variable in the regression model or the elimination of some variables that can be disturbing, for the absolute understanding of the relationship that exists between our variables of interest. In this case, what interests us are the correlations where relationships between variables can be observed, which can lead us to think that some affect the other. But the reality is that its variability is simply equal thanks to the effect of third variables. The idea is precisely to detect which are these third variables, to be able to eliminate their influence and thus to be able to verify if indeed the considered variables can maintain a supposed relationship. In the correlation for multiple variables, the simple correlation can be used, which as we know is based on the correlation of two variables. But if we have three or more variables, the model used for multiple correlation is nothing more than an extension of the simple correlation and this model is called multivariate normal distribution. Suppose we have three variables and among them three simple correlations, we will call them 12,

13 and 23, as we all know, the correlation coefficients that exist between these variables can be measured. However, if we measure the correlation two by two and do not take into account the influence of the third variable, it is what we call partial correlation. In a partial correlation, what is done is to establish the correlation between two variables and the rest of the other variables are taken as fixed, for the previous case of 3 variables we must correlate variables 1 and 2, taking variable 3 as constant and the nomenclature to use is 12.3. In the same way, if we want to correlate variables 2 and 3, taking variable 1 as constant, the nomenclature of the partial correlation to use is 23.1. When we keep a variable constant, we can either do it statistically or experimentally and in both cases we must obtain equivalent results. Suppose we want to know the correlation between arm and leg length measurements, while the total height variable remains constant. It is no secret to anyone that the lengths between the arm and the leg will have a greater correlation between them, with respect to the size in general. Simply put, a tall person will have long arms and legs, while a short person will have both short limbs.



Now suppose and carry out a study where we select people of the same size, of course we will find a residual correlation, between the lengths of the arms and legs of the individuals that make up the sample. This usually happens in vertebrates, since both extremities are determined biologically through similar mechanisms, which are responsible for their differentiation. But it can be said that there must be some correlation between both lengths, even when we do not take into account the size of the individual. This is how the significant correlation between two variables is transformed into a partial (non-significant) correlation when a third variable is constant. In other words, the most prudent thing to do is to measure the correlation between two variables, but in turn, that this correlation is not a reflection of the possible relationships that both variables have with another third variable. How to calculate partial correlation using Pearson's correlation The idea is to make simple correlations by relating one variable with the other, but eliminating the effect of a third variable, in order to know the correlation that X1 has with X2, but eliminating the effect of X3 we must apply the following formula that is based on simple correlations :

$$r_{12.3} = \frac{r_{12} - r_{13} * r_{23}}{\sqrt{1 - r_{13}^2} * \sqrt{1 - r_{23}^2}}$$

Let's go with an example, suppose we have a sample of 17 students and we want to investigate the effect that intelligence (X1) and social class (X3) have on the grade of a certain subject (Y). After the relevant measurements, we obtained the following data:

Intelligence	Social class	Test score
109	3	4,1
120	4	4,3
112	2	6,40
115	2	4,5
98	1	4,2
101	3	5,5
100	2	6
105	2	5,1
130	5	8,8
121	4	7,5
132	5	7,8
140	5	9,3
111	4	5,2
109	3	6,5
95	3	5,2
88	2	2,1
106	4	4,8

To establish the relationship of the intelligence variable X1 with the dependent variable Y, which in this case is the

grade of the subject but eliminating the effect of social class X2. The formula in this case would be as follows:

$$r_{y1.2} = \frac{r_{y1} - r_{y2} * r_{12}}{\sqrt{1 - r_{y2}^2} * \sqrt{1 - r_{12}^2}}$$

We calculate the Spearman correlation coefficient that exists between variable Y and X1, we do this in Excel by placing ourselves on any cell and typing the following command: = CORREL (I choose all the data of the variable X1; I choose all the data of the variable Y) in this way we obtain:

ry1 = 0.800

We repeat the same process to calculate the correlation coefficient between variables Y and X3.

ry2 = 0.656

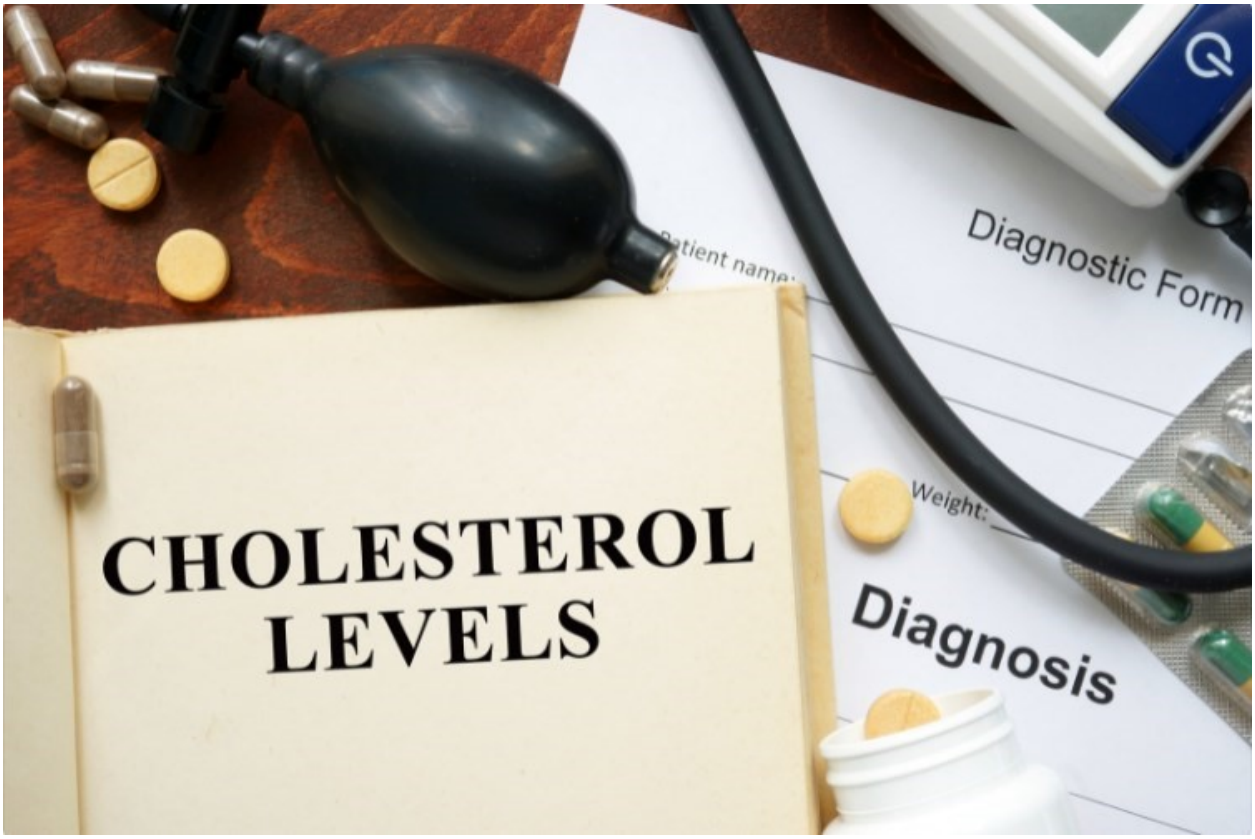
Similarly for variables X1 and X3:

r12 = 0.772

Now we substitute the data in the formula:

$$r_{y1.2} = \frac{r_{y1} - r_{y2} * r_{12}}{\sqrt{1 - r_{y2}^2} * \sqrt{1 - r_{12}^2}} = \frac{0{,}800 - 0{,}656 * 0{,}772}{\sqrt{1 - 0{,}656^2} * \sqrt{1 - 0{,}772^2}} = 0.61192$$

Once the correlation that exists between the variable X2 with the variable X1 and the dependent variable Y has been eliminated, the correlation that exists between X1 and Y without the effect of this second variable is 0.61192, as you can see, there is an average correlation between both variables. Partial correlation exercise 2: A researcher proposes that cholesterol levels (Y) depend on two variables which are age X1 and fat X2.



After measurements, they provide us with the following data:

Cholesterol	Age	Fats
350	80	35
190	30	40
263	42	15
320	50	20
280	45	35
198	35	50
232	18	70
320	32	40
303	49	45
220	35	35
405	50	50

If the researcher wants to measure cholesterol with respect to age, but leaving fat as a constant variable, he must apply the same formula that was used in the previous exercise and therefore repeat the same procedure in Excel to find the values to substitute in The equation.

$$r_{y1.2} = \frac{r_{y1} - r_{y2} * r_{12}}{\sqrt{1 - r_{y2}^2} * \sqrt{1 - r_{12}^2}}$$

Only this time, we do not do the calculations manually, but we use Excel for it, in any case I attach the exercise carried out on this platform, in case you prefer to investigate a little the commands used to do the calculations. The results obtained were the following:

	Pearson's correlation coefficients
ry1	0,649
ry2	-0,132
r12	-0,422
ry1.2	0,660128919

The final result of the partial correlation between X1 that represents age and cholesterol levels (Y) eliminating the effect exerted by the variable "fat" (X2), gives us a result of ry1.2 = 0.66, this indicates that once the second variable has been eliminated, the other two have a slightly higher correlation than that obtained in the previous exercise, therefore, it is slightly higher than a medium correlation.

CHAPTER

THIRTYONE

DESCRIPTIVE STATISTICS

31.1 Random descriptive statistics

Descriptive statistics is nothing more than a set of collected data where mathematics intervenes to order, characterize and present them. For example, the age of the students of a high school, the different temperatures in the winter months, the height of the workers of a certain company, etc. In order to describe in an appropriate way, the different characteristics of that specific set.

Now, we call a statistical variable the set of different numerical values that are capable of adopting a quantitative character. Variables can be considered of two types:

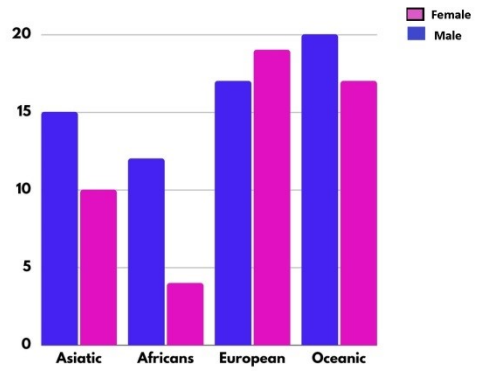
- Quantitative variables: are those measurable and that can be represented numerically such as annual income, the price of a product, the age of a certain population, etc.

- Qualitative variables: are those that cannot be quantified, for example: the sex of a population, its skin color, nationality, etc.

On the other hand, we can also classify the variables in:

- One-dimensional variables: as their name implies, they only reflect information on a single characteristic, for example, the purchasing power of the members of a building.

- Three-dimensional variables: are those that collect the information referring to two characteristics of a certain population, for example, the height and if they are female or male of the students of a certain school.



- Multidimensional variables: are those that gather information on at least three characteristics, for example: the weight, age and height of the students in a certain classroom.

We can also classify quantitative variables as discrete and continuous:

- Discrete: they are the variables that can take only integer values (-2, 1.7, etc.). For example, the number of inhabitants of a building can be 150, 300, 98, but it can never be 33.45.

- Continuous: they are the numerical variables that can acquire any value within an interval and among them we will have, for example, the speed that a vehicle acquires, since it can be 120.2 km / h, 83.4 km / h, etc.

When studying the behavior of any variable, it is important to differentiate the following concepts:

- Individual: any element that contains the information about what we are investigating is called. For example, if we study the ages of the boys in a classroom, each one of the students is an individual; But if the investigation is about the price of houses in a city, our individual in this case will be each house that is part of that particular city.

- Population: it is the set made up of all the individuals in a study, for example: animals, people, objects, etc. that contain the relevant information from our investigation.

- Sample: it is the subset that we select from a population, since we cannot study the entire population.

Suppose that we are studying the cost of the houses that are part of a certain city, as we have already said, in this case the individual is the house and the population will be made up of the total number of houses that make up that city. As we refer to the cost of the dwellings, the sample will depend on the small sectors or subgroups of dwellings, which represent the different economic strata of the aforementioned city.



On the other hand, the random variables are those chosen at random or by some random processes.

Statistical data: are the numbers or measures collected through observation and can be conceived as the necessary numerical information, for making better decisions and with a greater basis, for a particular situation.

To obtain the necessary data, there are endless methods such as looking for data that have been published by other sources, but you can also design an experiment capable of measuring what you want to verify, you can also carry out an investigation or make observations of the attitudes, behaviors or opinions of the individuals that make up the study.

We can classify the data into:

- Indiscreet data: are those numerical answers that come from a counting process.

- Continuous data: are those numerical responses that come from the measurement process.

31.2 Measurement scales

In order to carry out a measurement in the field of exact sciences, one quantity must be compared with another, which must be taken arbitrarily as a reference point and is called a "standard". While for the social sciences the measurement process consists of linking abstract concepts with empirical indicators.

Now, to measure the different variables, four different measurement scales are used: ordinal, nominal, interval and ratio. In this way, the variables are classified, the questions that the researcher must ask to measure these variables are designed and it is also established which is the most appropriate type of statistical analysis to use, in the treatment of the data obtained.

It is important to emphasize that the reliability and validity of the measurement of a certain variable depends directly on the decisions that the researcher makes when handling it, so that an adequate understanding of the concept can be achieved. Thus avoiding ambiguities and inaccuracies, since otherwise, the variable may give unreliable information.

1) Nominal Measurement

Although it is true that there are different categories in this type of measurement, there is no specific order among them.

To better exemplify, suppose that we have a group of people that must be classified according to their sex, we can establish: female (F), male (M) and other (O). In this way, respondents only have to indicate their gender and this does not imply a real order.

As in the previous example, numbers can be assigned to each of the genders to identify them: F = 1, M = 2 and O = 3, but as we know, none of these numbers quantifies the number of people corresponding to each gender.

2) Ordinal Measurement

This measurement scale is quantitative, since it allows ordering each of the events according to the minor or major characteristic of a specific attribute. For example, in schools at the primary level, students are usually trained by height, this allows a quantitative order, but the measures of the students are not provided.

In this field we can also include measurements that express a certain attitude of the population with respect to some situation. For example: Do you agree to privatize the electricity service? So people will be able to answer alternatives such as:

- Strongly disagree

- In disagreement

- Indifferent

- Agree

- Totally agree

Depending on the answer alternatives, these can be coded with numbers ranging between 1 and 5, suggesting a pre-established order, but without implying the same distance between each of the numbers.

3) Interval Measurement

This measurement has the characteristics of both ordinal and nominal measurements and establishes a constant distance between one measurement and another. While it is true that the established interval scale applies to continuous variables, it is no less true that this type of measurement lacks a point indicated as absolute zero. A representative example of the interval measurement is a thermometer, since when it is at 0 ° C it is an indication of the freezing temperature of water; while when it is at 100 ° C, it reveals its boiling level. But as we all know, the zero point is taken at an arbitrary level and this does not imply that at this point, there is a total absence of temperature.

4) Ratio Measurement

This type of measurement includes the characteristics of all the measurements mentioned above, that is, nominal, ordinal and interval measurement. It also establishes an exact difference between its intervals, but unlike the previous

one, it has an absolute zero point. Of course, at this zero point there is no attribute or characteristic that is being measured. For example, variables such as: number of children, age, height, etc.

31.3 How the data is organized

The data is nothing more than the information collected and it can mean either the opinion of many people regarding a subject, the age of a population, where they live, how many people live in a house, the type of blood that a certain group of individuals, etc.

The data collected can be very useful in helping many professionals to make decisions and solve problems, on the other hand, statistical graphs facilitate the presentation of these results, when they are shown to others. Once all the information has been collected, a database is created where each and every one of these data obtained is entered.

Now, the data is encoded when it is very complicated, that is, when it has a very long description, it is identified with a keyword and when the database is done, you will have a table as a result. It is important to emphasize that it is not advisable to place tables and graphs simultaneously, since they reflect exactly the same thing, so it is best to place a table and its analysis or a graph, together with their respective analysis.

Suppose we have conducted a survey of a group of people about their opinion regarding the installation of public toilets in squares. On the other hand, we establish a score from 1 to 9, where 1 represents the people who totally disagree with this measure, while 9 reflects the respondents who totally agree.

As a result of the measurement we obtained the following data:

31.4 Table 1: Originally collected data

5 7 8 6 6 8 5 9 5 5 7 5 6 4 5 8 5 6 2 4 5 4 6 4 6 3 6 2 4 9 4 3 5 3 7 4 5 8 5 6 5 4 1 3 3 1 4 3 4 8 6 4 4 2 1 3 6 3 1 4 2 4 8 5 7 6 4 4 6 4 2 4 7 4 2 5 6 7 5 5 7 5 6 4 5 4 6 6 5 6 1 5 4 5 5 5 2 6 5 6 5 4 7 2 8 1 2 4 7 4 4 2 3 7 5 6 3 4 9 5 5 3 4 4 5 7 6 7 6 6 5 8 6 1 5 5 7 5 6 3 5 5 5 8 5 6 2 5 7 7

We can ask ourselves the following concerns: - The number of people surveyed - The most common or frequent response - How many people disagree with the measure? For this, it is necessary to take into account the number of people who answered between 1 and 4 points, on a scale of 1 to 9.

As we can see, it can be difficult to respond to the aforementioned concerns, since most people find it difficult to process a lot of information at the same time. If we look at the data table, it would be necessary to have a lot of patience and an excellent view, to be able to answer our questions with total security. The recommendation is to organize the data in such a way that it is easier for us to read, for this it is necessary to order them from smallest to largest

31.5 Table 2

1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 5 5 5

the first column we will present the values represented by the letter X and in the second column the frequencies or repetitions of the value represented in the initial column will be indicated.

31.6 Table 3 - Frequencies (*f*)

With this new table it is much easier to answer the concerns or questions previously raised

- Here we can see that the total number of people surveyed was 150 - The most frequent response expressed by the people surveyed was ultimately number 5 - To find out how many people disagreed with the measure, simply add the number of respondents who answered options 1 to 4, that is, 59 people Frequency accumulation (F)

We can realize that all the questions asked have not been implemented the same effort, so that both the number of data and the most frequent value can be answered with a simple reading of the previous table. It is important to take into account that the last question has required certain operations, since to arrive at the result of the people who disagreed in the survey, the responses of those who responded between 1 and 4 (6 + 11 + 12 + 30 = 59).

Now, this type of summation of consecutive results is what we call accumulated frequency and a table of accumulated frequencies will help us to answer many questions.

If we know how to correctly interpret the accumulated frequencies, we can predict environmental phenomena such as hurricanes, river overflows, earthquakes, etc.

31.7 Relative frequencies

Returning to the problem of the answers regarding the installation of public toilets, answers to other questions can be added. For example, number of people who have an indifferent attitude regarding the question posed, we could say that this type of people is in an average attitude and is measured with the value of 5. If we observe table 3 we will realize that 40 people responded this way.

Now, if we express the frequencies in relative terms, we can obtain the proportions with respect to the total and for this it will be necessary to perform the operation $fr = f / n$, where n is the total of the people surveyed. We will then enter the column of relative frequencies

As we can see, the proportions are expressed in quantities that range between 0 and 1, that is, decimal numbers. To better understand the proportions, it is advisable to express them in percentages.

31.8 Mean, median and mode

When you have a group of data, it is important to determine the central tendency, to have a better vision of the most representative behavior of the variable. That is why extreme values are not used, that is, neither the highest nor the smallest, since when we talk about a data distribution, the propensity is to accumulate towards the center and this is what we call the central tendency. To measure this type of arrangement, the most common is to calculate the arithmetic mean, as well as the median and the mode.

Arithmetic average

If we add all the values and divide them by the number of data (n), we will obtain the arithmetic mean

For example, if we have the following data: 2, 8, 9, 15, 3, 5, the arithmetic mean will be: = (2 + 8 + 9 + 15 + 3 + 5) / 6 = 7

However, when the data obtained has more than one frequency, we can obtain the arithmetic mean by adding a new column. Let's suppose that the following frequency distribution shows the heights measured in centimeters of the students in a secondary school classroom

As we can see, the arithmetic mean is a numerical measure, that is, it can be expressed quantitatively. For its calculation, each and every one of the values of the variable must be taken into account.

On the other hand, it is totally logical algebraically and is greatly affected by extreme values. It is important to emphasize that the arithmetic mean is a single value, so that the collected data set will have a single arithmetic mean.

Median

We call the central point of the ordered data set median either ascending or descending and depending on the amount of data there are two ways to calculate it:

1) When the number of data is even: In this case, the arithmetic mean between the two central values must be calculated.

For example, if we want to obtain the median of the following data:

If we count the amount of data, they give us 8 (even) and the first thing is, order them in ascending or descending order:

We look for the two central values, which in this case are: 2 and 4. Their arithmetic mean is:

2) When the number of data is odd:

In the same way as in the previous case, we realize that there are 7 data (odd) and they are ordered from least to greatest or vice versa:

The median is the data that is right in the center and is: 4 As we can see, the values of the variable are not included in the median, it is not disturbed in any way by its extreme values and from the algebraic point of view, it has no logic.

Mode

The mode is nothing more than the most repeated value, that is, it is the one with the greatest amount of absolute frequency. Fashion may not exist and if so, it may not be unique. However, it is a very important measure, since it allows us to organize, plan and even produce, depending on the needs of the majority.

Get the mode of the following data:

We order it in ascending or descending order:

As we can see, the value that is repeated the most in this case is -1 and therefore, that value is the mode.

Let's look at another case, if the data we have is the following:

Ordering from least to greatest:

We observe that no value is repeated, so its mode does not exist

Another example: In a store there are 20 employees, who present us with the following information regarding the hours worked per day:

We realize that there are two frequency values 5, so we can conclude that there is more than one mode, in addition, that the highest frequency is 8 and 9 working hours of daily work.

Speaking of the mode, we can say that not all values are included in the calculation, also that the mode can be affected by the designation of the intervals and the mode is not algebraically defined

31.9 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

THIRTYTWO

DISCRIMINANT ANALYSIS

This type of analysis can be used as a statistical tool to forecast the nominal behavior of dependent variables, if we use a linear combination of independent variables (also called predictive variables), so that the average scores of the dependent variables differ too much. in this linear combination. For example, in market research, when predicting whether potential sales in a certain territory will be "good" or "bad", we will consider these to be our dependent variables; while the evaluations regarding the income of available personnel in the territory, its population density and the amount of sales, will be our predictive variables.

It is also widely used in financial institutions where it is possible to establish which are the "problem" accounts and which are the "stable" accounts, where each of these accounts can describe parameters such as credit rates, existence of demands, number of times in delinquency, debt ratios and then the predictive variables that are capable of better discriminating the unit of analysis, objects, individuals are obtained, or for this case, it is frequent that it can turn from a "stable" account to a "problematic" account.

Discriminant analysis that focuses on two main objectives:

1.- To be able to predict the category of a certain unit of analysis

2.- To be able to determine the predictive variables that have a greater discriminating power when classifying the units of analysis, so that they have this or that attribute of the dependent variable.

The idea is to obtain a discriminant function obtained by computer programs and determine the values for each of the independent variables, which are called discriminant coefficients. It is important to emphasize that each of these coefficients has its corresponding sign, whether positive or negative, which will determine its assignment in the groups defined by the variables depending on. The main objective is to replace a unit of analysis with its independent variables, characteristics or parameters, in the function obtained and to be able to calculate a priori what its category is.

Algebraically speaking, a determining function is a linear combination of the original data and which at the same time is capable of maximizing the variability between problem accounts and stable accounts.

In short, it is a classification technique whose main objective is to obtain a function that is capable of classifying the unit of analysis, but based on prior knowledge of those values that certain discriminating variables have.

Let's suppose that we have a sample of patients, who have previously had a set of variables measured, we can divide the sample into diagnostic groups. But then we measure the same group of variables to a new patient and the discriminant analysis, based on the values obtained, allows the new patient to be assigned to a group of maximum probability and that at the same time, the value of that probability can be quantified. In short, it allows to classify new individuals to those groups that have already been defined in advance.

Problem Statement

A data table made up of N individuals is the starting point and for these individuals, a p number of variables have been measured for the usual cases and an additional dependent variable, which defines the group to which each individual belongs.

Points to consider:

- A matrix with a dimension of N x (p + 1) is generated

- Each case has a certain profile and is assigned to a group.
- The objective is to obtain a discriminant function with which the profile of the new individuals can be contrasted, so that, depending on the numerical result, they are assigned to the most probable group.
- It is important to emphasize that the more reliable the starting group, the better the subsequent assignments.
- It has a double purpose, the first is to explain the membership of each individual in a certain group, according to the variables that their profile has and thus verify their membership in the pre-established group in a quantified way with respect to weight that each variable has in discrimination. The second purpose is to predict to which group a new individual should belong, if we only know their profile of variables, that is, the first purpose is to explain and the second is to predict the group or categorical variable to which the new individual belongs analysis unit.

Example:

Suppose we have two defined groups and three variables V1, V2 and V3 that are explanatory, with 10 individuals of whom we know, both their profile and their assignment.

$$\begin{pmatrix} V1 & V2 & V3 & Group \\ 15 & 41 & 32 & 1 \\ 17 & 40 & 56 & 1 \\ 32 & 35 & 46 & 2 \\ 16 & 42 & 50 & 1 \\ 30 & 33 & 45 & 2 \\ 32 & 32 & 33 & 2 \\ 33 & 30 & 37 & 2 \\ 21 & 39 & 35 & 1 \\ 20 & 38 & 44 & 1 \\ 30 & 31 & 45 & 2 \end{pmatrix}$$

In the matrix we can see that the first individual takes values in the first, second and third variables of 15, 41 and 32, respectively and that he belongs to group 1. We can also observe that group 1 includes individuals 2, 4, 8 and 9, while group 2 includes individuals 3.5, 6, 7 and 10.

We can realize that the belonging of individuals to each group is not determined by the value of the variables and that is why our main objective is given by relating these two information.

The belonging of individuals to each group is established by other means and the variable capable of assigning individuals in each group is qualitative, but it becomes numerical for statistical treatment.

The idea is that for each new individual its values of V1, V2 and V3 are obtained so that we can use that information, to be able to classify it either in group 1 or 2.

It is important to determine which variables carry the most weight when assigning the most probable group to the individual.

Discriminant functions are similar to multiple linear regression equations and consist of obtaining linear functions from the explanatory variables with the ability to classify other individuals. That is, these functions are applied to each new individual and the one with the highest value will be able to define the group to which it belongs.

To achieve this we are going to use an IBM program called Spss, which helps us with the calculation and discriminant analysis.

SSPS comes from the acronym in English that stands for "Statistical Product and Service Solution" and is a widely used software to capture, analyze data, create tables and make statistical graphs. This program is capable of managing very

large volumes of data and contains a very extensive range of statistical analyzes, among which we can name: descriptive statistics (frequencies, means,), Bivariate statistics such as analysis of variance, T tests, correlation analysis, ANOVA, factor analysis, regressions, models linear and non-linear, representations of data graphs, management decisions, among others.

You can make predictive models, as well as validate them using advanced statistical techniques. The SSPS is capable of analyzing texts, for example, if you have a survey whose answers are mainly text, this program has a text analyzer, capable of obtaining information from each of them.

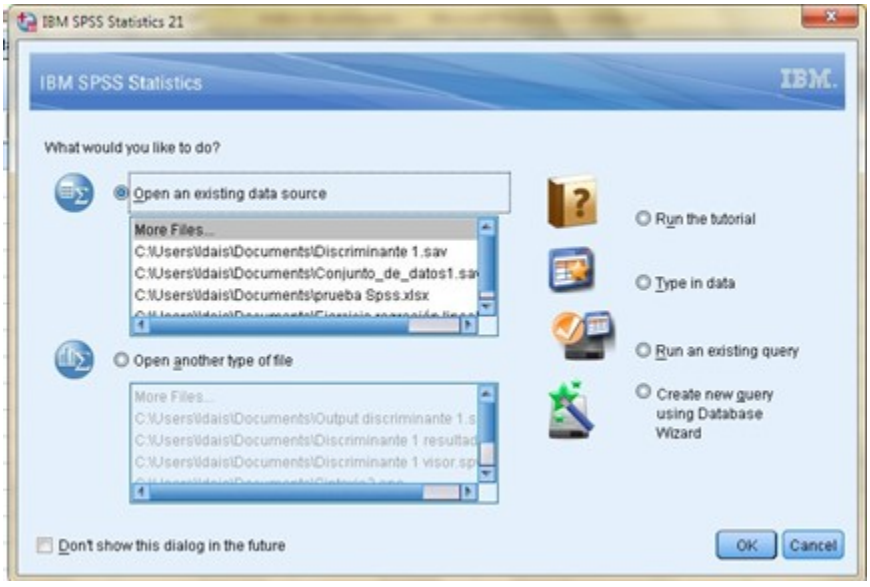
The main window of the SSPS is similar to a spreadsheet where there are multiple cells to store the data, which you can manually enter or import from a text file, spreadsheet or other format. However, unlike programs such as Excel, the analysis is not carried out precisely in the spreadsheet, but through the commands found in its drop-down menus. You just have to select the statistical test you want to perform and the output is generated in a new window.

You can also create your own survey with the QuestionPro where you can select a template, include the survey in your email or social networks in real time and for free.

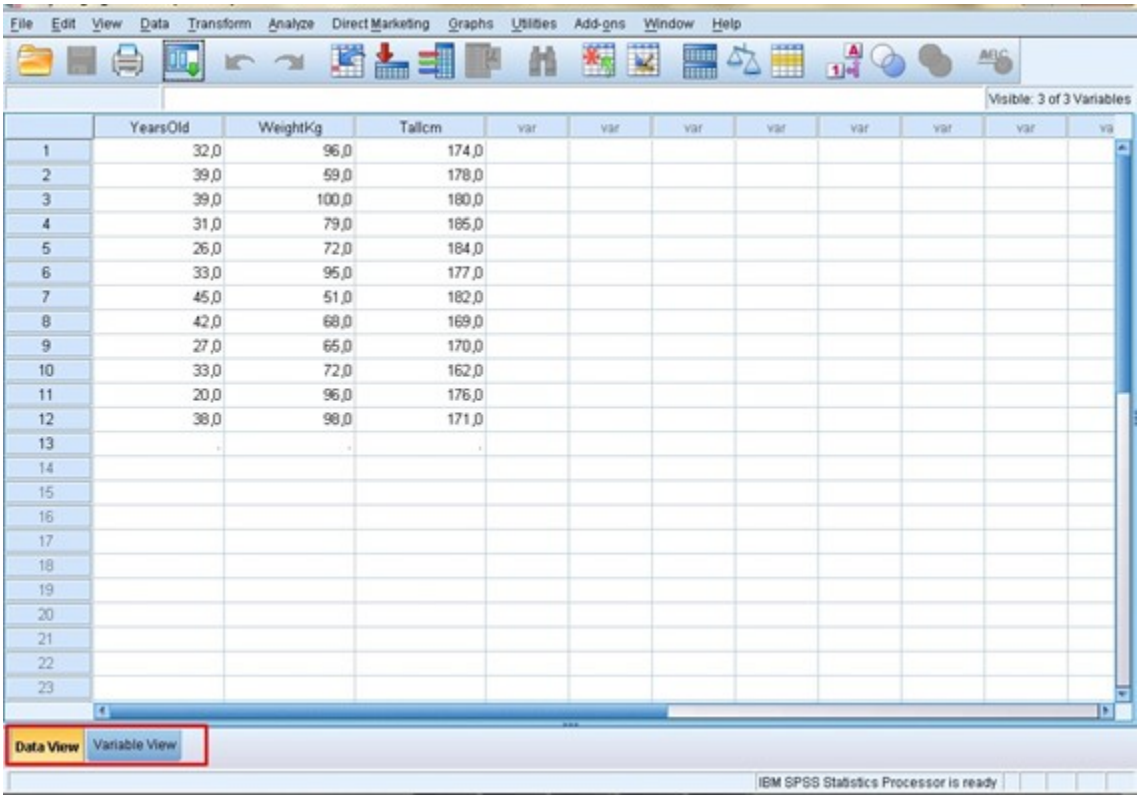
The Spss works in the following way, we must introduce a database on the subject that we want to treat statistically. Before entering the database, we must ask ourselves what our units of analysis are, for example, if our database is a public opinion survey, our units of analysis or individuals will be the people surveyed.

We are going to organize our database by placing the units of analysis or individuals from our sample in the rows and the characteristics referring to those units of analysis will be our columns. If, for example, our statistical analysis deals with international relations, the units of analysis par excellence will be the countries of our interest and each of our rows will be a different country, while our columns will be made up of the characteristics that we want to analyze for each of those countries.

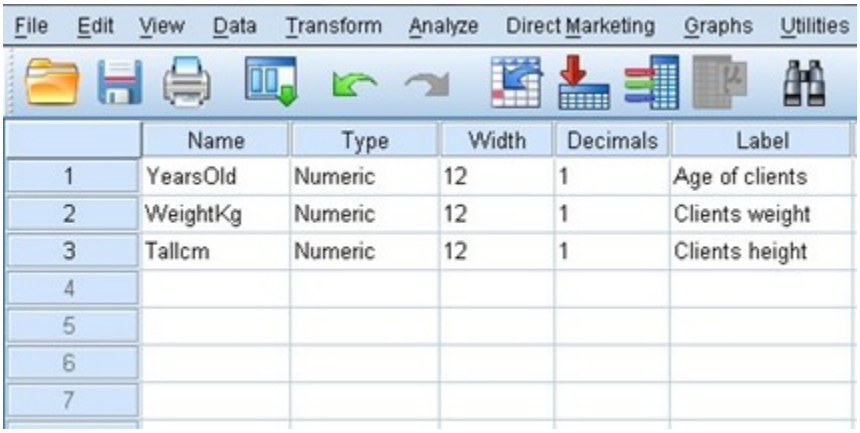
Now, as soon as we open or begin to execute our SPSS statistical program, a window appears where we must indicate if we are going to import our database from a file where we have previously entered it or if we are going to enter the data of our sample, one by one and directly within the SPSS.



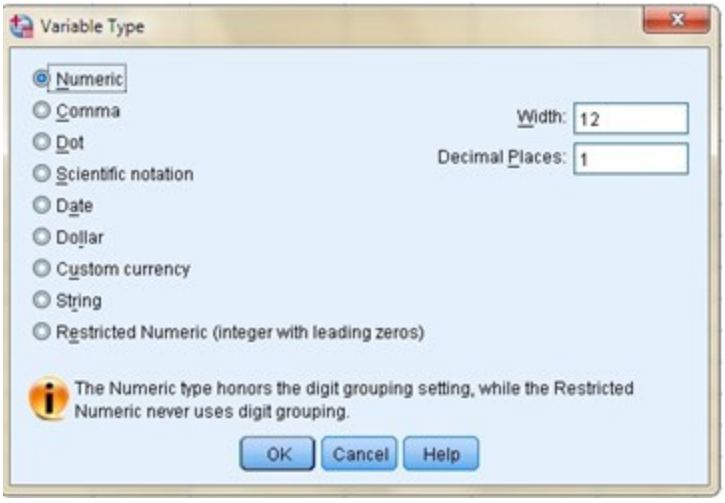
To show an example, we are going to import the data from a previous exercise, which will help us to show some points of interest to use our statistical program, so we will leave checked the box that the program has by default that urges us to "Open an origin of existing data ", after" Accept "a new window will be opened where we will have the possibility to search in which part of our computer the file that contains our database is located, we choose the address with its respective extension and click on "Open", where again another box will appear with the title of "Opening data source" and we are simply going to "Accept" the configuration that the program offers us by default, that is when the database will be imported and we can see it in the following environment:



Now, we can see two tabs that are in the lower left part of our environment. If we open the "Variables View" tab, another window will open where the columns containing the characteristics of our unit of analysis will appear in a list of variables, each occupying a row in this new window. This is where we can change or modify the attributes of our variables as convenient.



In the first column we can see the name of our variable and it is usually placed in lowercase and without any spaces. In the second column we can establish the type of variable, if we position ourselves on any of the boxes we can see three points on the right side and when we choose them a new window appears where we can change the type of variable that Spss shows us by default, it is there where we can define if the decimals are separated by periods or commas, if the number is in scientific notation, is a date, a currency, etc.



The third column defines the width of our variable, for example, if we have a numeric variable and we define a width of 4, the maximum number that we could place would be 9999, since 10000 has a width of 5 digits.

In the fourth column we define the number of decimal places that our figure will have. Our fifth column is dedicated to the labels, which help us to better describe our variable, since many times the name is not enough to make clear what our variable means and to be able to recognize the meaning of the values it takes and there we can place it. that we want when describing our variable, including capital letters, spaces, symbols, etc.

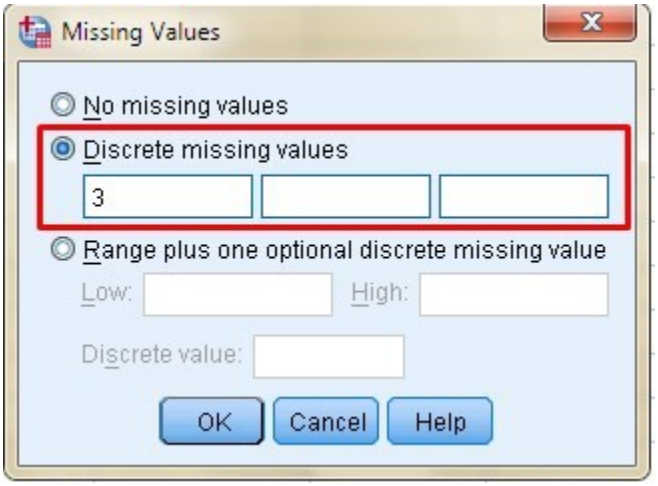
The sixth column is intended for the values, it is in this column when we can assign the values to an ordinal or nominal variable, for example, if our variable is gender or sex, we can assign the number 1 to the male gender and 2 to the feminine.



In the case of having an ordinal variable, for example, confidence in the National Police, we can see that the values range from 1 “No confidence”, to 4 “Total confidence”, going through all the possibilities between these two extremes and defining them with a number that identifies that possibility.



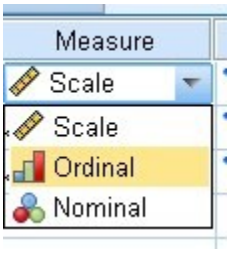
In the next column "Lost" is where we can establish what values we should consider and what values we should not consider in the analysis, we are talking about missing values when the value is a blank box and the Spss will place a point (.) By default, but I can give instructions to the program that for a certain variable I don't want it to consider me the number "3", so I go to the row where the variable is located and the column "Lost" I go to the cell "None" and choose the three points on the right side and the following window opens:



It is there where I must put the number "3" and the program will consider all the values, except that one. In the next column you can specify the number of characters that will be displayed with the specified width, however, the width of the column only affects the presentation of the values, it does not change the defined width of the variable.

In "Alignment" as its name indicates, it helps us to align the data within the cell either on the left, right or centered side.

In "Measure" we must define the type of measurement:

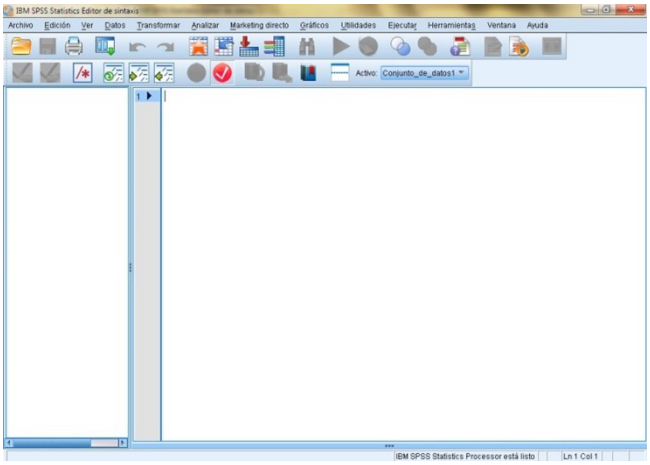


When we choose "scale" it is for quantitative measures such as income, age, height, temperature, etc. while "ordinal" is for quantifiable but categorical measures, for example, social class or educational level and finally we have the

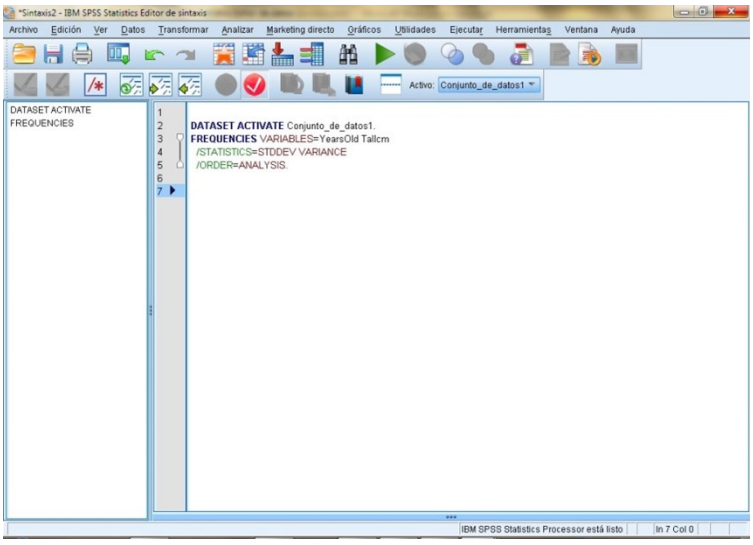
“nominal” measure where the variable is not quantifiable, as in the cases of gender, place of origin or classification ethnic.

Now, if we want to analyze a particular variable, we choose our top menu “Analyze” and in the drop-down we will find a whole list of analyzes, we just have to choose the one that suits us and a new window will open where we will choose the variable we want analyze. We will position ourselves on it and click on the arrow pointing to the right, and then choose if we want to obtain graphs, statistical data, etc., and then “Accept”. It is there where the results viewer will open in a new window, there we will find the results of the instructions that we have asked the program.

On the other hand, the program has a syntax area, it is a kind of notebook where the commands that we have asked our program are placed are placed, if we go to “File” → “New” → “Syntax” and the following completely empty environme

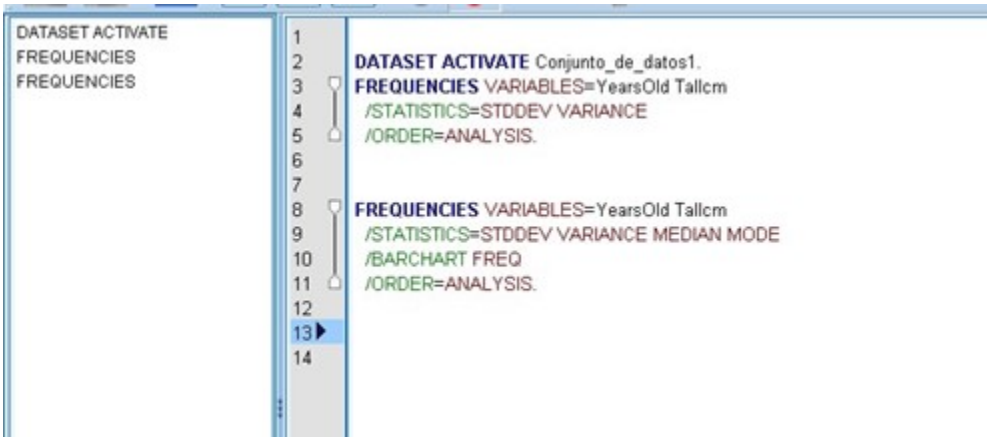


It is very useful if I want to keep a log of the commands that I am asking the program to carry out, for example if I give an instruction to Spss that gives me a table of frequencies of my first variable, I go to “Analyze” → “ Descriptive Statistic ”→“ Frequencies ”→ I choose my variable → Click on the arrow → As you can see we have repeated the procedure to analyze, but now we are not going to“ Accept ”but to“ Paste ”, apparently the program does nothing, however If we go to our syntax we can realize that it is no longer empty, but we will find the command that we have just asked the program to do and it will look like this:



This will be very helpful if we carry out several steps to reach a specific result, we can save all the commands that we have carried out, to repeat the procedure at another time. We are now going to ask the program to carry out other actions: “Analyze” → “Descriptive Statistic” → “Frequencies” → I choose my variable → “Statistics” → I mark the boxes of “Median”, “Mode”, “Standard deviation” and “ Variance ”→“ Continue ”→ It returns me to the previous

window and I continue with“ Graphs ”→ I mark the box of“ Bar graph ”→“ Continue ”→“ Paste. ”We will notice that other commands appear in the syntax such as What:



There we can visualize the variables that we chose for our analysis, in the following line we can see the instructions for: standard deviation, variance, median and mode, a line below we will find the bar graph and finally, the analysis.

Frecuencias

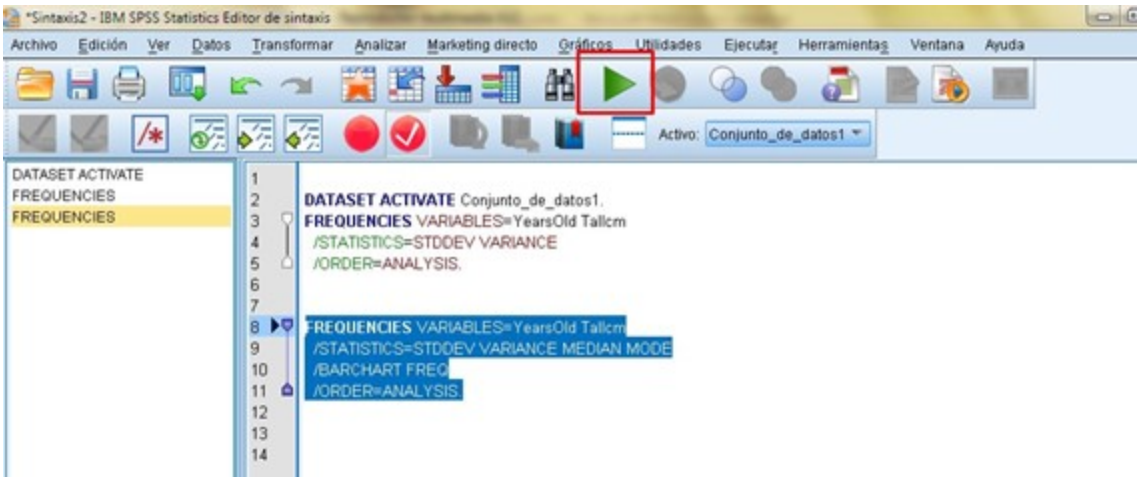
[Conjunto_de_datos1]

Estadísticos

		YearsOld	Tallcm
N	Válidos	12	12
	Perdidos	1	1
Mediana		33,000	176,500
Moda		33,0[a]	162,0[a]
Desv. típ.		7,2253	6,8135
Varianza		52,205	46,424

a. Existen varias modas. Se mostrará el menor de los valores.

Now, if we go to the results viewer we will realize that the expected results have not been included, that is, our second frequency table does not appear, nor the bar graph, etc. and it is because we have given the order to the Spss to give us the result, we have simply given it instructions that appear in our syntax. So to get the result, we must select the order in our syntax box with the mouse and then click on the green arrow, which is at the top.

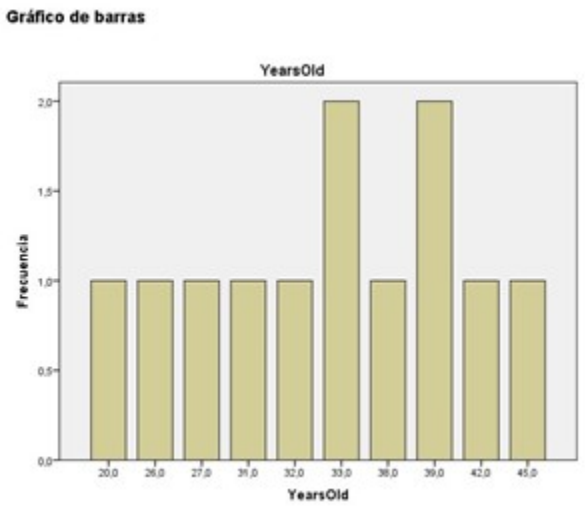


Our results viewer automatically appears with the table of median, mode, standard deviation and variance. Later our frequency table, but this time of the second variable, which was the one we chose.

Tallcm

		Frecuencia	Porcentaje	Porcentaje válido	Porcentaje acumulado
Válidos	162,0	1	7,7	8,3	8,3
	169,0	1	7,7	8,3	16,7
	170,0	1	7,7	8,3	25,0
	171,0	1	7,7	8,3	33,3
	174,0	1	7,7	8,3	41,7
	176,0	1	7,7	8,3	50,0
	177,0	1	7,7	8,3	58,3
	178,0	1	7,7	8,3	66,7
	180,0	1	7,7	8,3	75,0
	182,0	1	7,7	8,3	83,3
	184,0	1	7,7	8,3	91,7
	185,0	1	7,7	8,3	100,0
	Total	12	92,3	100,0	
Perdidos	Sistema	1	7,7		
Total		13	100,0		

Lastly, our bar chart:



If we want to choose a different variable and delete the previous one, we only have to position ourselves on the variable that we want to delete and click on the arrow, but this time the one that points to the left side and that is when we will choose the new variable by positioning ourselves on it, where Again we will choose the arrow to the right side, which is the one that tells us that we will include our other variable, to be able to analyze it.

It is very important to take into account that both the data set and the syntax are saved in separate files and it will be necessary to open both when having the result set again. When opening the file where the syntax is saved, we will again have to choose those commands that we want to be carried out in our results viewer and once again position ourselves on the green arrow and click on it.

We are going to perform a discrete analysis where the dependent variable is categorical. Let us remember then what a categorical variable is, it is that qualitative variable in which I can take values such as categories or qualities, for example, gender (male, female), health conditions (very good, good, fair, bad, very bad), etc.

In this example, our independent variables are continuous and are capable of determining the groups to which individuals belong. So the idea is to find linear regressions, between those independent variables that best discriminate the groups.

The focus of this discriminant analysis is to carry out a pattern that allows classifying the new individuals. Starting from the explanatory variables, linear functions are constructed and these equations are applied to each new case, where the function with the highest value is the one that will define the group to which it belongs.

The example that we are going to analyze is a financial institution that initially grants a loan to 16 clients and after three years of having granted the loan, 8 of those 16 clients were classified as failed and those clients, we are going to classify as the group 1. While the rest of the clients that we will call compliant, will make up group 2.



	group	heritage	debts
1	1	1,3	4,1
2	1	3,7	6,9
3	1	5,0	3,0
4	1	5,9	6,5
5	1	7,1	5,4
6	1	4,0	2,7
7	1	7,9	7,6
8	1	5,1	3,8
9	2	5,2	1,0
10	2	9,8	4,2
11	2	9,0	4,8
12	2	12,0	2,0
13	2	6,3	5,2
14	2	8,7	1,1
15	2	11,1	4,1
16	2	9,9	1,6

We have information regarding the net worth of each of those 16 clients and also their outstanding debts. We will then try to construct a discriminant function that is capable of substantially differentiating these two groups, starting from these two variables (equity and debts) and that also allows us to classify, with a minimum of error, the new clients in each of these groups.

This is how better decisions can be made, based on the statistics of previous clients, it is possible to predict whether a new client is suitable or recommended for a loan.

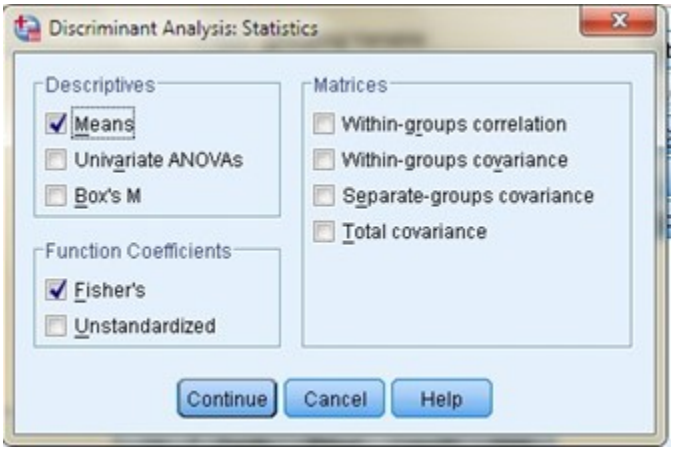
Now, the information we have about the 16 clients, with respect to their assets and debts is the following: These amounts are multiplied by 103 and are expressed in dollars ($).

Let's suppose that the analyst of this financial institution receives two new loan applications. Where the first one is from an individual with a net worth of 10.1 and has outstanding debts of 6.8; while the second request is from an individual

with an equity of 9.7 and his outstanding debts are 2.2. We must help you decide which of these two requests is the least risky, so that the analyst accepts the most suitable one when granting the loan.

Let's start with the discriminant analysis, the first thing we are going to do is go to the "Analyze" tab and in the drop-down we are going to "Classify" and then choose "Discriminant", a new window opens where we must choose by positioning ourselves on the dependent variable "group" and then enter it in the "grouping variable" box with the arrow pointing to the right. Then we must define the range, so we choose the button that contains that instruction and we place a minimum range of 1 and a maximum of 2, since we only have these two numbers to define this dependent variable, then we choose "Continue".

Now we must position ourselves on the two independent variables, that is, equity and debt, and then enter it in the "independent" box with the arrow pointing to the right. Later we choose the button "Statistics" and a new window opens where we must mark the boxes of "Means" and "Fisher's" then "Continue" and finally "OK".



The results viewer will open in a new window and we will be able to see the "Processing summary for case analysis" There we can see that the 16 cases (100%) were processed and no case was excluded.

Resumen del procesamiento para el análisis de casos

Casos no ponderados		N	Porcentaje
Válidos		16	100,0
Excluidos	Códigos de grupo para perdidos o fuera de rango	0	,0
	Perdida al menos una variable discriminante	0	,0
	Perdidos o fuera de rango ambos, el código de grupo y al menos una de las variables discriminantes.	0	,0
	Total excluidos	0	,0
Casos Totales		16	100,0

In the following box that represents the group statistics, we can see the mean and the standard deviation for both the groups of failed clients and for the compliant clients. The cut-off point of the discriminant for the two groups is also observed: the cut-off point for the equity has a value of 7, which implies that if the equity is less than 7 the client is classified as failed and if it is greater than this value , the client will be classified as compliant.

Estadísticos de grupo

group		Media	Desv. típ.	N válido (según lista) No ponderados	N válido (según lista) Ponderados
failed clients	heritage	5,000	2,0709	8	8,000
	debts	5,000	1,8639	8	8,000
compliant clients	heritage	9,000	2,2891	8	8,000
	debts	3,000	1,7444	8	8,000
Total	heritage	7,000	2,9518	16	16,000
	debts	4,000	2,0268	16	16,000

The same occurs with the cut-off point for outstanding debts, as we can see it has a value of 4, which indicates that if the client has outstanding debts greater than 4, it is classified as bankrupt and if their outstanding debts are less than 4, will be classified as a compliant customer.

The following table to take into account is that of the eigenvalues found in the summary of the discriminant canonical functions:

Resumen de las funciones canónicas discriminantes

Autovalores

Función	Autovalor	% de varianza	% acumulado	Correlación canónica
1	1,716[a]	100,0	100,0	,795

If we square that term and multiply it by 100, we will obtain the percentage that this function is capable of achieving when explaining the variance, so:

(0,795)2*100=63,2%

The experts affirm that a percentage greater than 45% is a positive indicator of the variance, so since we obtained 63.2%, we can affirm that the function is valid for what we want to do.

Now we will observe the Wilkes Lambda value to know if the function is statistically significant, we can realize that we obtain a value of 0.002 and that it is also a number much less than 0.5. As we have explained in previous articles, since it is much lower than this coefficient, we can conclude that it is indeed statistically significant.

Lambda de Wilks

Contraste de las funciones	Lambda de Wilks	Chi-cuadrado	gl	Sig.
1	,368	12,987	2	,002

The following table to take into account is that of the standardized coefficients of canonical discriminant functions, these values tell us which ones contribute the most to our function, it is important to note that these values range between -1 and 1, whichever value is closest to the unit, it is in short, the one that has the greatest weight in the function. Of both values, the one that corresponds to equity is the closest to 1, since it has a value of 0.922 and therefore, it is the one that contributes the most to the function.

Coeficientes estandarizados de las funciones discriminantes canónicas

	Función
	1
heritage	,922
debts	-,686

We now turn to the last table of this summary that corresponds to the coefficients of the classification function. It is from these coefficients that we are going to generate the discriminant functions with which we are going to be able to classify the new individuals, therefore, this box is the most important of all.

Coeficientes de la función de clasificación

	group	
	failed clients	compliant clients
heritage	,777	1,813
debts	1,296	,364
(Constante)	-5,876	-9,396

Funciones discriminantes lineales de Fisher

We go first with the function that we must generate starting from the failed clients, our predictive function being the constant to which we will add the coefficient that corresponds to the patrimony, multiplied by the value of the patrimony of the new client, plus the debt coefficient multiplied by the value of your debts.

Let us remember that the first applicant that the analyst had to evaluate had a net worth of 10.1 and his debts payable were valued at 6.8; While the second applicant had an equity of 9.7 and his debts were 2.2, with these data and those obtained in the last table of the summary we can now generate the functions of group 1, which correspond to the failed clients and would remain then as follows:

For applicant 1 = [-5.876 + 0.777 x (10.1) + 1.296 x (6.8)] = 10.7845

For applicant 2 = [-5.876 + 0.777 x (9.7) + 1.296 x (2.2)] = 4.5121

We repeat the operation to generate the functions of group 2, which, as we already know, belong to fulfilled clients, but this time with the coefficients belonging to that item, therefore the functions will be:

For applicant 1 = [-9.396 + 1.813 x (10.1) + 0.364 x (6.8)] = 11.3905

For applicant 2 = [-9.396 + 1.813 x (9.7) + 0.364 x (2.2)] = 8.9909

The recommendation that we can make to the financial institution analyst is to choose the new applicant, whose values that are evaluated in the functions are the highest and in this case, it is the first applicant who counts those values, which are: 10.78 and 11.39 (values higher than 4.51 and 8.99 corresponding to the second applicant).

32.1 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

THIRTYTHREE

× EXPONENTIAL DISTRIBUTION

The exponential distribution is equivalent to the discrete geometric distribution, but for continuous random values and we know that we are in the presence of an exponential distribution when, for example: We are interested in knowing the time it takes for a certain event to occur, but knowing that the time elapsed and measured from any time t until the event occurs at instant tf, it will not depend on the time elapsed in advance in which absolutely nothing happened.

33.1 Some examples of exponential distribution

1. When we successively repeat an experiment in a Poisson process but in equal time intervals and the time elapsed between the occurrence of two consecutive events, is in accordance with an exponential probabilistic model. To clarify a little more, suppose that we are going to measure the time elapsed between two injuries that have occurred in the body, which may be relevant.
2. The elapsed time in which a radioactive particle takes to disintegrate. This is very commonly used in science for dating fossils or some organic matter through the carbon 14 technique.
3. The time elapsed in an emergency service for the arrival of a patient.



4. The time it takes for a pharmacist to serve a client or for a doctor to carry out a certain examination.

33.2 The density function of a continuous random variable that is exponentially distributed is defined by

Being

The distribution function is determined as:

si

The formulas corresponding to the expected value and the variance have:

33.3 Applications of the exponential distribution

This type of distribution has a wide practical utility, which can be considered as a perfectly adequate model when we refer to a probability distribution of the time that occurs between two events and that in turn follow a Poisson process.

An exponential distribution can be derived from an experimental Poisson investigation, even with its same characteristics when denouncing the Poisson distribution, only in this case, the random variable is taken as the time it takes for an event to occur.

When we refer to the Poisson distribution, in this case the events per unit of time are described, while the exponential distribution is responsible for studying the time that exists between each of these events. Therefore, when the arrivals are Poisson, it can be said that the time between these arrivals is given by an exponential distribution.

Another big difference is that the exponential distribution is continuous, since the time between one event and another does not necessarily correspond to an integer, while the Poisson distribution is completely discrete.

When we are using the exponential distribution, it is important to assume that the arrival times are not random, that is, that a certain arrival time will not depend on another arrival or service carried out in advance, nor on the possible queue that may form. An important feature to take into account in this type of distribution is precisely that it has no "memory". We will try to clarify this point through an example: suppose that in a surgical room the attention time dedicated to a patient follows an exponential distribution. Given the case that a certain patient has already been operated on for 6 hours, the probability that the operation will last one more hour is going to be the same as if the patient had had two or 10 hours of operation up to now (whichever they may be). This is because the times of the operation have a great variability and this happens in the exponential distribution. Perhaps the next patient to be operated on will only last an hour in the operating room, since his surgery is likely to be much simpler than the previous patient's.



Let's go with the first example of exponential distribution: suppose we have an online computer terminal whose response time is x, specifically the variable x being the time that elapses between the user's query and the beginning of the system's response to this query, we also know that it has an exponential distribution and that the expected response time is 5 seconds. It is required to calculate the probability that the response time is at most 10 seconds.

As we know then the random viable follows the exponential distribution so that:

We can see that this type of distribution only depends on the parameter that we do not know at first. However, in the problem statement we are informed that the time elapsed between the user's query and the system's response has an expected time of five seconds, this indicates the expected value. On the other hand, we know that the expected value is equal to:

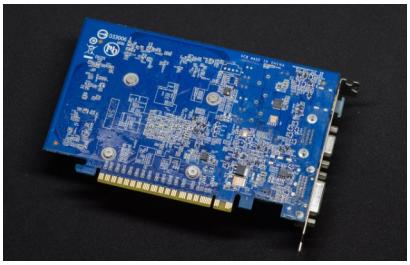
, therefore:

When calculating the probability that the response time is a maximum of 10 seconds, we can express it as:

We can conclude that the response time is a maximum of 10 seconds is 86.46%.

Example two of exponential distribution: a certain company manufactures video cards for PCs and the following information is available: the duration of the video cards expressed in years are distributed exponentially and 9.6% of

these video cards fail before after one year of use. It is required to determine the probability that a randomly selected computer video card will fail after two years of use.



X = lifetime of PC video cards in years

The answer to the question of what is the probability of a randomly chosen PC video card failing after two years of use expressed mathematically is:

In order to obtain the probability, we must calculate the value and we know that the probability distribution is given by:

Clearing we have:

To clear I must apply the natural logarithm to both sides of the equation

-0.1 = -

 = 0.1

Once we have the value of the parameter we can calculate the probability:

We can already conclude that the probability of a business PC card failing after two years is 81.87%.

At a bank teller window, service times are exponentially distributed with an average of 2.5 minutes. Suppose a customer arrives at the bank teller window at 11:00 a.m., what is the probability that the customer will still be at the teller window after 11:04 a.m.?



X = The attention time measured in minutes

We know that the average value is 2.5 minutes and also that the mean is equal to the expected value, so:

We must take into account that our variable is determined by the attention time expressed in minutes and if the client arrives at 11 in the morning, from that moment until 11:04 4 minutes have passed, so the probability that the client find in the window after four minutes have passed is:

Recall that the probability distribution function will always be equal to `P(X  x)`. But in this case, as well as many others that we have seen before, we need to know when the variable is greater than or equal to a certain value. That is why we must use the complement of the probability that is:

We can then conclude that the probability that a customer arrives at 11 in the morning and is at the window after 11:04 is 20.19%.

CHAPTER

THIRTYFOUR

FERMAT'S THEOREM AND MORE THAN THREE CENTURIES OF HISTORY

In 1607, an illustrious jurist and mathematician named Pierre de Fermat was born in Beaumont de Lomagne (France).

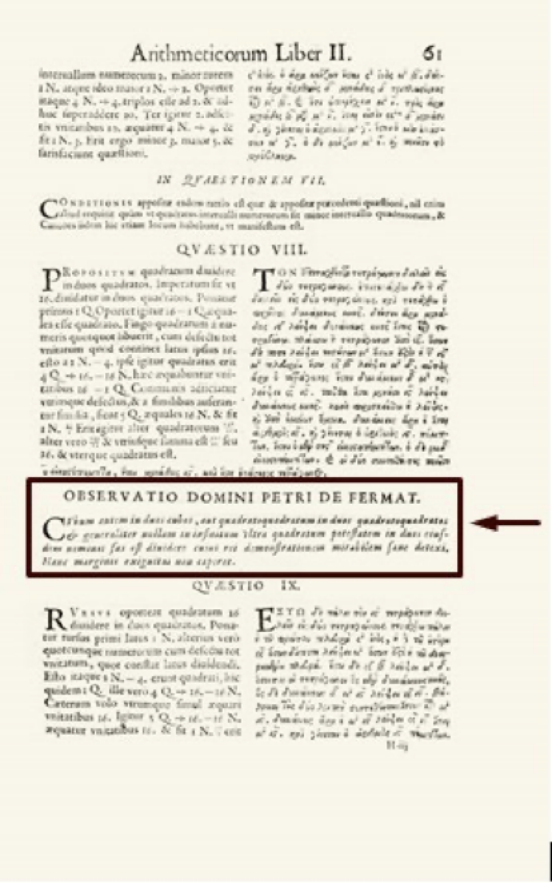
Eric Temple Bell, a Scottish-born mathematics historian, dubbed Fermat "Prince of the amateurs."



Fermat was educated at the University of Orleans and made great contributions in the field of mathematics. One of the most famous tells the story is that the mathematical genius had in his possession a bilingual edition of the book "Arithmetica de Diofanto" (Latin and Greek), on whose pages and apart from each problem, Fermat wrote comments or more good math puzzles.

In the course of time, each of these riddles have been solved by personalities such as Newton, Leibniz, etc. but one of them remained unsolved and is the one that was written, around the content embodied in problem VIII.

Fermat's note stated: "It is impossible to find a way to convert a cube into the sum of two cubes, a fourth power into the sum of two fourth powers, or in general any power beyond the square, into the sum of two powers. of the same class … "He also completed it with the following sentence:" … I have discovered for the fact an excellent demonstration. But this margin is too small to fit in it."



Arithmeticorum Liber II. 61

IN QVÆSTIONEM VII.

QVÆSTIO VIII.

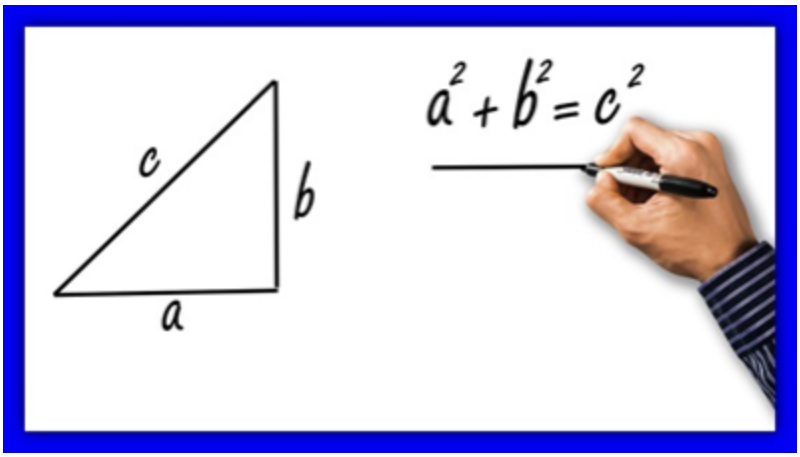
OBSERVATIO DOMINI PETRI DE FERMAT.

QVÆSTIO IX.

This puzzle was about the result of a number to “n” NO SE DICE ASI, as the addition of two numbers raised to “n”. In summary, what Fermat affirmed was that since “n” is an integer equal to or greater than 3, there would be no positive integers in this formula, where “x”, “y” and “z” fulfill this equality:

$$x^n + y^n = z^n$$

Nowadays, a large part of us and at some point in our lives, have used the Pythagorean Theorem, that famous formula that relates the length of the hypotenuse with that of the legs in a right triangle and where Fermat’s Theorem is applied for n = 2.



It is no secret to anyone that this equality is al reves, is equally true for all possible combinations and different numbers. But if we go further and ask ourselves what happens when n = 3? Will there be a numerical combination that by raising two numbers to the cube to the third power and adding them, we will obtain the cube of a third number as a result?

Suppose for a moment that we manage to demonstrate the above. What will happen to exponents greater than 3?

On the other hand, this annotation by Fermat was kept anonymous? for a long time and a great number of leading mathematicians have tried to solve this theorem without success. Reasons why, a lot of intrigue was generated around this riddle and for more than three centuries it was a true mystery.

34.1 GREAT MATHEMATICS PROVEN FERMAT'S THEOREM FOR SOME CASES

The first to make progress in this regard was Fermat himself, who managed to show that his theorem did work for the case n = 4 and for this, he used a certain variant of the principle of induction with the infinite descent technique.

Another important mathematician who made a great contribution was Leonhard Euler when he was able to prove Fermat's Theorem for the case n = 3, although it is true that an error was later found in this proof. Other contributions pre-established by Euler himself, allowed to find the correct solution and that is why, it was considered in mathematical circles, that Euler had proved the theorem for this case.

Even by this failed proof, the certainty arose that some complex numbers behave differently from integers.

34.1.1 Sophie Germain

The next step was taken by mathematician Sophie Germain. Where she established Fermat's conjecture for a specific case that expresses: If "p" and also "2p + 1" are both prime numbers. The Fermat expression determined for a power "p" would be fulfilled when none of the "x", "y" or "z" were divisible by "p".

Sophie Germain managed to prove the conjecture for every number "p" less than 100 and another mathematician named Adrien Marie Legendre, proved this case for all numbers less than 197.

But in 1825 it was when Legendre together with Peter Gustav, were able to generalize the proof from Euler, only for the case n = 5. Later Lamé manages to prove the theorem in 1839 for when n = 7.

Many years later (1955), two Japanese mathematicians argued that all elliptical curves, although they were of different shapes, could be considered as camouflaged modular shapesm?. They were called: Goro Shimura and Yutaka Tamiyama.

But they ran into the problem that to confirm or disprove this conjecture, there are an infinite number of different elliptic curves, so proving that every possible elliptical curve has a similarity to some modular shape was simply an impossible task.

It was not until 1982 when a mathematician named Gerhard Frey came up with the idea of comparing elliptic curves as a solution to Fermat's Theorem, by means of the following formula:

```
y ^ 2 y2?= x (x-ap) (x + bp)
```

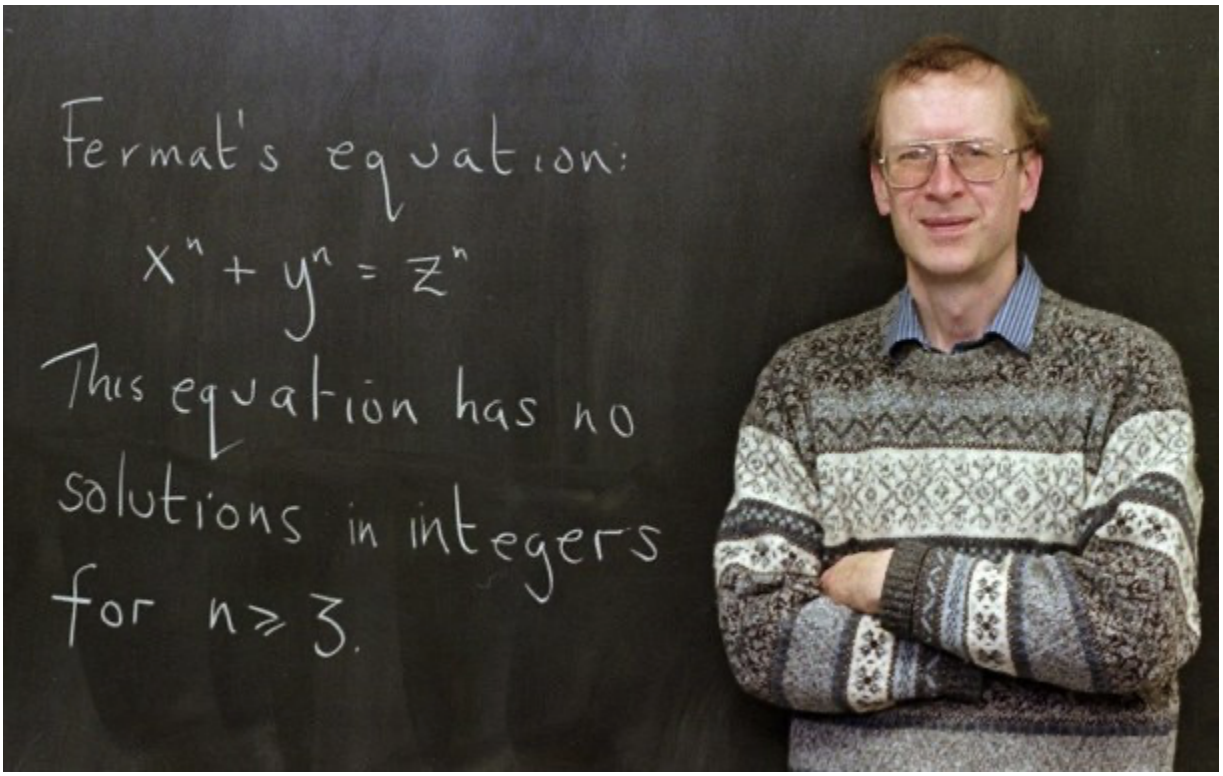
However, in theory, this elliptical curve did not have an associated modular shape and therefore, only one of the two conjectures could be true, since they contradicted each other. So if there was an elliptical curve that corresponded to Fermat's Theorem, we could assume that all elliptic curves would not necessarily have an associated modular shape.

Discovering which of the two propositions was the correct one would indirectly lead to solving whether Fermat's Theorem was true or not, since if a way was found to know if for each possible elliptic curve there was an associated modular form, as had been proposed by the Japanese Tamiyama and Shimura. There would then be no elliptical curve that would correspond to Fermat's Theorem.

34.1.2 Andrew Wiles

This mathematician born in 1953, encountered Fermat's Theorem for the first time at the age of 10, in a book that dealt with this dilemma, in a bookstore that was on the way home from school. The theorem shocked him since despite its simplicity, even he could understand it at such a young age, but at the same time it was so complex that no one had been able to solve it three centuries after its promulgation. Even a large number of illustrious mathematicians claimed that it could not be solved.

At that time, Wiles had full knowledge that his mathematical abilities and skills were not enough to try to solve the riddle, so he forgot it to return to it in 1986.



Credit: Charles Rex Arbogast / AP

Andrew believed that the secret to solving this conjecture was in geometry and specifically in achieving a mathematical representation of all elliptic curves. In addition to comparing them with their associated modular forms, but he also knew that these are abstract and symmetric functions, found in the plane that represents imaginary numbers.

Following his belief, Wiles developed a mathematical method that allowed him to compare each of the infinite elliptical

curves, with the also infinite modular shapes, but obviously without the need to compare them one by one. This titanic work took him 7 years of work.

During these 7 years, Andrew Wiles did not tell anyone about his secret project, because he thought that no one would take it seriously and after this period of time, the persevering mathematician showed his colleagues the solution to Fermat's conjecture. Thus he managed to summarize in numbers and letters, more than 350 years of attempts to solve the mystery.

He presented his proof in 1993 and had to go through the usual review process, to check his theory. However, in August of that year they realized that their hypothesis contained an error that was in one of its sections, which of course, greatly disappointed the poor mathematician.

Only he failed to daunt him and spent the next year trying to fix the flaw and just when he was about to abandon the search, he managed to solve it.

For the month of September 1994, Wiles managed to finish the last test and was able to confirm what Fermat said, whose validity had not been demonstrated since his proposal in 1642. This heroic feat led him to win the Abel prize for mathematics and together with he got nothing more and nothing less than $ 700,000.

If we reflect on the path of the immense effort and the complicated mathematical tools that important specialists in the area have used, to demonstrate this conjecture raised by Fermat. Also comparing them with the small note written in 1642 by the illustrious mathematician in the margin of a book, where he clearly stated that he did not have enough space there to prove it. We cannot help but wonder if Fermat had proposed a very elegant and simple solution to his theorem, in which he outlined that there should be no exponent greater than n = 2, for the equality to be fulfilled.

Although it is true, that Fermat himself tested his conjecture for the specific case when n = 4. It is no less irrefutable than the theorem at that time, it was not verified for all the remaining values greater than 2 and this fact is so relevant that Fermat never wrote about it again, in his remaining 30 years of life.

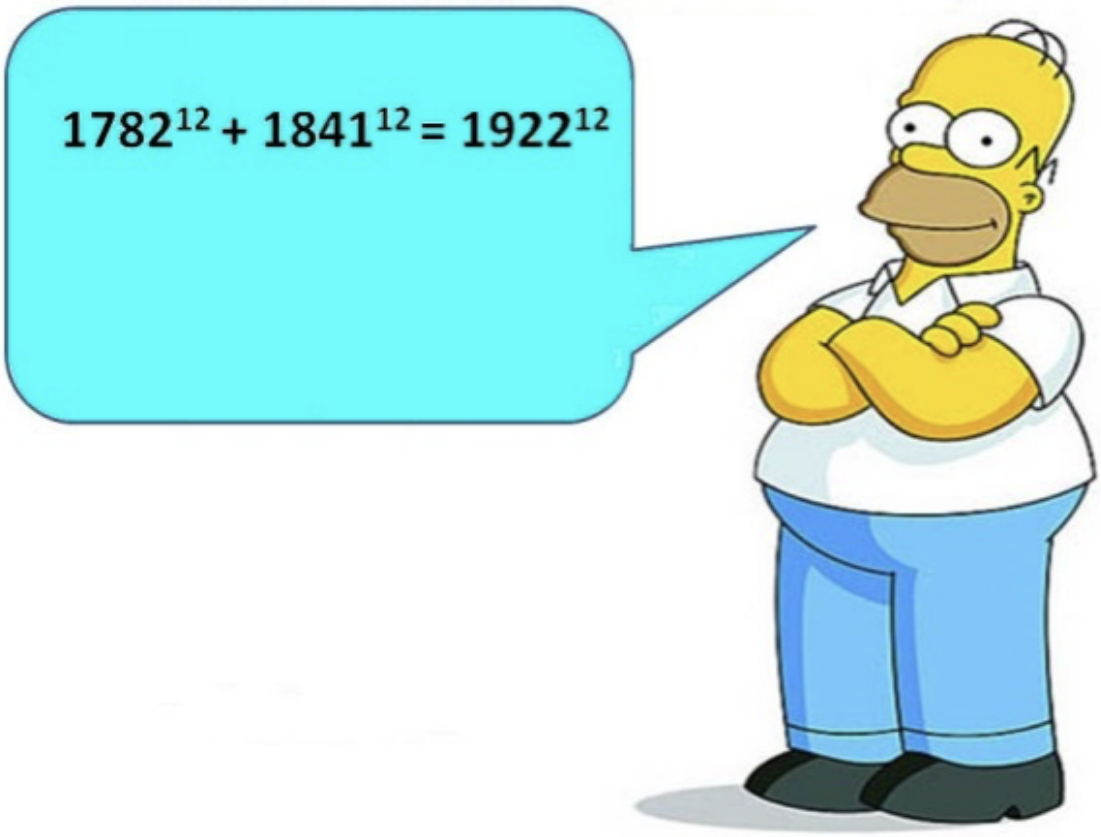
This incredible story has permeated even TO the general public, even those unfamiliar with mathematics. To such an extent that from time to time, references to the theorem appear in popular culture.

One of the most curious examples is a scene that appears in the series "The Simpsons", in which Homer is in front of a blackboard, where we can appreciate the following equality:

```
398712 + 436512 = 447212
```

If we realize it, this formula coincides with the case n = 12 of Fermat's Theorem:

```
x ^ 12 + y ^ 12 = z ^ 12
```



The curious thing is that if we do the test in any calculator, we will realize that the equality is fulfilled. So Homer could have found a perfect example, capable of contradicting Fermat's conjecture and Andrew Wiles's later proof, right?

The reality is that this formula that appears in the series is nothing more than a mere illusion. Since in this case, the numbers are so immensely large that they do not usually fit on the screens of common calculators and the difference is so small, that somehow they are hidden, precisely those numbers that cannot be shown on the screen. In fact, the Gaussians can demonstrate the calculations in detail and we will be able to realize that in effect, the formula is not fulfilled and therefore, Fermat effectively continues to be right in the statement of his theorem.

34.2 About the Author

Graduated in Mechanical Engineering, and a master's degree in teaching component, I gave classes in several institutes of mathematics and physics, but I also dedicated several years of my life as a television producer, I did the scripts for mikes, the camera direction, editing of video and even the location. Later I was dedicated to SEO writing for a couple of years. I like poetry, chess and dominoes.

CHAPTER

THIRTYFIVE

FIBONACCI SERIES

35.1 The Fibonacci series, the golden ratio, and how they describe the universal proportions of the world around us

Leonardo de Pisa was an Italian mathematician who is better known throughout the world as Fibonacci. This mathematician discovered a sequence commonly known as "The Fibonacci series"; he came up with this idea when calculating the number of rabbits that could be bred over a period of several months.

Suppose that at the beginning of the first month we have a pair of newborn rabbits. Therefore, we have one (1) pair of rabbits that will take a month to develop enough to be able to mate. So at the end of the first month, we mate this pair of rabbits and, adding together the number of pairs in this generation and the previous generation, we have 1 + 0 = 1 couple—the same pair of rabbits, because the babies have not yet been born.

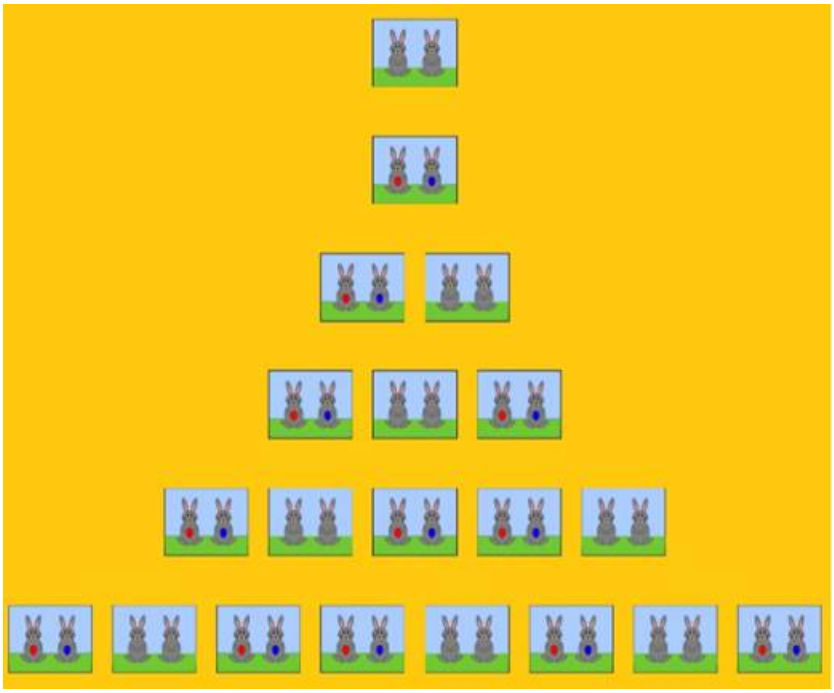
Now, at the end of the second month the first couple gives birth to a second pair of rabbits and then mates again. The newborn pair is (of course) not yet matured and the next pair of babies has not yet been born, so we have 1 + 1 = 2 pairs of rabbits.

By the end of the third month, the first pair of rabbits gives birth to a third pair and mates again. The second pair is now mature and mates. The first pair has already sired two pairs of rabbits, but neither of these pairs has sired any of their own children yet. Two pairs—the ones from one month ago—survive into this generation, but only one pair—the one from two months ago—is old enough to birth a new pair for this generation. Therefore, the number of pairs for this month is: 2 + 1 = 3

At the end of the fourth month, the first pair of rabbits has sired three pairs, while the second pair has sired their first pair of rabbits. So we have one pair for each of the rabbits in the previous month, 3, plus one extra pair for each of the pairs two months ago, 2, because only those pairs are old enough to produce children for this generation. This gives 3 + 2 = 5 pairs of rabbits this month.

If we keep doing these calculations from the starting point of 0 and 1, adding the previous two numbers together, we can continue the sequence:

- 0 + 1 = 1
- 1 + 1 = 2
- 1 + 2 = 3
- 2 + 3 = 5
- 5 + 3 = 8
- 8 + 5 = 13
- 13 + 8 = 21 and so on



35.2 The Fibonacci sequence in nature

This type of mathematical pattern is found in countless places within nature. For example, the number of petals a flower has almost always matches a number in the Fibonacci series. Some flowers have 3 petals, you will find others that have 5 petals, some will have 8, and you can even find flowers with 13 petals. Much less often will you find a flower with a number of petals that does not match a Fibonacci number. That is, with 4, 6, 7, 9, 10 or 11 petals.

The numbers that belong to this series are presented in a big part of the world that surround us.

In the year 1753 a Scottish mathematician named Robert Simson discovered that the quotient of two consecutive numbers in the Fibonacci series tends towards 1.6180339… as the numbers get larger. The result will always be alternatively somewhat above or somewhat below 1.6180339… but trends closer and closer without reaching it absolutely.

The number to which the relationship between two successive numbers of this same series converges is called the golden ratio. It is an irrational number, like the more well-known irrational numbers pi and e, and is denoted by the Greek letter phi.

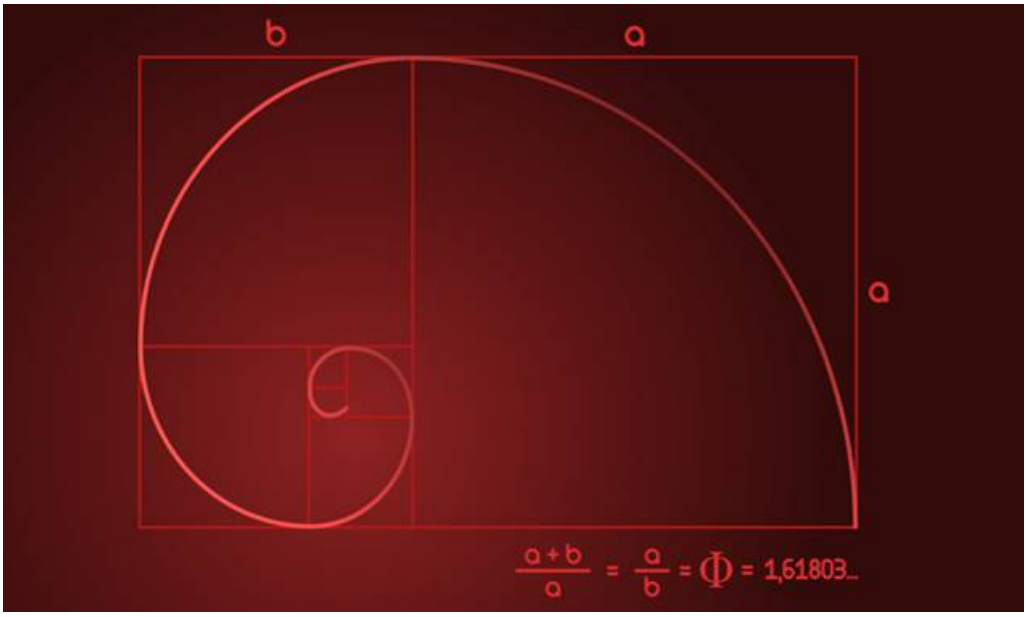
If you closely track the angular positions of the seeds of a sunflower as they spiral out from the center, you may notice that each seed is at a certain fixed angle from the one next closest to the center, and that this angle is approximately 137.5º. This is called the golden angle, and it is obtained by partitioning the 360º degrees of a circle into two parts according to the golden ratio.

This angle allows the seeds to pack into the space available in the most optimal way, that is, with the least leftover space. This causes the seeds or florets to completely cover the disk of the sunflower in a characteristic spiral pattern. This angle allows the new leaves that are generated in the sunflower to not block the sun for the previous leaves and also cover the maximum amount of surface, thus receiving as much sun as possible. The same phenomenon occurs with the leaves of an artichoke.

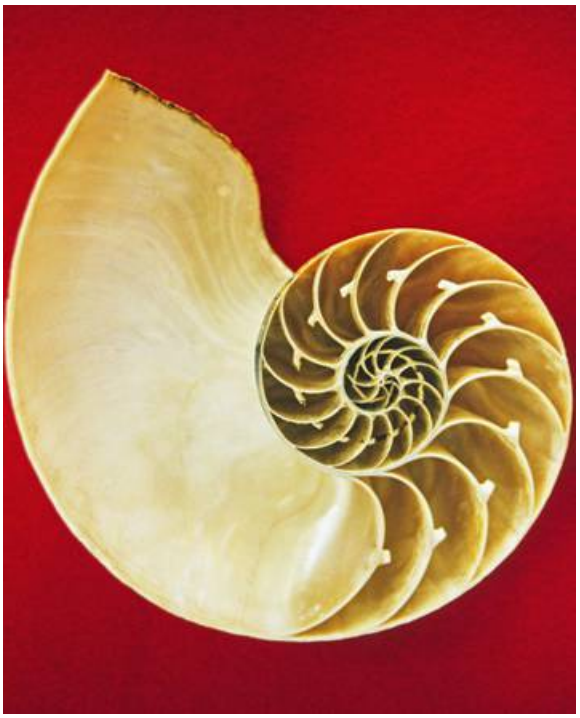
But it does not end there. If you count the spirals that form in the center of a sunflower, you will realize that there are 89 spirals in one direction and 55 in the other; they can also have 144 and 89. Both are successive pairs from the same illustrious sequence.

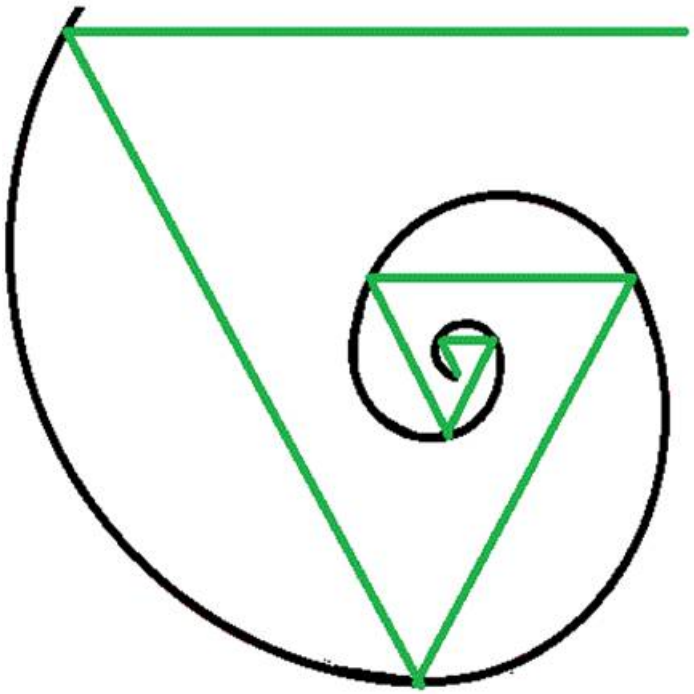
Trees do not escape this phenomenon. If you look closely at the angle that is formed between two consecutive branches, you may realize that they too have an angle of approximately 137.5º between them.

The sequence discovered by Leonardo de Pisa is also related to the so-called golden spiral, which is generated by drawing a series of adjacent squares, the sides of which are made up of the terms of the Fibonacci series. The spiral is formed by combining quarter-circle arcs with radii equal to the side lengths of these squares.



The shell of a nautilus (a type of cephalopod mollusk) has a similarity with the golden spiral, only that instead of be formed with arcs through the sides of squares, it is formed with arcs through the sides of equilateral triangles. For a given fixed side length of the starting polygon, Fibonacci spirals formed from triangles spiral in more tightly than those formed from squares.





Not satisfied with the similarities described above? We also see that equivalent spirals are present in certain galaxies and hurricanes.





35.3 The Fibonacci series and the golden ratio in art

Great composers of the 20th century, such as Olivier Messiaen, Delia Derbyshire, Béla Bartók, and the band Tool, used this famous succession to invent new musical structures and to inspire their art.

The golden ratio, phi, has been directly involved in art for thousands of years, and was associated with the ideal proportions of certain ancient architectural structures.

This importance of the golden ratio in art and architecture may be related to this special construction: If one divides a distance into two unequal segments, such that the ratio of the lengths of the longer segment and the shorter segment is equal to the ratio of the lengths of the entire distance and the longer segment, these ratios will be equal to the golden ratio.

That is to say:

a / b = (a + b) / a

Where “a” is the longer segment and “b” the shorter.

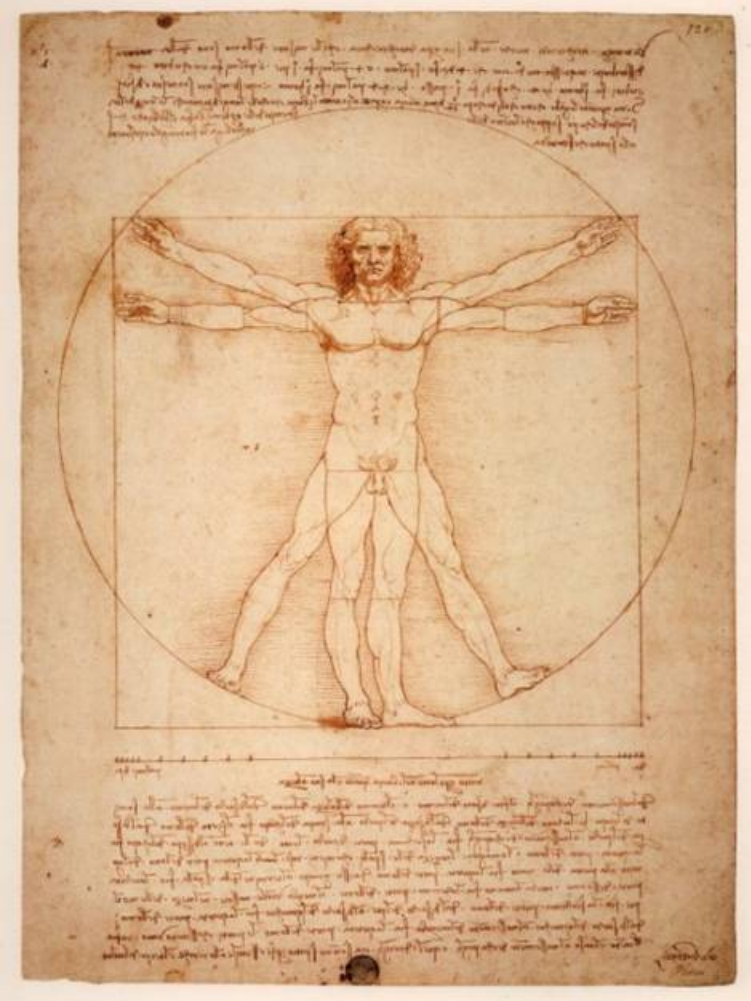
The Pyramid of Giza has a length of 230 meters on each side of its base and its height is 146 meters. The relationship between the two measures is approximately 1.575, which is quite close to the golden ratio of 1.618.

A rectangle whose length and width satisfy the golden ratio is called a golden rectangle, and is considered one of the most visually satisfying geometric shapes.

Even the famous mathematician and sculptor Phidias, born in 500 BC, is believed to have applied the golden ratio to the design of sculptures in the Parthenon.

The Franciscan friar, economist, and mathematician Luca Bartolomeo de Pacioli was highly recognized for being one of the early contributors to the field of accounting and inventor of double-entry book-keeping. He published a mathematical treatise in 1509 called “De divina proportione”, which was illustrated by none other than Leonardo da Vinci. He claimed that “without mathematics there is no art” and intended to reveal the mathematical secrets of harmonious forms to the artists of the time with this treatise, using the golden ratio as his main tool.

Leonardo da Vinci himself, through what he called the “sectio aurea”, or “golden ratio”, exhibited the ideal symmetry in his paintings “The Mona Lisa”, “The Last Supper”, and “The Vitruvian Man”.



Da Vinci claimed a relationship between ideal human proportions and the golden ratio. He observed that the ratio between height and the distance from the ground to the navel approached phi for particularly harmonious figures. Similarly, the ratio of the distance between the fingers and the shoulder and the distance from the elbow to the fingers seemed also to approach this number. "The Vitruvian Man" was designed with these ideal proportions.

As if that weren't enough, this sequence has multiple applications in mathematics, computer science, and game theory. As one example, take this mathematical curiosity: add any ten consecutive numbers from this famous series, and the result will always be a multiple of 11. Clearly, the Fibonacci series is at the center of countless fascinating mathematical anecdotes.

35.4 Original Author

I Graduated in Mechanical Engineering, with a Master's degree in the teaching component. I gave classes in several institutes of mathematics and physics, but I also dedicated several years of my life to being a television producer. I did scripts for the mics, camera direction, editing of video, and even the location. I then wrote for search engine optimization for a couple of years. I like poetry, chess and dominoes.

CHAPTER

THIRTYSIX

FRACTAL INGLES

36.1 Fractals and their novel way of better explaining the world around us

A fractal is a geometric body with an irregular arrangement that is repeated at different scales. This term was proposed by Benoît Mandelbrot in 1975, whose term is derived from the Latin fractus, which comes from fractured or broken. We can find many structures in nature of the fractal type.

Benoît Mandelbrot was a Polish-born mathematician, well known for his contributions on fractals and is considered to be the promoter of this field in mathematics in the early 70s. At that time the computer was beginning to become popular, which he knew use to design the best known examples of fractal geometry that are: The Mandelbrot set, in addition to the Gaston Julia sets, the latter developed the mathematics focused on fractals that Mandelbrot later developed.

Benoît is considered the father of fractal geometry and he knew how to focus this discipline when interpreting many objects that we can find in nature. In his book "Fractal Geometry of Nature" published in 1982, he expressed all his research concerning this field. It can be said that fractal geometry is a more exact approximation when it comes to explaining certain natural patterns, than the commonly used conventional geometry.

Mandelbrot became interested in the patterns that govern the cracks, ridges and fractures found in nature, a subject that at that time had not preoccupied scientists. The mathematician held the theory that fractals are more natural in many respects and that therefore, they can be better understood intuitively by man than those objects that are based on Euclidean geometry and that have been artificially smoothed.

Although it is true that the term fractal is rather recent, the bodies that we currently call fractals have been known since the beginning of the 20th century. The principles of what today is called the fractal dimension were established at that time through the theory of measurement.

According to Benoit B. Mandelbrot, a large part of nature is characterized by being highly irregular and also has infinite complexity. However, in this infinite complexity there are two islands of complete simplicity, one of them Euclidean and the other refers to a relative simplicity (fractal), in the latter, the irregularity is present but is equal to all scales.

For example, Mandelbrot commented that mountains are not cones, clouds are not spheres, and coastlines are not circles. In the same way, the bark of the trees is not exactly smooth and neither does the lightning travel in straight lines. That is why nature is ultimately fragmented and irregular and has a display of different levels of complexity.



If we observe reality, we can realize that these irregular patterns are described by Euclidean geometry with a clear deficiency, so it proposes a change of approach towards fractal geometry, as the ideal study tool for many natural systems that display this new complexity.

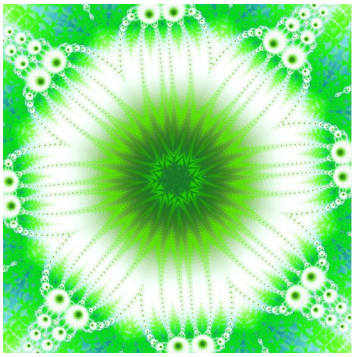
We can find fractals everywhere in nature, both in inert systems and in living systems and at all scales. Fractals can be observed in the formation of tumor cells if we refer to small scales. But on medium scales, we can name the structure that makes up the cerebellum or also the shapes of the dendrites.



Large-scale fractals can be found in the distribution of galaxies. The systems where we can find fractals are so extensive that this universality has managed to capture the attention of both philosophers and scientists.

The repetition of certain forms such as the branched structures that can be observed in many vascular transport systems of both animals or plants, even the nervous systems comply with these patterns and this is the product of the adaptation of living beings to evolutionary processes, that have been developed over millions of years.

These patterns induce us to study the geometry of the amorphous, that is, the geometry that nature presents us with. In addition to universality, the main characteristic that separates fractals from other geometric forms is their peculiarity known as invariance or self-similarity in the face of scale transformations.



The characteristic of natural vegetables is to be the same or very similar to each other, on all possible scales. Since these levels of fragmentation or irregularity are repeated in an identical way throughout its structure and when it comes to fractals, each of the parts are equal to the whole and vice versa. Thanks to the property of self-similarity, the first mathematicians began to investigate them, but they considered them as something pathological or rather imperfect.

Selfsimilarity is said to all forms that have a structural similarity in the entire geometric object and also in various parts of itself, that is, the similarity exists at different scales.

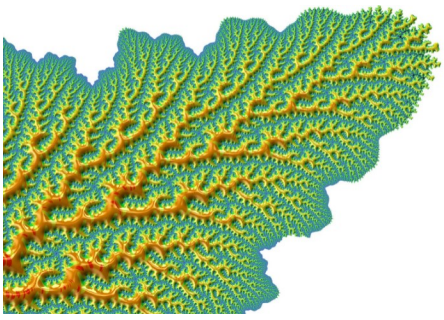
When we refer to an exact self-similarity, it is when several parts of a whole are repeated and also have the same pattern with the whole, in this way a multiple or rather infinite repetition of the initial properties can be successively amplified.

When we refer to approximate selfsimilarity or also called quasi selfsimilarity, it is when there are small differences between the shape of the part and the shape of the whole, this type of selfsimilarity can be found very frequently in nature.



When we are in the middle of nature we can glimpse mountains landscapes, white clouds scattered in the sky, a lush forest that refreshes the environment and endless forms around us, which can hardly be represented using Euclidean geometry made up of lines, planes and elemental curves.

The leaves of a fern with the branches of a tree reproduce on a smaller scale and are very similar to the structure of the whole plant. In the same way it happens with the branches of the bronchi in our lungs, the branches of the arteries, veins and irregularities instead of smoothing, remain at the same level and are similar to the entire model.



Mandelbrot designated with the word fractal, these configurations both irregular and selfsimilar.

Fractals should be granted extraordinary properties such as their finite areas contained in perimeter with divergent lengths. We can observe this in the famous paradox called “the length of the coast of England”, imagine this coastline, which, like most coasts, does not have a perfectly defined length. In this sense Lewis Fry Richardson (English mathematician, meteorologist, physicist and psychologist) and one of the pioneers in fractals, made the first observation regarding the longitude measured by a coastline.

Richardson wanted to find the probability of going to war between two countries and the length of the border that they both have in common. But in collecting data, he realized that there was considerable variation in published lengths with respect to international borders. For example, between Belgium and the Netherlands, some publications referred to 380 km, while others stated 449 km. In the same way, there were significant differences between Portugal and Spain, some publications affirmed a dividing line of 987 km and others, 1214 km.

Then Richardson realized that the length will depend on the method used when measuring, since any land mass has specific characteristics on all scales ranging from a size of hundreds of kilometers, to very small fractions, which they can be measured in millimeters or less. That is why there is no obvious size of the smallest feature that must be taken into account when measuring and therefore there is no single perfectly defined perimeter of a continental mass. Of course, there are approximations when making assumptions regarding the minimum size of the feature to be measured.

It should be noted that this is a consequence of the fractal nature of coastlines, since this problem is totally different from measuring other simpler edges. Suppose we want to measure the length of a certain metal bar, although it is true that it is not perfectly straight, it is much easier to idealize that it is. Therefore, it is possible to measure with any device within a small degree of uncertainty, that is, the more accurate the measuring device becomes, the closer the results will be to the actual length of the bar. Of course, when we are measuring a coastline, the problem becomes much more complex.

When we think of the concept of length, the Euclidean distance comes to mind, where a straight line is the shortest distance between two points. But going further, we can think of a geodesic length, which is nothing more than the shortest line that joins two points that make up a surface. Suppose we have the surface geodesic length of a sphere, also called the length of the great circle and it is measured through the arc generated if the sphere intersects with a plane that contains both points and that also passes through the center of the sphere.

When we want to measure arc lengths of certain geometric curves, we can approximate the measurement of the length of a curve, by adding the means of each segment and connecting each of its points. If we use few segments to approximate the curve, the estimate will be very low. But if we use shorter and shorter segments, we will get closer and closer to the actual length of the curve.

On the other hand, a fractal is a curve where its degree of complexity is not minimized with increasing scale and its approximations to a smooth curve, as the precision of the measurements increases it approaches a single value.

Theoretically, the length of a fractal diverges to infinity, so if you want to measure the length of any coastline with a resolution that tends to infinity, the cumulative length of each of the folds that are infinitely smaller, would generate that the line of the coast would grow indefinitely. Of course, this reasoning is based on the assumption that space can be subdivided indefinitely. This assumption has a plausibility that comes from Euclidean geometry, but it is a philosophical speculation and would not correctly reflect the changing reality of the concepts of distance, space as well as at the atomic level (one nanometer). There are orders of magnitude smaller than atoms and the smallest measurable unit in the universe is the Planck length.

If we measure the coastline with segments of 1 cm or less, it cannot be considered a stable reality since erosion and multiple effects of marine dynamics constantly change the environment, even this phenomenon can occur in some locations at larger scale and this is the reason why the concept of an infinite fractal cannot be strictly applied to the coastline.



There are certain practical considerations to properly choose what is the minimum detail and the magnitude that should be considered, that is, what is really the unit in which the measurement should be expressed. Suppose that a coastline is measured in kilometers, therefore, small variations that are much less than 1 km can be easily ignored. While if you want to measure the coast in centimeters, you must consider those small details, which are there with that order of magnitude.

Thus, certain homogeneous criteria must be established in order to delimit the coastline in each case, such as tidal flats or estuaries. That is why for different measurement units, the fact of using different measurement methodologies contributes to destroying the usual certainty where the units of measurement can be converted from one unit to another, through a simple multiplication.

To summarize, if the coast of England were measured in 200 km segments, the mean length of the coast would give an approximate result of 2400 km.



But its masters a scale interval or segments of 50 km, the average length of the coastline would be about 3400 km.

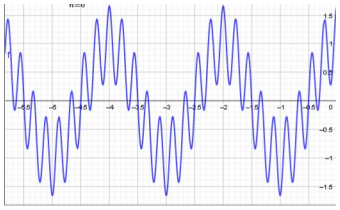


The paradox of the coast can easily be extended in three-dimensional space to the concept of fractal surfaces.

Euclidean geometry does not serve to represent very well the environment created by man, which is loaded with structures that are based on the straight line, parallel or perpendicular planes, spheres and circles. This type of geometry does not serve to describe our buildings, the instruments we use and many designs generated in the artificial world. However, it is very difficult to explain the elements of nature whose basic structure is quite irregular and is repeated at different scales. The lightning, the trees, the clouds, the coasts and other elements in addition to their irregularity have an amazing order, since their forms redound at different scales within the same nature.

36.2 Classic examples of fractals

The first example that was considered a fractal was the Weierstrass function dating back to 1872 and which is considered a fractal because it is a continuous function but not differentiable at any point.



Then other examples appeared with similar properties but perhaps with a slightly more geometric definition. These

examples could be built starting from the seed or initial figure, to which simple geometric constructions were added. The succession of figures obtained was approaching a limit figure that represents what you hear today we call a fractal set.

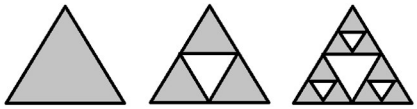
Helge von Koch in 1904 contributed a curve that also has no tangent at any of its points and that is named after him "the Koch curve. Its construction is quite simple, we start from an equilateral triangle and in each of its three equal segments, we subdivide them into three equal parts, if we eliminate the central subsegment and there we build another equilateral triangle, thus we will obtain a Star of David. If we repeat this procedure, building small equilateral triangles in the middle of each segment we will obtain a fractal commonly called "Koch's snowflake".



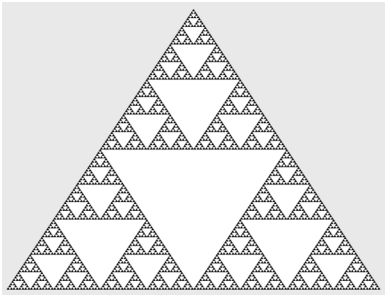
As we build triangles in the middle of the segments of each previous triangle, we will obtain a really intricate contour, since between the contiguous and very close points, we can get infinite zigzags. If we continue with the progression we can realize that the area of the snowflake converges to an area that is 8/5 times the area occupied by the original triangle. While the progression of its perimeter diverges infinitely. In other words, the Koch snowflake has a finite area, but it is bounded by an infinitely long perimeter.

36.3 The Sierpinski triangle

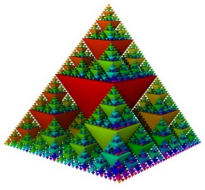
Waclaw Sierpinski devised the triangle that bears his name in 1915. Its construction starts from an equilateral triangle that is divided into four identical equilateral triangles and this is achieved through the union of the midpoints of each side, and then eliminate the central triangle. Subsequently, the previous process is repeated but with each of the new triangles obtained in advance.



This process is repeated infinitely again and thus we achieve the Sierpinski triangle as a result.



This triangle can also be represented in a three-dimensional way as we can see below:



36.4 Sierpinski's carpet

Sierpinski the same Polish mathematician from the previous construction and also generated what is commonly called the Sierpinski carpet. The construction of it starts from a square and later we place eight equal squares around it. As in the previous triangle, this process is repeated but to each of the eight newly created squares and again we repeat the process recursively to arrive at the expected result.

36.5 Julia's set

The mathematician Gastón Julia studied the behavior of complex numbers when they were iterated by a function and generated a family of very important fractals called "Julia's sets" that are obtained by means of simple quadratic functions. To build the Julia set, the following process must be followed:

Choose any complex number and build a sequence of numbers with the following steps, the first thing to do is define the complex number:

1)

2) , substituting in we have

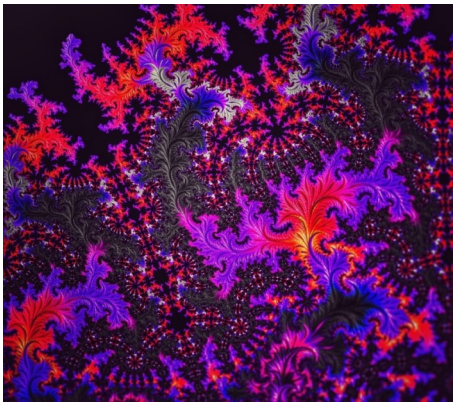
3) and following the sequence we will obtain the remainder, that is:

4)

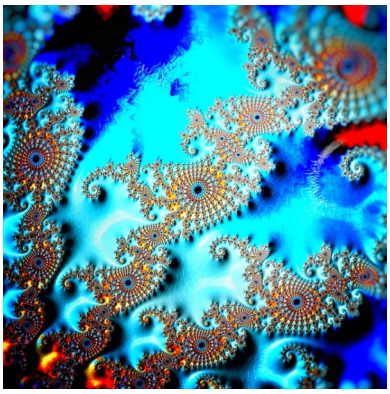
5) and so on we arrive at the formula of the sequence:

When the sequence is bounded, we can then say that z is part of the Julia set that we will call Jc; whereas when the sequence tends to infinity, it will no longer be part of the Julia set.

The Julia set is a laborious and complicated process, since all the previous steps must be repeated for any complex number z and in each case it must be decided whether or not this complex number belongs to the Julia set. Given the large number of calculations that are needed, it was not until the 80s that these sets could be represented, when the computer became popular and it was then that the corresponding graphs could be represented, the unfortunate thing is that Mr. Gastón Julia, could not get to see the result of these graphs or fractals.



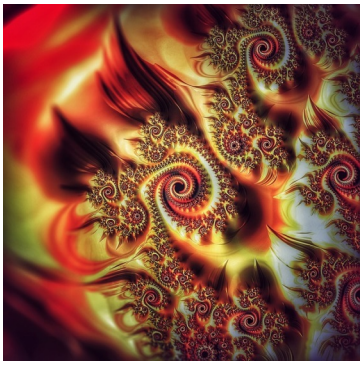
Each of the complex numbers that belongs to Julia's set generate a different graph, that is, from each one of them a specific fractal with bright colors is obtained.



In order to generate them, an algorithm called "escape time algorithm" is used, which is responsible for assigning a specific color to a point z, which in turn is translated into a pixel of the final image, for this it is necessary to discern several possibilities:

- If the result tends to infinity, we already know that it does not belong to the Jc
- If the result tends to zero, then z belongs to the Julia set
- If it oscillates between several states
- If the pattern you display is not discernible

The idea is to color according to the number of iterations that are necessary to identify the points that escape to infinity and generally another certain color is used that represents those points that have not deserted from Julia's set and these points are called " The Julia set filled ", the points that remain on the border are precisely called" Julia set "and the differentiation of colors is achieved after a large number of iterations.



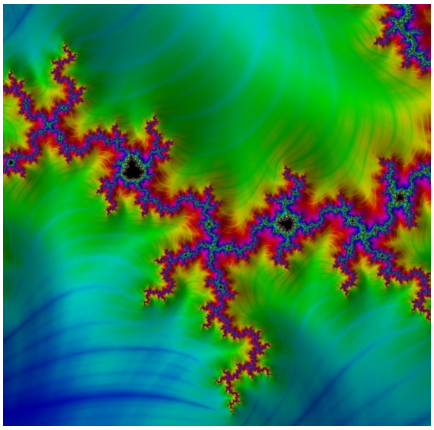
36.6 The Mandelbrot set

Mandelbrot had known about Gastón Julia's works since the mid-1940s, since his uncle was a professor at the Collège de France (Paris) of mathematics and recommended them for him to continue developing them. Although it is true that at that time they did not attract much attention, he returned to them at the end of the 70s, precisely when he began to apply mathematics through computers. It is important to emphasize that Mandelbrot worked at this time for the IBM company, specifically at the Thomas Watson research center located in New York.

At one point he received a commission to study the perturbations of electronic transmissions and the mathematician discovered that if he made a graph with the data of the perturbations he found a pattern of self similarity, but also, at all scales of its magnification. But not only that, Mandelbrot realized that this self-similarity could also be observed in the statistical graphs of the variations in the price of the stock market, in the prices of cotton, the fluctuations suffered by turbulent liquids and in a myriad of behavior patterns in different areas. At that time he devoted himself to researching Gastón Julia's previous works and studying the disturbances that exist in different areas through the use of the computer.

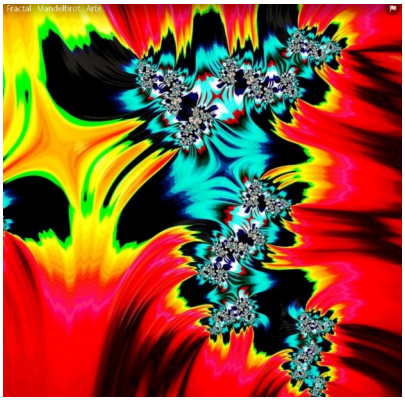
This is when “fractality” was first spoken of then to explain all these phenomena through the fractals of the Mandelbrot set.

We are going to intersperse Mandelbrot fractals in this sections of the text, although they do not have a direct relationship with that part of the article, but it seems important to us that they have a vision of what it is about.



To generate the set that bears his name, the mathematician makes a modification to Julia’s iterative process, setting the initial point as Zo = 0 and making the point c vary, so the Mandelbrot set is constructed with a recursive sequence:

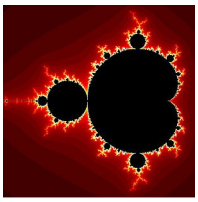
Suppose then that this sequence is bounded, if so c belongs to the Mandelbrot set, otherwise it is excluded.



For example, when c = 1 then we obtain the following sequence: 0, 1, 2, 5, 26, as we can see, it is a sequence that diverges since each time it gives us a larger number and therefore it is not bounded, so for this value 1 it can be said that it is not an element that belongs to the Mandelbrot set.

However, if c = -1 the sequence that occurs is: 0, -1, 0, -1,. . . , and we can see that in this case it is bounded, so that for this value (-1) we can conclude which indeed belongs to the Mandelbrot set.

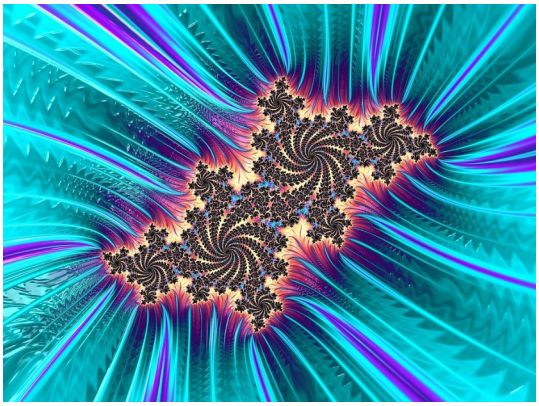
If we use the escape time algorithm, we can see in the following image that dark red represents the points that do not belong to the Mandelbrot set and this can be defined after a few calculations, while white indicates that it has taken check it and the black color represents the bounded points within the set.



Romero Schmidtke , Mandelbrot0, CC BY-SA 3.0

What is done in these cases in order not to calculate a large number of values, is to place a limit of p terms to decide, for example, if the first p terms of the sequence are bounded, it can be considered that the set belongs. Of course, as we increase the p-value, the image precision will improve.

It is important to take into account that those points that are distanced from the origin with values greater than 2: are considered not to belong to the set. It is enough then to find a single term that verifies: to know that c is not within the set.

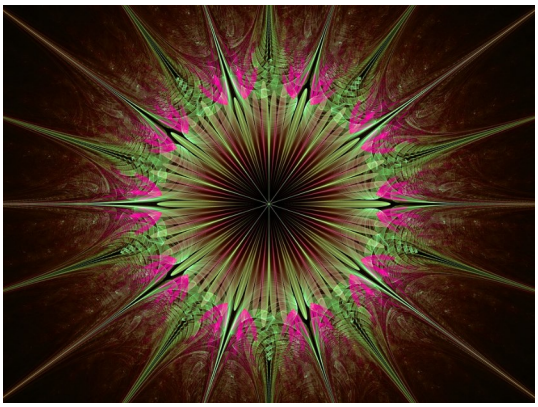


Fractal geometry has come to explain a large part of the natural phenomena that have been considered chaotic or irregular, since they have a specific shape, a pattern and a characteristic in common and that is that they are self-similar.

But fractals not only serve to understand natural forms of events, they are also applied in different disciplines such as astronomy, medicine, genetics, music, engineering, animation and the visual arts. Just as we entered Mandelbrot images interspersed with the text, in the same way, we will now include artistic fractals.

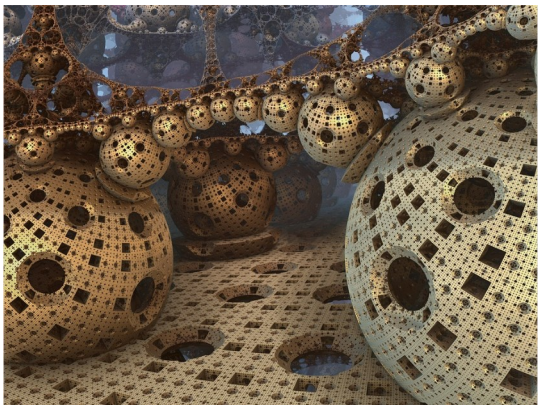


On the other hand, there are various processes in nature that have irregular shapes, when, for example, land and river water come into contact, almost all the branching processes of thousands of examples in nature bifurcate with objects similar to the first and give way to tree-like structures, including roots, coralline structures, and many porous elements.



The best known natural elements that have fractal characteristics are: DNA structure, crystals, trees, mountain ranges, ocean waves, coasts, algae, pineapple, proteins, mountain goat horns, nets fluvial, turbulent fluids, actin cytoskeleton, rings of Saturn, Romanesque cauliflower, snowflakes, heart rate, pulmonary and blood vessels, earthquakes and geometric optics, among others.

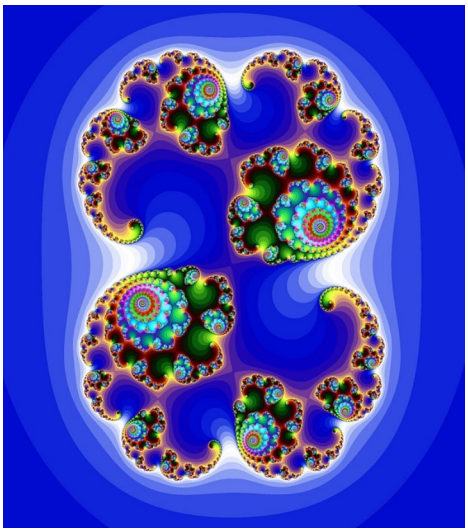
Fractal forms, in addition to presenting themselves in a spatial way in the objects of nature, also have their own and evolutionary dynamics of their complex systems, it is a dynamic that consists of cycles that start from a certain simple reality, but end in a new reality much more complex. But not only that, they are even part of more complex cycles that in turn are part of the dynamics of another much larger cycle. All these cycles of dynamic evolutions present the similarities of chaotic systems.



Music has a special facility to assimilate the language of mathematics and in this case it is no different. Some pieces by Mozart, Bach and Beethoven have integrated fractals and mathematics into their works, either intentionally or by pure intuition, these musicians made an analogy between the arrangement of notes and a fractal dimension. They are also used both in the rhythm and in the harmonic composition of any melody, even in the synthesis of sounds. This is based on what composition is called the “micro-modes”, that is, small groups made up of three notes, where they can be worked both vertically or harmonically as well as horizontally or melodically. But in addition, the earthquake can be treated with specific temporal sequences determined precisely by fractal sequences.

36.7 Fractals in finance

Experts say that current financial analysis systems do not explain market behavior and that the only way to understand it is by using fractals and chaos theory. The theory proposes that the crisis that exists worldwide is a demonstration that the indicators do not work. The problem is that although it is true that the proposition is interesting, the theory has not been proven in reality. He strongly attacks the Black Scholes model and Mandelbrot claims that if we were talking about astronomy instead of economics, all current economic theories would be discredited. A new path is proposed since the nature of markets is thought to be turbulent and if the behavior of market prices is observed, a fractal regularity is discovered, regardless of scale.



Although it is true that the behavior of the market is extremely hazardous. There are graphical simulations of the evolution of the market according to the standard model and also according to the fractal model and definitely, the latter simulates its behavior much better, in fact, there are graphs that denote that it can become indistinguishable. It may seem strange to us that it is distinguished between a series of random data, but it is conclusively so and not everything that is random is of the same type. At a theoretical level this theory is valid, it will be necessary to see if it can be verified in reality.

CHAPTER

THIRTYSEVEN

FREE DISTRIBUTION TESTING

Also called non-parametric tests, they are those that are based on a certain type of hypothesis whose observed data do not have a normal distribution. In general, these types of free distribution tests have results derived from their ordering and this somehow makes them easier to understand. However, non-parametric tests also have certain limitations, among which is their lack of strength when a normal hypothesis is raised and this results in that some test is not refuted even if it is false. On the other hand, when the sample is not proportional and given the case that the test does not correspond precisely to the question of the procedure, the hypothesis will need to change and of course, this is another limitation. Non-parametric test and its characteristics

- The hypotheses are strict
- Measurement is difficult to apply
- It is necessary for the observations to be independent
- Hypothesis tests are required There are several types of nonparametric tests and some of them are:
- The sign test
- The signed test of Wilcoxon ranks
- The Kruskal-Wallis test
- The Mann-Whitney U test
- Median of Modd
- Friedman's test The advantages of nonparametric or free distribution tests
- As it is not necessary in this type of tests to comply with strict parameters, they can be used in different situations.
- They are easier to understand, since they generally have simpler methods.
- They can be used in non-numerical data.
- Statistics of this type can be used even without the sample size, even estimating any related parameter for which the information is not available and this is because as the assumptions are less, they can be applied in multiple ways.
- In this type of test, the most important and appropriate specific information for the investigation process can be obtained.
- Non-parametric tests have greater efficiency compared to parametric tests in asymmetric distributions, that is, in those cases where there are aberrant or atypical values.
- The reliability level is what is actually specified in most tests. Disadvantages of free distribution testing
- These types of tests are not systematic.
- As its distribution varies, it is especially difficult to make the correct choice, since for a particular problem, there may be several tests.

- These tests cause some confusion, since their application formats are different.
- The qualitative information of the collected data can lead to the loss of information.
- Most likely, you will need to have a heavier backrest.
- Given the case that the sample is very large, the tests not for metrics have a relatively low efficiency with respect to the parametric ones, when it comes to fulfilling the assumptions.
- The hypotheses raised in non-parametric tests are usually less precise and this leads to an interpretation of the results in a more ambiguous way.
- For large samples, its application becomes very laborious.

37.1 The Sign Test

This is one of the simplest non-parametric methods to apply, since it is not necessary for the data to be normally distributed and therefore, it can be used in different ways.

The sign test can be used for two types of cases, when we are going to test the hypothesis to the median of a population. It is important to emphasize that when we use non-parametric tests, we are always going to refer to the median and not to the mean, since it is assumed that in this type of test there is no normal distribution.

Recall that the median is the central number of a sample group, so half of the samples are greater than the median and the other half are less than the median. The steps to obtain this data will be to order the samples from smallest to largest. If the number of samples we have is an odd number, the median will be (after sorting the data) the number that occupies the central position. However, if our amount of data is an even number, the median will be the sum of the two central data divided by two.

For example, if we have the following data: 2, 3, 3, 4, 5, 5, 6, 6, 7, as we can see the number of data is equal to 9 which is an odd number, so the median will be the data that occupies the central value, which in this case is 5.

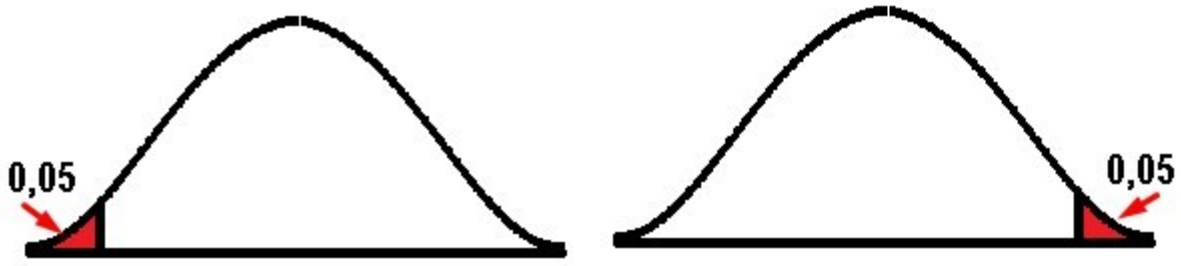
An example of a median for an amount of even data can be: 8, 9, 10, 11, 12, 13. In this case we must choose the two central data, add them and divide them by two: ((10+11))/2 = 10.5 The second case is when we want to contrast if there are differences between two populations, in this way we can know if one population is larger, smaller or different than the other. In this case we are talking about paired samples that are evaluated at two different moments, but between one moment and another, there is usually some intervention, which will produce some type of change between one sample and another. In the case of paired tests, it will not be necessary to test whether a median is greater or less and in this case, the variables must be ordinal or continuous and if they are ordinal, they can be ordered or ranked.

In paired tests, the null hypothesis is to try to verify that the population median is equal to a given value, while the alternative hypothesis, as opposed to the null, will be that the population median will be greater, less than or simply different from the given value. Let's differentiate one-tailed and two-tailed hypothesis tests

37.2 Single-Tail Test Definition

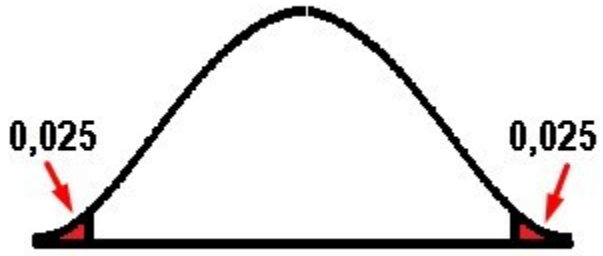
The single-tailed test means that the rejection region is at one end of our sampling distribution. This implies that the test parameter is going to be higher or lower than our critical value. If our sample falls within the rejection region either on the left or right side, depending on the case, this immediately leads us to accept the alternative hypothesis, instead of the null hypothesis.

When we believe that the population parameter is less than the assumption, the hypothesis considered will be the left-tail test, and on the contrary, if the population parameter is greater than the assumption, we will be in the framework of a right-tail test.



37.3 Two-Tailed Test

This test is used when the critical area or rejection region is at both ends of the distribution and the idea is to determine if the sample we are analyzing is within or outside of a certain range of values. On the other hand, instead of accepting the null hypothesis, the alternative hypothesis is accepted, when the value is within the two tails in the probability distribution. In this case is divided into two equal parts and therefore the critical value will be / 2. In general, the value of = 0.05 is established so that the critical region will be found on both sides, but with a value of 0.05 / 2 = 0.025. Both sides are considered in order to verify if the estimated parameter is greater or less than the assumed parameter, so that in this case, the extreme values act as evidence against the null hypothesis.



Hypothesis tests for a population median

Nomenclature: `P = statistic of the binomial distribution test Med_0 = hypothetical value of the population median x = lower frequency, either with a (+) or (-) sign n = sample size p = probability of success q = probability of failure p = q = 0.5` Let's go with the first example:

We have a sample of the weights in kilograms of 9 children with 5 years of age

Prove that the median is equal to 22.50 kg



As the statement of the exercise urges us to test if the median "is equal to" and at no point do they ask us to know if it is greater or less than, then we can immediately deduce that the test is bilateral or two-tailed, then the first thing is state the null hypothesis and the alternative. As we already know thanks to the table that shows us the hypothesis tests for the median of a population:

Ho = 22.5

Ha 22.5

The simplest way is to test the null hypothesis is to compare it with the given value and that it is based on the sample of size n. Then each value of the sample that is greater than Med _0 is replaced by the sign (+), while each value of the sample less than Med_0 is replaced by the sign (-). In other words, each of the sample values are compared with 22.5 and if they are greater we will denote them with a sign (+), while if they are less we will place a sign (-) and those values equal to 22, 5 should be completely ignored.

Now we go on to count how many positive signs there are, how many negative signs, and how many were ignored with the symbol (0).

We can see that the sum of the signs gives us a result of nine pieces of data in total, which was the initial number of our sample. However, the method tells us to completely ignore those data equal to 22.5; so that we are not only going to ignore the data to which we assign the (0), but we are also going to ignore the number of data, therefore n = 8 and not 9 as we originally had. Now we are going to assign the value of x, which, as we saw previously, is the one with the least amount among the 2 signs, so x = 2 since this is the least value between the numbers 6 and 2. We must calculate the value of P for all those values less than or equal to the value of x since the sum goes from 0 to x = 2, that is, P (x 2) = P (x = 0) + P (x = 1) + P (x = 2) and remember that p = q = 0.5, substituting the data in the formula we have:

P= _(k=0)^XnCkp^k p^(n-k) P = 8C0(0,5)^0 (0,5)^((8-0)) + 8C1(0,5)^1 (0,5)^((8-1)) + 8C2(0,5)^2 (0,5)^((8-2)) P = 8C0(0,5)^8 + 8C1(0,5)^1 (0,5)^7 + 8C2(0,5)^2 (0,5)^6 Recall the combination formula NCn = N!/(N-n)!n! substituting the values in the formula we have: P= 8!/8!0! (0, 5)^8 + 8!/7!1! (0,5)^1 (0,5)^7 + 8!/6!2! (0,5)^2 (0,5)^6 P = (0,5)^8 + (8 .7!)/7! (0,5)^8 + (8 .7 .6!)/6!2 (0,5)^8 P = (0,5)^8 (1 + 8 + 28) = 37(0,5)^8= 0,1445

As in this case we have a two-tailed or bilateral test, we must take into account that we are going to compare our probability with `/2 = 0,05/2 = 0,025.`

As we can see in the box of hypothesis tests for population means, for the two-tailed case, if P 0.025 then the null hypothesis (Ho) will be rejected.

However, in this case 0.1445 > 0.025 and then we can conclude that since the value of P is greater than 0.025, the null hypothesis is not rejected (Ho = median = 22.5) and therefore the median is equal to 22 ,5.

Let's go with the second case of paired samples

In the hypothesis test with paired samples, the formulation of the null hypothesis and the alternative hypothesis change somewhat, while the formula remains constant and the rejection rule is the same as that of the population median hypothesis test. So we are going to establish a table with the formulation of the hypotheses, depending on whether to use the left-tail test, the right-tail test or the two-tailed test and in this table, we can see that everything will depend of the proportion of positive (+) or negative (-) signs

37.4 Left Tail Test Right Tail Test Two-tail test

Let us remember that the paired samples are those extracted from a population, where that same sample is going to be compared at two different moments and in the period that exists between those two times, an intervention or factor will be applied to modify the response of the sample. To later check if there really is a significant difference after that intervention, between one moment and another.

It is important to take into account that for this type of paired samples it is not necessary to compare the medians, it is enough to have two ordinal variables to use this test.

Now let's go with an example of paired samples

In a sample of 12 patients who use a private hospital, satisfaction levels were obtained on a scale from 0 to 10. Then the same scale was measured, but after the hospital made administrative and operational changes in order to improve the service, Two tables were obtained, one before and one after.



The idea is to try to verify that after the improvements, the patients increased their satisfaction levels. If true, the weighting of satisfaction levels after the changes should be higher than before. This reasoning gives us a certain direction and sense, if the after must be greater than the before we can intuit that this is a right one-sided test and if we go to the hypothesis of the previous box we can conclude that:

Ho: p (+) p (-) Ha: p (+)> p (-)

Now we are going to compare the satisfaction levels after the improvements with those of before, if they are greater than we will place a sign (+), if on the contrary they are less we will assign a sign (-) and again we will discard those data that are equal.

Subtracting the two data corresponding to paired and equal samples (with zeros), the number of observations that interest us are:

n = 10

Now we must take the smallest number between 8 and 2 to obtain x

x = 2

Since it is a one-tailed right-hand test, we are going to use = 0.05

P (x 2) = P (x = 0) + P (x = 1) + P (x = 2) P = 10C0(0,5)^0 (0,5)^10+ 10C1(0,5)^1 (0,5)^9 + 10C2(0,5)^2 (0,5)^8 P = 10!/10!0! (0,5)^10 + 10!/9!1! (0,5)^10 + 10!/8!2! (0,5)^10 P = (0,5)^10(1 + (10 .9!)/9! + 10.9.8!/8!2!) P = (0,5)^10 (1 + 10 + 45) P = 56 (0,5)^10 = 0,0547

As we already know, the rule for the rejection of the null hypothesis for the one-tailed test, either right or left, is equal to:

P But if we compare the values 0.0547 > 0.05

Although it is true that both values are almost equal, we can observe that P is a little greater than , so that we cannot reject the null hypothesis, so we can conclude that the null hypothesis is true and therefore:

```
Ho:  p (+)  p (-)
```

As we were able to establish previously, the positive signs indicated that the levels of satisfaction after the improvements were higher than those before the changes. But if the null hypothesis tells us that the number of positive signs is less than or equal to the number of negative signs, then we can conclude that the level of patient satisfaction did not improve, after the improvements made by the private hospital.

37.5 The Wilcoxon Signed-Rank Test

The Wilcoxon signed-rank test allows us to compare populations when the distributions do not satisfy the conditions required for other parametric tests. We are an alternative when the samples do not have a normal distribution, that is, they show skewness or tails. They are also used when the samples are too small to determine if they really come from normal populations.

It is important to take into account that the problem of small samples is not always solved with the Wilcoxon signed-rank test, since if the size of the samples is very small, so will the inference that can be made on these samples. However, there are two situations in which the Wilcoxon signed-rank test may be recommended a priori.

When the size of the samples is large enough to determine through hypothesis testing or graphical methods that the distribution of the populations is not of the normal type, it is best to use the Wilcoxon signed-rank test. Although the permutation test, quantile regression or bootstrapping can also be used.

In the case that the size of the samples cannot determine with certainty if the populations are distributed in a normal way and there is not much information available that can give us some guidance, with respect to the nature of the origin of these populations through previous studies or having prior knowledge that the variable is generally distributed in a normal way, it is best to use the Wilcoxon signed-rank test, since it does not need to assume the normality of the populations.

37.6 Main Characteristics Of The Wilcoxon Signed-Rank Test

In many publications it is common to find the assertion that the Wilcoxon signed-rank test contrasts the median of the differences, but this is true only under certain circumstances, since what the Wilcoxon signed-rank test really does is to compare the existing differences between the pairs of data that manage to follow a symmetric distribution around a certain value. For example, when two samples come from the same population, what is expected is that the differences that exist between each pair of observations, are distributed around zero symmetrically.

This test works on order ranges and therefore is based on the positions that the data occupy once they are ordered, therefore, it can only be applied to variables with values that can be ordered.

Conditions required by the Wilcoxon signed-rank test

- Data must be dependent
- The data must be ordinal to be able to order them from smallest to largest
- As we already know, it is not necessary to assume a distribution of the samples in a normal way, the important thing is that the distribution of the differences must be symmetric.
- The Wilcoxon signed-rank test works with medians and not with means.
- It is very useful when there are outliers and also when there is no normality in the data and it is preferable to the t-test, in those cases where the sample size is very small.

Now let's go with an example of a Wilcoxon signed-rank test for 1 small sample

A manufacturer of electric irons requires testing the accuracy of a thermostat in its set position, whose temperature is 500 ° F. To do this, a test engineer is instructed to obtain the actual temperatures at that set position on 15 different plates using thermocouples. Measurements resulted in the following temperatures:

The idea is to test if the median varies from 500 ° F with 95% confidence (= 0.05)

The statement of the hypotheses is:

Ho: Me = 500 ° F Ha: Me 500 ° F

To apply the method it will be necessary to include a column with the subtraction of the data from each of the measurements obtained in the 15 plates of the value of the given temperature. Subsequently, a third column will be included specifying the signs (+) or (-) as the case may be, of the sign resulting from the difference between the temperatures. To then order these differences from smallest to largest, but in absolute value and assigning them a value from 1 (to the smallest difference) to 15. As the hypotheses are equal to or different from 500 ° F, we assume that it is a two-tailed test.

The lowest rank will be that number whose absolute value is the smallest of all, in this case it is 0.8 and we will assign the number 1, the next in the higher order of absolute values is 1.6 to which we will assign the number 2 and so on we will continue assigning values of range 3, 4, 5, etc. depending on the ascending order of their absolute values.

It is important to take into account that as two values (5,4) are repeated in the column (Xi - Me), half the range is assigned to each one, with respect to the order of the differences in absolute value from lowest to highest . As they would occupy ranks 7 and 8, each of them acquires the value of 7.5, which is the average between the two.

Then we must add all the positive values of the range that have positive signs T (+) and negative signs T (-)

T (+) = 7.5 + 14 + 11 + 15 + 5 + 3 + 7.5 + 12 + 1 + 10 = 86 T (-) = 13 + 4 + 2 + 6 + 9 = 34

I take the smallest number between 86 and 34, that will be my calculated T value (Tcal).

Tcal = 34

The null hypothesis is rejected if Tcal < T (, n), and n is the number of data, so n = 15.

We do not go to the table that provides the critical values of Wilcoxon for the two-tailed tests and we intersect the values of = 0.05 and 15:

	alpha values						
n	0.001	0.005	0.01	0.025	0.05	0.10	0.20
5	--	--	--	--	--	0	2
6	--	--	--	--	0	2	3
7	--	--	--	0	2	3	5
8	--	--	0	2	3	5	8
9	--	0	1	3	5	8	10
10	--	1	3	5	8	10	14
11	0	3	5	8	10	13	17
12	1	5	7	10	13	17	21
13	2	7	9	13	17	21	26
14	4	9	12	17	21	25	31
15	6	12	15	20	25	30	36
16	8	15	19	25	29	35	42
17	11	19	23	29	34	41	48
18	14	23	27	34	40	47	55
19	18	27	32	39	46	53	62
20	21	32	37	45	52	60	69
21	25	37	42	51	58	67	77
22	30	42	48	57	65	75	86
23	35	48	54	64	73	83	94
24	40	54	61	72	81	91	104
25	45	60	68	79	89	100	113
26	51	67	75	87	98	110	124
27	57	74	83	96	107	119	134

As we can see, the result of the table is equal to 25 and therefore:

`Tcal > 25 34 > 25`

Then the premise is not fulfilled if Tcal < T (, n), which implies that the null hypothesis cannot be rejected. So accepting the null hypothesis, the median is significantly equal to 500 ° F.

37.7 Wilcoxon Signed-Rank Test Example 2 For Paired Samples

The following data shows us the rates of defective work performed by employees, before and after a salary incentive. It is about comparing the two data sets, in order to know if the salary increase decreased the number of defective units produced with a significance level of 0.01.



The hypotheses are as:

`Ho: Me1 Me2 Ha: Me1 > Me2`

The first thing we need to do is subtract the values between the defective units before the salary increase and the number of defective items after the incentive. To then order the absolute value of the range from lowest to highest, assigning values from 1 onwards.

As we can see, the absolute value of 1 is repeated twice and that of 2 is repeated seven times. So the absolute minimum value (1) occupies places 1 and 2, so the average between the two is 1.5. In the same way, the absolute value of 2 occupies places 3, 4, 5, 6, 7, 8 and 9, so its average is: (3 + 4 + 5 + 6 + 7 + 8 + 9) / 7 = 6. It is important to emphasize that the zeros (0) are not taken into account neither for the range nor for the number of observations, so in this case n = 10 instead of 12 as we had initially.

Adding the range of the positive and negative numbers we have:

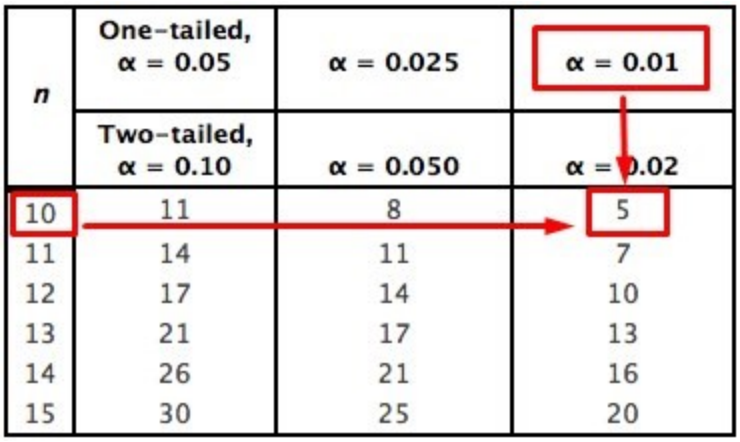
`T (+) = 35.5 T (-) = 19.5`

As the alternative hypothesis tells us that the mean value must be "Greater than", we assume that the Tcal is the greater of both values. If we go back to the tables above and look at the hypotheses, we can conclude that this is a right-tailed test.

`Tcal = 35.5`

We can then say that the null hypothesis is rejected, when the alternative hypothesis is true and this occurs when `Tcal > T (, n).`

To find `T (, n)` we go to the Table of critical values of the Wilcoxon T test for a single tail, with a significance of 0.01 and a value of n = 10



n	One-tailed, α = 0.05	α = 0.025	α = 0.01
	Two-tailed, α = 0.10	α = 0.050	α = 0.02
10	11	8	5
11	14	11	7
12	17	14	10
13	21	17	13
14	26	21	16
15	30	25	20

By tables we obtain that T (, n) = 5, if we compare this value with that obtained from the Tcal we have:

```
35.5 > 5
```

The alternative hypothesis is then proved and therefore the null hypothesis is rejected. In this way we conclude that Me1 > Me2, which implies that the median of the defective production after the wage incentive, is definitely less than the median before the increase. This means that the task of lowering the production of defective units was achieved by raising the salary of its employees.

37.8 About the Author

Graduated in Mechanical Engineering, and a master's degree in teaching component, I gave classes in several institutes of mathematics and physics, but I also dedicated several years of my life as a television producer, I did the scripts for mikes, the camera direction, editing of video and even the location. Later I was dedicated to SEO writing for a couple of years. I like poetry, chess and dominoes.

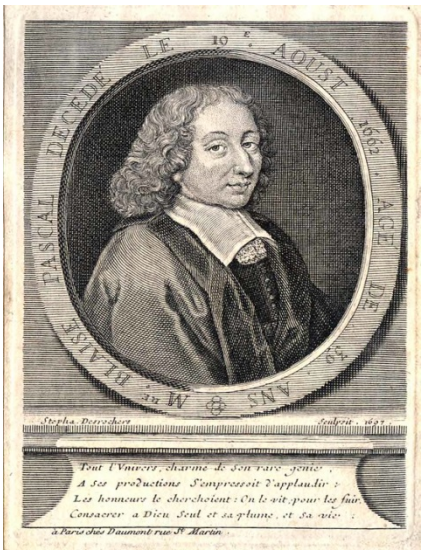
CHAPTER

THIRTYEIGHT

FREQUENTIST VERSUS BAYESIAN STATISTICS

For the nineteenth century the main entertainment of the members who represented high society, were games of chance. Among them was an expert gambler named Antonie Gombaud, known as the Knight of Meré, and he approached Blais Pascal (a French philosopher and writer born in 1623) to pose two problems that were on his mind, regarding gambling.

Both Pascal and Pierre Fermat were maintaining a great and fluid correspondence around both problems. Thanks to the solutions found by these great characters in history, the foundations were laid on game theory and the calculation of probabilities. From there came a myriad of applications that are used today.

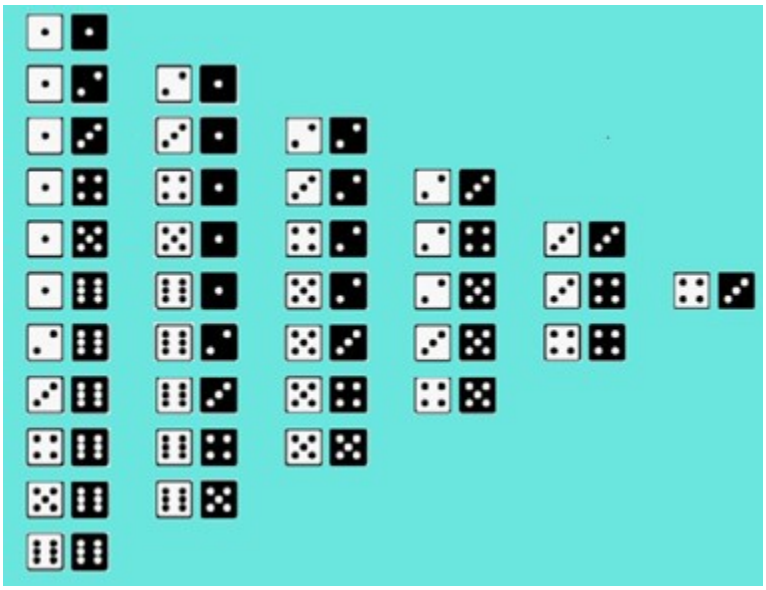




Without knowing it, between the two of them they had created a very powerful tool of interpretation, organization and information for making optimal decisions and from that moment on, the expectations of rolling the dice again have never been the same. Finally, through the beginning of probability, the outcome of the bets could be predicted with a greater degree of accuracy and thus be able to get more out of them.



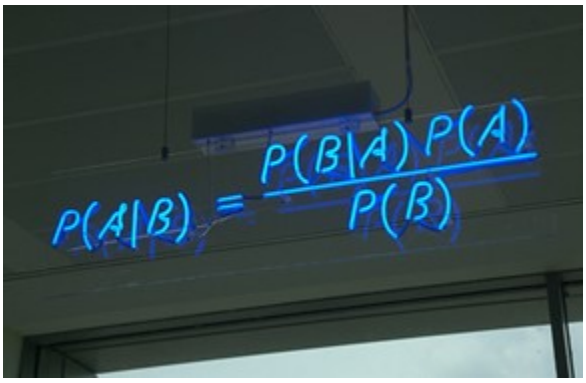
For example, if we have two dice, one white and one black, what are the probabilities of obtaining the result of the sum of the points of both dice?



As we can see we can obtain a minimum of 2 points, therefore we can never have 1 point or less and we will have a maximum of 12 points, we will never have 13 points. After counting each and every probability, we can obtain the following distribution table.

POINT	CHANCE	PROBABILITY
1	0	0%
2	1	3%
3	2	6%
4	3	8%
5	4	11%
6	5	14%
7	6	17%
8	5	14%
9	4	11%
10	3	8%
11	2	6%
12	1	3%
13	0	0%

Later Thomas Bayes, a Presbyterian minister and English mathematician born in 1702, creates a theorem that bears his name "Bayes Theorem" where he introduces the probability that an event occurs, but taking into account another event that occurred in advance. For example, if, in general, every time we have the flu, we get a headache, we may come to think that if we have a headache, it is likely that we have the flu.



As we can see, it is to understand the probability of obtaining a result, according to the observation of the causes that generated it. This is called "inverse probability", since the direct probability based on classical or frequentist statistics, measures the probability through the frequency with which the expected events occur, based on the amount of results obtained when applying a certain procedure.

The followers of Bayesian analysis affirm that the importance of this tendency lies in drawing general conclusions, but from what has been observed previously and not vice versa. Bayes raises the vision of probability by entering the subjectivity of the observer and how he can change his judgment according to new information or additional evidence that is presented in the way of the investigation.

However, statistics evolved in the most empirical way and based on measurements where subjectivity and intuition were put aside, therefore, the most used statistic throughout the 20th century has been the frequentist. Of course, it became much more established with the appearance of software and computers, where this type of process could be carried out in a more expeditious manner.

As we all know "statistics don't lie", but something was actually missing: For example, suppose that two people want to share a roast chicken, the common thing is to think that each of the diners gets half a chicken; but that does not necessarily imply that both have been satiated, since it may be that each one has not eaten exactly half, it is even probable that one of them has eaten the whole chicken, while the other only dedicates it to observe.

On the other hand, when we talk about the probability of contracting AIDS or cancer, we can understand that population statistics are not very useful to us, since we must take into account not only lifestyle habits, but also genetic parameters.

For this reason, it is becoming increasingly evident to use Bayesian analyzes that are adapted to reality.

In fact, this type of statistics has been shown to be much more effective when it comes to dealing with the social sciences and some matters of econometrics, where certain less scientific parameters such as feelings, philosophy and human behavior must be taken into account.

Another advantage that Bayesian statistics offers is that it does not necessarily depend on the size of the sample, although for obvious reasons, the larger this sample, the more accurately we can assess the conclusions we have regarding reality.

The other diatribe posed to frequentists is that their tests focus on affirming or refuting their hypothesis, instead of emphasizing the belief in their hypothesis and the correlation that exists with the empirically analyzed reality. While Bayesians do emphasize precisely the credibility of their hypothesis and are not forced to choose between black and white.

Due to the aforementioned, Bayesian statistics can work in a study where we cannot obtain a large sample, without distorting the results, since not only the previous data are taken into account, but also the new events that are taking place; in addition to the subjectivity of the researchers themselves with respect to how reality can behave according to their analysis.

Giving a much more enriching framework and leaving a greater degree of freedom to the researcher, so that with his knowledge, he can get to assess the probability that the results determined in advance will occur.

However, a hypothesis is required to be able to interpret the results to be obtained and an estimated probability must be established before carrying out the study. Subsequently, the Bayes factor is used, which is nothing more than a measure capable of comparing the data obtained in the investigation, with respect to the proposed hypothesis.

The Bayes factor is applied to the set of probabilities that are established in advance according to the hypothesis, to calculate the highest probability of the data that is expected to be obtained, after the investigation is carried out. It is important to propose the hypothesis that has the highest degree of certainty, in order to verify the data obtained with the greatest possible measure of correctness.

We will then show 3 types of hypotheses to be verified: Association, correlation and mean difference.

We can show that the Bayesian hypothesis is more acceptable than the classical one, based on a study that was done in this regard. For this, the 3 types of hypotheses mentioned above were used and studies were simulated with respect to the contrast between the association, the difference of means and the correlation.

For each of these hypotheses, it is demonstrated how both the Bayes factor and the posterior probability can be interpreted, including how authentic the hypotheses are according to the results obtained in an investigation. Of course, taking into account whether the previous expectations regarding the results obtained after the study are met.

Suppose that we are going to start with a medical investigation, as it happens in any other scientific field, the idea is to compare the different relationships that can be proved, whether causal or not, taking into account the proposed hypothesis. For this, the results of the data that we cannot take as a sample are extrapolated with those data that we do obtain from the participating population.

One of the most frequent examples in this field is to demonstrate whether a drug is more effective than those on the market, either to cure a disease or ailment. In order to verify this hypothesis, empirical data is required from those participants, who have been treated with one of the two options that have been considered in the evaluation.

The evidence will show which of the two drugs is more effective for the treatment in question. But the data obtained can be extrapolated to treat other patients who have not participated in the aforementioned study, this is what we call inference. It is no secret to anyone that no investigation can take into account each and every one of the factors involved and therefore, the predictions of the results cannot be exact. Reasons why, the results should be shown as estimates based on probabilities and using extrapolation, which in turn will depend on the assumptions chosen and the measurements thrown during the study.

Of course, the science that supports the purpose of the research is statistics and from time immemorial, two proposals were established to generate these inferences, which are Bayesian and frequentist statistics.

To establish the difference between both methods, in classical or frequentist statistics, the probability is measured through the frequency with which the expected events occur, based on the number of results obtained when applying a certain procedure.

For example, if we obtain 0.5 as a result, we can conclude that 50% of the time the expected event was obtained. While in Bayesian statistics, the probability has to do with the degree of belief of the result that can be obtained in reality, for example, for the same value of 0.5 it is interpreted as 50% of the certainty that was obtained with respect to something.

38.1 Hypothesis testing

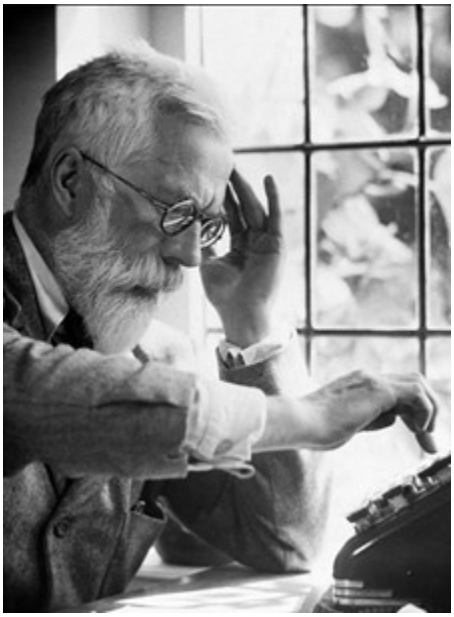
A hypothesis is a presumption about reality and is usually presented as a feasible forecast, that is, based on the theoretical arguments that we have before conducting our research. Now, when we speak of statistical hypotheses, we refer to those that can be verified by mathematical methods, specifically we refer to probabilities.

Although it is true that when conducting both medical and other research, we may find ourselves with the need to contrast more than two hypotheses; It is advisable to consider only two, in order to facilitate the study of a single assumption and not lose ourselves in a compendium of multiple unknowns. In general, a null hypothesis and an alternate hypothesis are established.

When we refer to the null hypothesis, it is to establish a conjecture capable of predicting that there is no difference between the analyzed variables; while the alternate hypothesis does predict a difference between them.

The way to test these hypotheses will depend on the type of statistics that we intend to use. In case of applying the frequentist statistic, only the null hypothesis is checked and for this, random distribution models are developed taking that null hypothesis as true, so that the aforementioned distribution is centered on the null value as its highest probability.

From there comes the value of "p" defined by Fisher, which is responsible for determining the compatibility between the estimated value that can be observed in a study, with the null value.



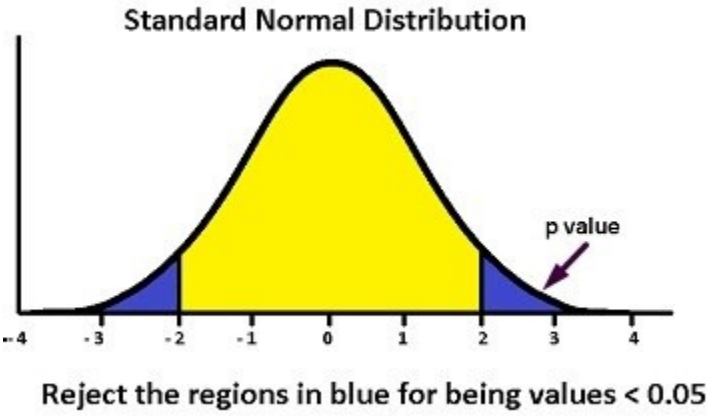
In other words, "p" is the probability that a previously measured statistical value will be taken as possible, but taking into account a certain null hypothesis.

This value summarizes the probability of seeing a data with its most extreme values and therefore, as the probability of being equated with "p" decreases, the less compatibility it will have with the null value and the variables that influence can be deduced, for that this result is so different from "p".

However, until the contributions of Pearson and Neyman, a limit value had not been established to know if the difference between the values was large enough to deny the hypothesis.



That is why both introduced the PSEHN value, where they established that a null hypothesis can be rejected if "p" is less than the error set at 5%, that is, if p <0.05. This way of establishing a maximum value of "p" helps us to differentiate those sampling results that are a product of chance, from those that are statistically significant.



Although it is true that frequentist statistics has predominated throughout history, in more recent years Bayesian statistics have been taken up again, since many errors have been made when interpreting the value of "p". They have even inappropriately used the statistical meaning of the null hypothesis, that is, the PSEHN value and that without naming other multiple advantages that Bayesian statistics can offer you.

38.2 About the Author

Graduated in Mechanical Engineering, and a master's degree in teaching component, I gave classes in several institutes of mathematics and physics, but I also dedicated several years of my life as a television producer, I did the scripts for mikes, the camera direction, editing of video and even the location. Later I was dedicated to SEO writing for a couple of years. I like poetry, chess and dominoes.

CHAPTER

THIRTYNINE

THE GAUSS-JORDAN METHOD TO SOLVE SYSTEMS OF LINEAR EQUATIONS

Carl Friedrich Gauss was a mathematician and physicist born in Germany at 1777 and developed such a huge body of works in so many different fields, that any science student will find his name many times, within different subjects, up to a point of believing Gauss is just everywhere.



Among all the contributions of Gauss to mathematics, we find a method for solving Systems of Linear Equations that is widely used now that computers can be programmed to do all the hard work. This method has the advantage of being easily programmable because it uses a sequence of repetitive operations once the equations are stored on the computer memory as an array of terms similar to a matrix containing the coefficients of each equation in one row.

The way Gauss solved the problem was by using some properties of Systems of Linear Equations to make changes in the matrix, changing the coefficients by getting equivalent equations which won´t alter the System. These changes can be:

- A) Swap two of the rows, putting each one in the position of the other
- B) Multiply every term in one of the rows (equations) by the same number different from zero.
- C) Add or subtract each term in one of the rows (equations) from the corresponding term from another row, resulting in a new row which also belongs to the same equations system.

You can do any of these operations and the equation´s system remains the same, the solutions will be the same. Gauss thought a way to use this to convert the initial group of equations into one which would be easier to solve.

39.1 The Gauss method

The method is very ingenious and very straightforward too. Let´s show how he did it with one example; a 4 equation´s system with 4 unknowns (w, x, y, z):

$$\begin{cases} 3w - 2x + 3y + z = 12 \\ w - 4x - 2y + 2z = -5 \\ 2w + 2x - 5y + 2z = -1 \\ -w + 2x - y - 3z = -12 \end{cases}$$

These coefficients can be stored in a matrix like this:

$$\left[\begin{array}{cccc|c} 3 & -2 & 3 & 1 & 12 \\ 1 & -4 & -2 & 2 & -5 \\ 2 & 2 & -5 & 2 & -1 \\ -1 & 2 & -1 & -3 & -12 \end{array}\right]$$

The matrix has as many columns as equations (and unknowns) as the system, plus one column because of the constant terms, so in this case, the matrix has 5 columns X 4 rows.

Gauss thought a good way of solving these systems was by "getting rid" of some terms, by making them zero, until he could get an equation with only zeroes except for one unknown and the constant term, making it very easy to find then the unknown. How to accomplish this?

We must remember the operations (A, B, C) we can perform without changing the system. Now let´s focus on the second equation:

```
w-4x-2y+2z=-5
```

The first unknown (w) is multiplied by the coefficient 1, not written. That´s why the first term on the second row of the matrix is 1.

How can I get rid of this unknown by making changes to this second equation? How can I turn this 1 into a zero so that the w just disappears from the equation?

Not the obvious idea, multiplying the whole equation by zero. If we read again the operation B as explained before, we find there it´s very clearly stated that we cannot multiply by zero. The other way would by adding -1 to the first term. The third operation we talked about before, C, states that we can add two equations belonging to the system, term by term, and the resulting equation belongs to the system too. So, if there would only be another equation in the system with -1 as first coefficient, we would only add this equation, term by term, to the second one and the first term would become just a zero, it would go away. But of course there is not this desired equation with a -1 multiplying w. Life is never so easy.

What was the solution Gauss found? Well, he thought of multiplying any other equation by a number which would turn it´s first coefficient into a -1. If we multiply every term of a linear equation by the same number, the resulting equation is equivalent to the original, just as stated on B.

If we do this with the first equation (3w - 2x + 3y + z = 12), the coefficient multiplying the unknown w, the first one, is 3 so, in this case, we would need to multiply the whole first equation, term by term, by a number which would turn a 3 into a -1. That number would be -1/3 so that the operation would go like this:

$3w - 2x + 3y + z = 12$ Multiplied by $\left(\frac{-1}{3}\right)$ → $\left(\frac{-1}{3}\right)3w - \left(\frac{-1}{3}\right)2x + \left(\frac{-1}{3}\right)3y + \left(\frac{-1}{3}\right)z = \left(\frac{-1}{3}\right)12$

And we get: $-1w + \frac{2x}{3} - 1y - \frac{1z}{3} = -4$

Where the desired -1 is the first coefficient. We can add now this equation to the second equation of the system in order to turn it´s first coefficient into a zero.

Modified first equation $-1w + \frac{2x}{3} - 1y - \frac{1z}{3} = -4$

Second equation $1w - 4x - 2y + 2z = -5$ (+)

$0w - \frac{10x}{3} - 3y + \frac{5z}{3} = -9$ → Modified second equation $-\frac{10x}{3} - 3y + \frac{5z}{3} = -9$

We can see that the first coefficient in the second equation is now zero, so it has now one less term.

The system of equations and the matrix of coefficients would now look like this:

$$\begin{cases} 3w - 2x + 3y + z = 12 \\ -\frac{10x}{3} - 3y + \frac{5z}{3} = -9 \\ 2w + 2x - 5y + 2z = -1 \\ -w + 2x - y - 3z = -12 \end{cases}$$

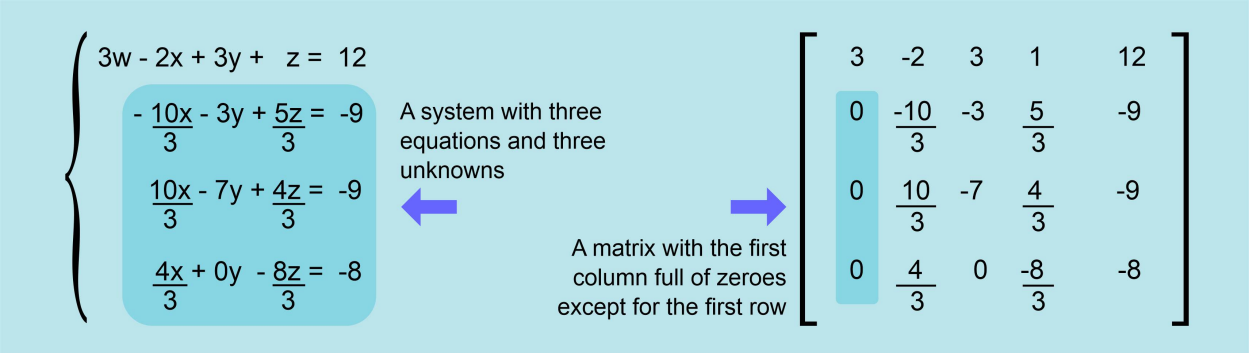
The first term has been nullified:

$$\left[\begin{array}{cccc|c} 3 & -2 & 3 & 1 & 12 \\ 0 & \frac{-10}{3} & -3 & \frac{5}{3} & -9 \\ 2 & 2 & -5 & 2 & -1 \\ -1 & 2 & -1 & -3 & -12 \end{array}\right]$$

Now we are one step closer to get the solution for the system, since we have one equation with only three unknowns instead of four. Can we go on doing the same with more equations? Of course we can, and Gauss did exactly this for the third and fourth equations. His method gets rid of all the first terms except in the case of the first equation; you will always need at least one equation with the first term so that the value of w can be calculated.

39.2 Repeating the steps going down

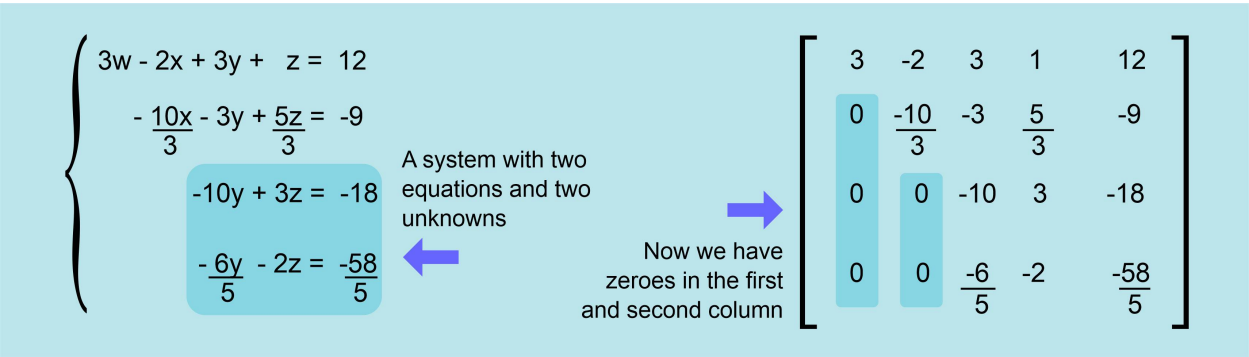
So, after doing similar operations on the third and fourth equations, we get:



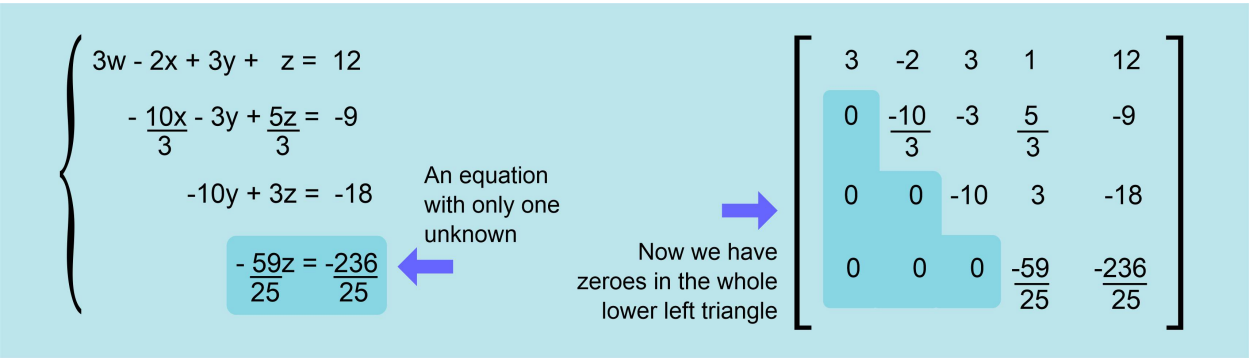
Now the system, if we ignore the first equation, has only three unknowns (x, y, z) and three equations (second, third and fourth equations).

Once we grasp what we have done here, we can understand the whole method Gauss devised so smartly, because if we forget about the first equation and we repeat the previous process, leaving now the second equation untouched, and we modify the third and the fourth equations so that their first term (the coefficient for x) is zero, we will get a smaller system of equations with only two unknowns and two equations.

The Gauss method keeps shrinking the size of the equation´s system into smaller systems which are easier to solve. This is how the system of equations looks once it´s reduced to just two equations:



This way we can keep reducing the size of the system until we get only one equation and one unknown, which is directly solved:



39.3 Getting results and turning the tide to move upwards

So from the fourth equation we can get directly the value for z, our first result:

```
z=4
```

Up to this moment, the method works from top to bottom, getting our first result from the last equation but now the flow is reversed and we start moving upwards. Having the value for z, we can use it on the third equation (z=4 then 3z=12) getting:

```
-10y + 12 = -18
```

From where we can get directly the next result, the value for y:

```
y = (-18-12) / (-10) = 3
```

Then, having z=4 and y=3, we can continue upwards and use these values in the second equation in order to get the next unknown, x, and finally, we use these three results (x, y, z) in the first equation to get the last result, the unknown w.

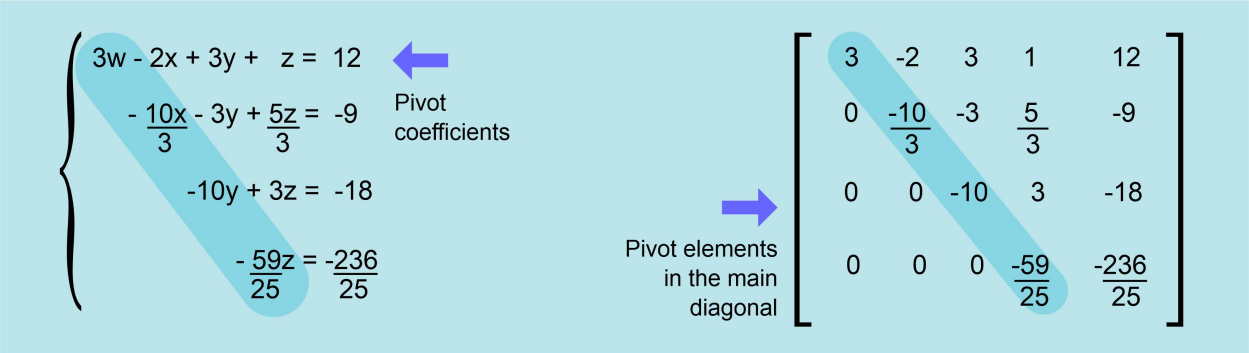
Following this procedure, we have calculated all the results:

```
w=1 x=2 y=3 z=4
```

And this method can be used for any linear equation´s system no matter how big it is, how many equations it has, thanks to Carl Friedrich Gauss.

39.4 Some details to keep in mind when programming this method

When we were operating to turn the first column into zeroes, we left the first equation untouched, it was used to modify the other equations focusing on the first term of the first equation; this term we use is known as the "pivot". Once we changed all the coefficients below this first term into zeroes, we moved down and used the second equation, leaving it untouched, to change third and fourth equation. We used the first non-zero term to change into zeroes all the coefficients below (second column) so in this case, this second term is the pivot. When we repeat the procedure using the third equation, the third term is the pivot, and so on.



The matrix we have been showing on the right side of the system is a representation of how the coefficients can be stored on a computer to make all these operations digitally, by using a programmable version of this method, an algorithm. There are some details to keep in mind when designing this algorithm.

The element we use as a pivot cannot be a zero. To prevent this from happening, the usual procedure is using the equation which has the larger number as it´s first coefficient as the pivotal equation. We must remember that we can swap two equations from the system without altering the system, so before using the first equation to modify the others, we look for the equation with a larger first coefficient and swap it to the first row, then we proceed. The same happens when we will use the second equation, we compare it´s second coefficient (because the first one has been changed into a zero) with the corresponding coefficients on the third and fourth equations, and then swapping the one with the largest coefficient to the second row.

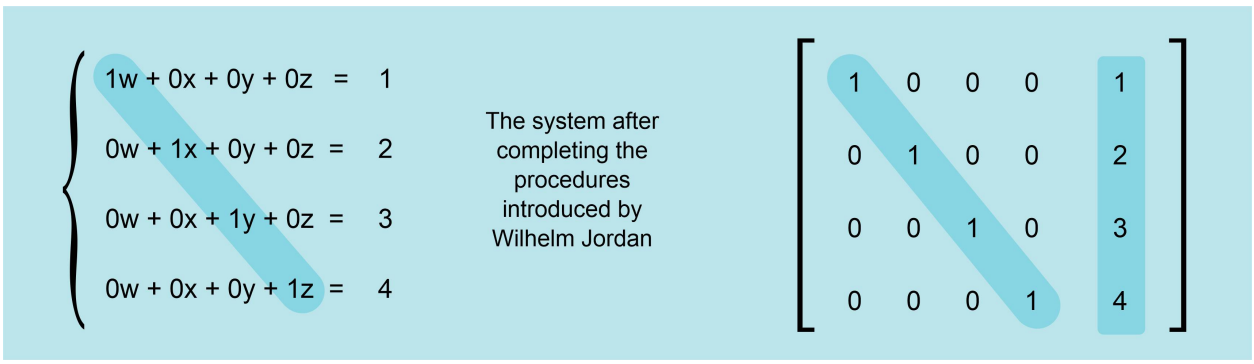
This same swapping should be done until all the lower-left triangle is full of zeroes, so that the last equation is ready to be directly solved. It´s a way to guarantee that each pivot will not be a zero.

39.5 The Jordan improvement

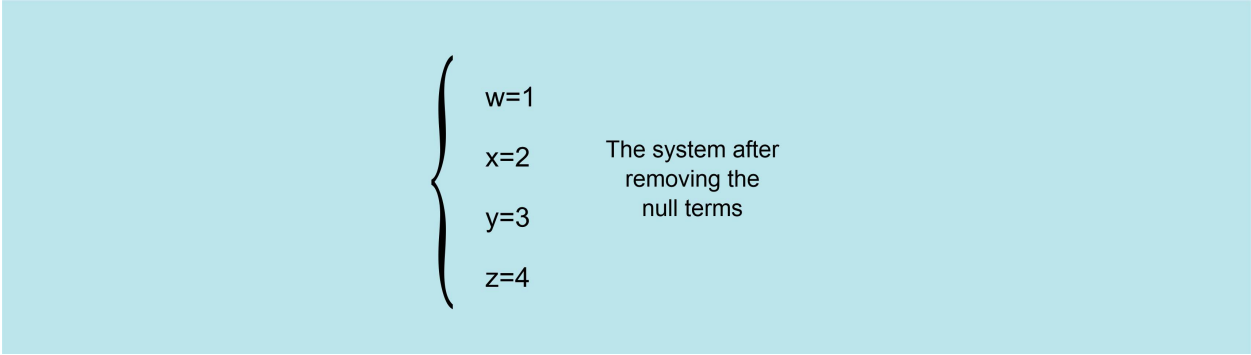
Wilhelm Jordan was a German geodesist born at 1842, and he was also a writer with an interest in mathematics and geometry. He worked on the method developed by Gauss and improved it while he was trying to use it on some surveying data. Later, he published his technique in his book Textbook of Geodesy.



To understand the work of Jordan, we must remember that the Gauss method turns into zeroes all the low-left triangle of the matrix. Jordan had the idea of keep using the same procedure on the top-right triangle, turning all these coefficients into zeroes as well, keeping only the terms in the diagonal, the pivots, so that each equation would have only one unknown, and then operating on those terms so that they would be changed into ones (1) and each equation would bring directly one result. We can better understand all this by looking at the system after the upper-right triangle has been changed into zeroes and the pivots in the diagonal turned into ones.



In the equation´s system, we left the zeroed terms in order to make evident the correspondence of the equations with the matrix, but the usual way to write these equations would be simpler, not writing the null terms and not writing the number 1 when it is multiplying the unknowns, like this:



By watching at the simplified equations, it´s really obvious why Jordan wanted to add these steps to the method of Gauss. Each equation is just the result for each unknown. Very elegant.

Though these methods were developed a long time before computers, it´s evident the authors wanted to develop an algorithm with simple and repetitive steps that would work even for large equation´s systems; it´s perfect for computers, the iterative process can be programmed and executed digitally in a very precise way just by introducing the coefficient´s matrix. As a matter of fact, this is how computers solve linear equation´s systems in the present, sometimes running the Gauss method and some other times the Gauss-Jordan variation.

We can only feel admiration for this kind of minds which, by sending their intelligence and wisdom through the centuries, can help us solve our problems today.

39.6 About the Author

Jorge Araica is a Graphic Designer with technical background, an old school pro with some knowledge in the engineering and programming fields and also a promotor of critical and rational thinking as a way to spread a scientific attitude towards knowledge. Freedom is his other passion, and he will stand for it at every opportunity he gets.

CHAPTER

FORTY

GRAPHIC SCHEMA THEORY

Graph theory is the branch of mathematics that studies the characteristics and properties of graphs, a graph being a set of nodes or vertices that are joined by links that can be called edges or arcs and in this way relationships are represented. binaries that exist between the elements of a set.

Graphs allow us to study the interrelationships between those units that interact with each other. A clear example is how a computer network can be represented where the vertices represent the terminals while the edges represent the connections. A graph can be represented graphically as a set of vertices or nodes joined by lines. Most of the problems can be represented through a graph from the social sciences to the exact sciences.

It is important to emphasize that a graph should not be confused with graphs, since the latter have a much broader term. A graph is an ordered pair G=(V,E) where V and E are a set of vertices and edges respectively and E in turn is determined by unordered pairs of vertices {x, y} belonging to E, being adjacent x and y. In the graph they are represented by an unoriented line capable of joining these vertices. Given the case that the graph is directed, it bears the name of digraph and is denoted by the letter D, for this case (x,y) in an ordered pair that is represented by an arrow that starts from x and arrives at y, it is said that (x ,y) belongs to E.

Graph theory is based on applied and discrete mathematics, being necessary to know graphs in diverse areas such as algebra, combinatorics, polygon geometry, probability, topology and arithmetic. It is currently used to a greater extent in the field of computer science, information technology and telecommunications. Thanks to its large number of applications when it comes to optimizing processes, routes, search algorithms and flows, among others, a new theory known as network analysis is then generated.

A graph is composed of edges that are the lines capable of joining its vertices, we can classify its edges as follows:

• Adjacent edges: two edges are said to be present when they converge at the same vertex.

• Parallel Edges: Edges are said to be parallel when they share both their initial and final vertices.

• Cyclic edges: these edges start from a vertex and return to the same vertex

• Crossing: is the point where two edges intersect.

The vertices are elements that make up the graph and depending on the situation, each vertex has an associated valence corresponding to the number of edges that converge at this vertex.

The set of vertices that are interconnected by edges is called a path, it can be said that there is a path between two vertices when they are connected by an edge.

Graphs are classified into:

• Simple graph: it is the one that joins any two vertices with a single edge or it is the same to say that an edge is the only one capable of joining two specific vertices.

• Multigraph: is that graph capable of accepting more than one edge between two vertices, these edges being called loops or multiples.

• Oriented graph: as stated above, it is the directed graph or called a digraph whose edges have been given an orientation and is represented by an arrow.

Graphic Schema Theory

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• Cyclic edges: these edges start from a vertex and return to the same vertex

• Crossing: is the point where two edges intersect.

The vertices are elements that make up the graph and depending on the situation, each vertex has an associated valence corresponding to the number of edges that converge at this vertex.

The set of vertices that are interconnected by edges is called a path, it can be said that there is a path between two vertices when they are connected by an edge.

Graphs are classified into:

• Simple graph: it is the one that joins any two vertices with a single edge or it is the same to say that an edge is the only one capable of joining two specific vertices.

• Multigraph: is that graph capable of accepting more than one edge between two vertices, these edges being called loops or multiples.

• Oriented graph: as stated above, it is the directed graph or called a digraph whose edges have been given an orientation and is represented by an arrow.

40.1 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

FORTYONE

KENDALL'S CORRELATION COEFFICIENT FOR REPEATING VARIABLES

41.1 Normal Distribution

In the previous article, we stated that one of the conditions to be able to implement Pearson's correlation coefficient is that the variables involved must have a normal distribution, otherwise, it is necessary to change the method to use Spearman's or Kendall's.

So what is a normal distribution? It is when the distribution of the function is symmetric, but the value of the mean, median and mode also coincide, that is, these three values are equal.

When it comes to graphing the function whose distribution is normal, we are left with a graph like the Gaussian bell. On the other hand, the most frequent values are around the mean and as we move away from this value, the frequency decreases.

Let's go with a simple example, we have a variable (x) that has the following data:

We introduce these values in Excel and to find the distribution of the function we must have the standard deviation and the median. To do this, we simply go to "Data" → "Data Analysis" → "Descriptive Statistics" and a window opens, where we must place in the input range all the values that make up the column of our variable (x), We must also check the box of the output range and in it, we position ourselves on any cell, which is where we want the result of the analysis to be shown, finally, we simply click on OK and a table will appear with the required data, even with other descriptive statistics data that may be of interest to us.

Now we go to the column next to (x), we identify it as F (x) and in the first row of data we assign the following instruction: = NORM.DIST (we choose the cell where the first value of x is found; the cell that contains the mean value; the same with the standard deviation; 0)

Thus we obtain the first value of our normal distribution, now we must place the "$" symbol before and after the letter that represents the cell of both the mean and the standard deviation, since as we know they are values that will remain constant. Later, we drag that value to the last row, to generate the subsequent numbers and thus we can complete the data of our normal distribution.

Then we choose both columns, we go to `"Insert"` → `"Dispersion"` → `"Dispersion with smooth lines"` → `Ok.`

In this way we obtain our graph, which as we can see, is symmetric and looks like the Gaussian bell, we can also notice that the mean and median are equal, in this case, the mode "Does not apply" since it is the value most repeated and all the values of (x), in this case, are different.

If we follow this method with the data that our sample gives us, we can know if we are in the presence of a normal distribution or not and thus have an idea of what type of method we should use, when it comes to finding the correlation coefficient.

41.2 Kendall's correlation coefficient with equal variables

In the previous article, the last exercise we did, we learned to use Kendall's correlation coefficient to know the relationship between a pair of variables, but where each of the variables was different from all the others. Now we are going to explain how the Kendall correlation coefficient is used, when there are some variables that coincide or are equal to each other.

The procedure to calculate the concordant and discordant values is the same as for the last exercise that we carried out in the previous article. However, when calculating the Kendall correlation for values that include equal elements, the equation is different and I present it below:

```
=S/((1/2 N(N-1)-Tx)*(1/2 N(N-1)-Ty))
```

In the same way remains the Kendall correlation coefficient, N is the number of observations in pairs of variables and "S" is the difference of the sum between the concordant and discordant pairs.

But now we have two new terms that are Tx and Ty, where Tx is the adjustment of the values that are repeated in the variable (x) and in the same way Ty, is the adjustment of the values in (y).

In the previous article we explained in detail how the value of S is calculated and N is the number of our observations, we just need to clarify how Tx and Ty are found.

`Tx = 1/2 t(t-1),` where (t) is the number of times a value is repeated in the variable (x).

`Ty = 1/2 t(t-1),` in the same way as for Tx, is the number of times a value is repeated in the variable (y). It seems to us that the best thing is to make an example, so that you can visualize it in a more expeditious way.

Example 1:

We have the blood pressure data of 15 people of different ages, to assign the blood pressure ranges, we are based on a table that indicates the blood pressure that is considered healthy according to the age of the people, in this way we can set three ranges of blood pressure: low, medium and high, so we will list them from 1 to 3, respectively.

Of course, the older you get, your blood pressure tends to be even higher at normal levels. So we expect the Kendall coefficient to be positive, since the older the blood pressure is, the higher it is. On the other hand, we will also assign three different ranges according to age:

According to these ranges, the following results were obtained:

The first thing we are going to do is order the independent variable age from lowest to highest and assign the range (x) a value from 1 to N (In this case N=15) to accompany the previously ordered variable (x).

We should notice that the values of the ranges are repeated and that changes the correlation method.

We must now make a table where the age range is specified, what positions that range occupies in the previous table, for example: how can you observe the age range 1 occupies positions 1 and 2, it is repeated twice that is our value from (t), if we add the positions that are 1 + 2 = 3, we can obtain the data in the table that correspond to the sum of positions.

To obtain the assigned range we must divide the sum of positions by the number of repetitions, in the first row we can observe `3/2 = 1.5` and the last column we obtain it with the value of the number of repetitions (t), with the formula `t (t - 1)` and in this case it is `2 (2-1) = 2`.

We repeat this procedure for the rest of the age ranges, if we consider range 2, we will find it in positions `3, 4, 5, 6, 7, 8, 9 and 10`, this range is repeated 8 times, the sum of the positions is: `3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 = 52`. The assigned range will be `52/8 = 6.5` and the value of `t = 8 so t (t - 1) = 8 (8 - 1) = 56.`

We will have to repeat the same procedure for rank 3. Once the table is completed we can find Tx

`Tx = 1/2 t(t-1) = 78/2 = 39`

Now we will repeat the entire previous process, but this time for blood pressure, that is, we will order the blood pressure range from lowest to highest and we will give values to the range (y) from 1 to 15, yes, after ordering the variable, so we will have the following tables:

We can then find `Ty = 1/2 t(t-1) = 74/2 = 37`

Now we will simply return to our initial table, only this time we will add two columns with the new ranges assigned for each of the variables, so that we will obtain a table as shown below:

We are then going to look for the concordant and discordant pairs, for this we will join our ranges (x) and (y) with which we are going to work from now on:

The data in the range (x) are ordered from smallest to largest, but so that it does not lose the order of its ordered pair, both columns must be selected go to "Data" → "Sort" → Choose variable range (x) → Choose the option "Sort from lowest to highest" and the range (x) will be ordered in this way, with its respective ordered pair and without losing the agreement. The table will be as follows:

Now we are going to look for the pairs of concordant and discordant coordinates, for this we will have to compare the first value with the value found in the lower cells. To find the concordant values, it must be satisfied that:

`x_i < x_j, but also that y_i < y_j`

Being x_i the value that we are considering at the moment and x_j the values that are in the subsequent cells, therefore, we must take into account all the values that are in the following lower cells x_j and that are greater than the cell that Let's consider x_i the same for y_i and y_j.

If we look at the first value, we realize that it is worth 1.5 for both (x) and (y), therefore from row 3 to row 15 all the values are greater than 1.5, therefore, the first is true condition x_i < x_j. But also all the values of those 13 rows, satisfy the condition y_i < y_j. In the same way, it happens for the second value of 1.5, so both have 13 matching pairs.

Rows from 3 to 8 have 4 concordant possibilities, since we will have to compare their values and find those greater than 6.5 and 6 respectively, both for (x) and for (y), as both conditions must be met, these only It happens in the last four rows, where are the cells that contain the value of 13 > 6.5 and 12.5 > 6.

As we can see, this same condition is repeated from rows 3 to 8, so we can build a table of concordant values and from row 9 there are no concordant values.

We are now going to look for the discordant values and for this, the following two conditions must be met:

`x_i< x_j and also that y_i> y_j`

This implies that the subsequent values x_j to the considered value of x_i must be greater than this value, but the values of the lower cells y_j must be less than the considered value y_j. If we look at the table, from row 1 to 8, the values subsequent to x_i are indeed greater, but instead the values of the cells following y_i none of them are less than the values considered for these rows.

On the other hand, for rows 9 and 10, we can find that the values of x_j are greater than x_i in the following rows, however, for y_i there is only one smaller value that is found in row 11. So that meet both conditions, we only have one discordant value for both row 9 and row 10. The rest of the rows no longer have discordant values, so we can now generate a table of discordant values:

We can already find S by subtracting the sum of the concordant values from the discordant ones: `S = 50 - 2 = 48`

The last step is simply to apply the formula to find Kendall's correlation coefficient:

`=S/((-1/2 N(N-1)-Tx)*(-1/2 N(N-1)-Ty))`

Substituting the values, we have that:

`=48/((1/2 15(15-1)-39) (1/2 15(15-1)-44)) = 0.757`

The result indicates that the Kendall correlation coefficient is positive, therefore, there is a positive or direct linear correlation between the variables blood pressure and age, with a weight and strength much closer to 1 than to 0, which indicates a medium to strong correlation between both variables, that is, as age increases, blood pressure also increases.

Exercise 2:

A certain researcher wants to know if the degree of collaboration that employees have in companies has something to do with their level of education. To see the correlation between these two variables, the researcher took as a sample 21 people who work in a factory and were classified as low, medium or high degree collaborators with the factory and then the files were requested to corroborate their level of instruction. it was observed that the levels oscillated between secondary, technical and university. So after qualifying he was able to get the following data:

To make it easier to calculate Kendall's correlation coefficient, he gave each of those academic and collaborative grades a number, so he defined that:

Degree Of Collaboration

Academic Level

So they substituted the values in the initial table:

Again we must apply the method that we explained previously, to calculate the Kendall correlation coefficient.

To do this, we must take the independent variable (x), in this case it is the level of instruction and we are going to order it from lowest to highest in Excel, but also, once ordered, we are going to generate the range (x) with numbers from the 1 to N, as we know, for this particular example N = 22, so we are left with a table as follows:

Again we must make a table that includes the number of the row where the value is repeated, the number of repetitions of each value (t), the sum of the positions in the rows where the repeated value is found, the assigned range and the last column represents at `(t - 1)`, so we get a table as shown below:

Now we calculate the value of `Tx = 1/2 t(t-1) = 128/2 = 64`

We carry out the same process for the dependent variable and where we obtain the values ordered from lowest to highest and their corresponding range (y), with their respective values from 1 to 21, being as follows:

From this table we build the following:

We calculate: `Ty = 1/2 t(t-1) = 128/2 = 64`

We make a table with the original values of each variable and its respective assigned range, therefore:

We are left only with the assigned ranges, since it is with them that we are going to build the table of concordant and discordant values. But we must also order the range (x) from lowest to highest. It is important to take into account that for this step it is necessary to order the range (x) but we must choose both variables, that is, also the range (y), so that the relationship with its ordered pair is not lost.

We will also add a column with the number of the row, so that they will notice the observations we make with respect to the row.

Remember that matching values must meet two conditions simultaneously:

`x_i < x_j,` but also that `y_i < y_j`

If we observe the previous table, we can conclude that the values greater than 4.5 are found from row 10, therefore, for the first condition to be fulfilled, we must start from that row onwards. If we count them, it's 13 values, but for the second condition to be true, the values after row 10 must also be greater than 3.5. We can realize that the values found in rows 17 and 19 are not greater than 3.5 but are equal, so those values will not meet the second condition, therefore, the concordant values are 13 - 2 = 11 and these values are repeated until row 4.

In row 5, the first condition is met again that all values are greater than 4.5 from row 10, but the second condition is that from row 10 they must be greater than 10.5 where that only happens in the rows of 11 to 15 and in row 21, so in row 5 there are 6 concordant pairs, as in row 7. Now, for row 6, as there are no values greater than 18, there is no concordant pair.

We are then assembling the table of concordant values:

We continue filling the previous table, in row 9 we find again that the values must be greater than 3.5, so we have the same case as rows 1 to 4, that is, 11 concordant pairs.

In row 10, the first condition is that the values are greater than 11.5 and this is true from row 16 to 22, but since the value of (y) for that row is 10.5 the subsequent values must be greater than 10.5 and only in row 21 is this condition fulfilled, so for that row we have only one matching value.

From rows 11 to 22 there are no concordant pairs since although it is true that the first condition of row 16 to 22 is fulfilled, the second one that implies that the values must be greater than 18, it is not fulfilled and the same occurs for rows 11 through 15 and rows 16 through 22, there are simply no values greater than 18 so the first condition is not met.

We continue with the discordant pairs, remember that the conditions are:

`x_i < x_j and in addition to y_i > y_j`

Therefore, the subsequent values to the one we are considering must be greater than x_i and less than y_i.

For the first condition to be fulfilled, we must consider only the rows from 10 to 22, but we can realize that for the first 4 rows there are no values less than 3.5 in all subsequent values. Therefore, the discordant values for all these rows are null.

For row 5 we must look for the values of y_j that are less than 10.5 but starting from row 10 and we find them in rows 17 and 19, there we will have two discordant pairs, as is the case for row 7. While that for row 6, the values less than 18 that are from row 10 down, are the values that are in row 10 and all the values from row 16 to 22, minus the value that is found in the row 21, therefore, from there we will have 7 discordant values, in the same way as for row 8.

For row 9 there are no discordant pairs since there are no values less than 3.5. Later for row 10, there are only two values less than 10.5 and from row 11 to 15, all the values are less than 18, except for row 21, so there are 6 discordant pairs, the same happens for all rows between 11 and 15.

From rows 16 to 22, the first condition is not met, that is, the values are greater than 18, so there are no discordant pairs.

The complete table looks like this:

We find `S = 67 - 50 = 17`

Let us then calculate the Kendall correlation coefficient:

`=S/((1/2 N(N-1)-Tx)*(1/2 N(N-1)-Ty)) =S/((1/2 22(22-1)-64)*(1/2 22(22-1)-64))`

Since in this case Tx = Ty, the two roots of the denominator are equal, so I can square them and cancel the root, so it is:

`=6/(22*21/2-64) = 17/167= 0,102`

This coefficient indicates that there is no correlation between the level of education of a worker with respect to his degree of collaboration in the factory, as we already know, this value is interpreted in the same way as the Pearson correlation coefficient, therefore, at As it gets closer to zero (0), the correlation between both variables is lower and this result indicates that the correlation is practically null.

41.3 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

FORTYTWO

LONG-TERM BEHAVIOR OF MARKOV CHAINS

One of the most interesting aspects that Markov chains can give us is to be able to predict their long-term behavior, yes, if it exists. If so, we will obtain a probability vector "X" that will indicate the probabilities of being in each of the states, but after a large number of repetitions. So in a Markov chain, its long-term behavior if it exists is defined as:

We must take into account "if it exists" it is because there are Markov chains whose long-term behavior is not defined. But even if this is so, we can establish conditions that guarantee long-term behavior in a Markov chain.

For example, if we have a transition matrix P made up of strictly positive elements, we can show that this Markov chain can have a long-term behavior, in addition that it is well defined and this behavior is unique.

Let's suppose that we have a transition matrix P from a Markov chain. We can then say that there is a vector "X" that is stationary, given the case that "X" is a probability vector, which is fulfilled if its elements are positive, they add up to 1 and also PX = X.

If all these conditions are met, we can say that a Markov chain can have a perfectly defined long-term behavior and also that this long-term behavior is unique and can be represented with a stationary vector.

When it is true that PX = X, this implies that "X" is going to be a vector of P but associated with the eigenvalue = 1 and it is also a probability vector.

42.1 Stationary Vectors

Let's suppose that we have a Markov chain with a transition matrix P, we can define a stationary vector as a probability vector X that fulfills the condition

PX = X.

We must take into account that a stationary vector is an eigenvalue vector of P but that it is associated with the eigenvalue = 1.

When we have a Markov chain that has a defined long-term behavior, then we can say that this long-term behavior will be given by the stationary vector. That is, the stationary vectors establish the long-term behavior of a Markov chain.

It is important to take into account that not all Markov chains have a well-defined long-term behavior, but if all the elements or inputs of the transition matrix P are strictly positive and the matrix is stochastic, there is a theorem that guarantees that this matrix P has a defined long-term behavior and this behavior will be precisely the stationary vector.

To find the long-term behavior, we must find a probability vector that satisfies PX = X and this means that this vector is an eigenvector of P with = 1.

Now, to find this proper space, it is defined as the null space of the matrix (P - I), where I is the identity matrix, that is:

E= Null (P - I)

But we are interested in finding the proper space for when = 1, therefore the equation would remain as:

Let's remember a bit of linear algebra to know the method How is the null space of a matrix found?

Let M = (P - I) be a matrix made up of m rows and n columns, the null space of this matrix is defined as:

In other words, the null space of the matrix M is a set of elements that belong to R^n that when multiplied by the matrix M, its result is the vector

that belongs to

Let's go to an example: Let's find the null space of the matrix A

For this we must multiply the matrix by , that is:

It is important to take into account that the vector

must have as many elements as there are columns in the matrix, in this case matrix A has 3 columns and therefore the vector will have 3 elements: x, y, z. While vector

will have as many elements as there are rows in matrix A, which in this case also has 3 rows, therefore, vector

is composed of 3 elements.

Then we simply multiply the matrix A by the vector

and set it equal to the vector

To solve this system of equations, it is best to stagger the matrix and for this, it will be necessary to create the extended matrix:

Now, what is staggering a matrix?

An echelon matrix is characterized by only containing the unit on the main diagonal and below the diagonal, all elements must be null, but the elements above the diagonal can contain any value. This way of treating matrices greatly facilitates the calculation of its variables and to convert any matrix into a stepped matrix, it will be necessary to perform some operations with the rows of the matrix.

You can exchange rows, multiply the entire row by any convenient scalar number and add or subtract the rows, until the matrix can be scaled without affecting the result. If the first element in the upper left corner of the matrix is zero, it is advisable to exchange the rows for any other whose first data is different from zero.

We are then going to carry out the necessary operations to convert the augmented matrix into an echelon matrix.

The upper left number of the matrix is 2, to convert it to 1 since it is a condition to convert the entire diagonal of the matrix into unit elements, for this it is advisable to multiply the first row by ½

½

We are now going to try to convert the numbers that are below the first one (1) into zeros, for this it will be necessary to have row one previously multiplied by (4) in row 2, and the result will be our new row 2. From the In the same way, our row 3 will be the effect of adding to row 3, row 1 multiplied by (6).

Translating the result into an equation we have:

x - (1/2) y + (3/2) z = 0

We have the following system, where we realize that there are infinite solutions, since the variables "y", "z" can adopt different values and is what are called free variables, the best way to express a system with free variables is :

x = (1/2) y - (3/2) z

y = y

z = z

Now, only “x” depends on the other two variables, since both “y” and “z” can adopt any value, so that the system can have infinite solutions, we are going to organize the above a little better and we are going to make a parameter change to find one of the possible solutions.

y = t

z = s

Where “t” and “s” are any scalar values or numbers

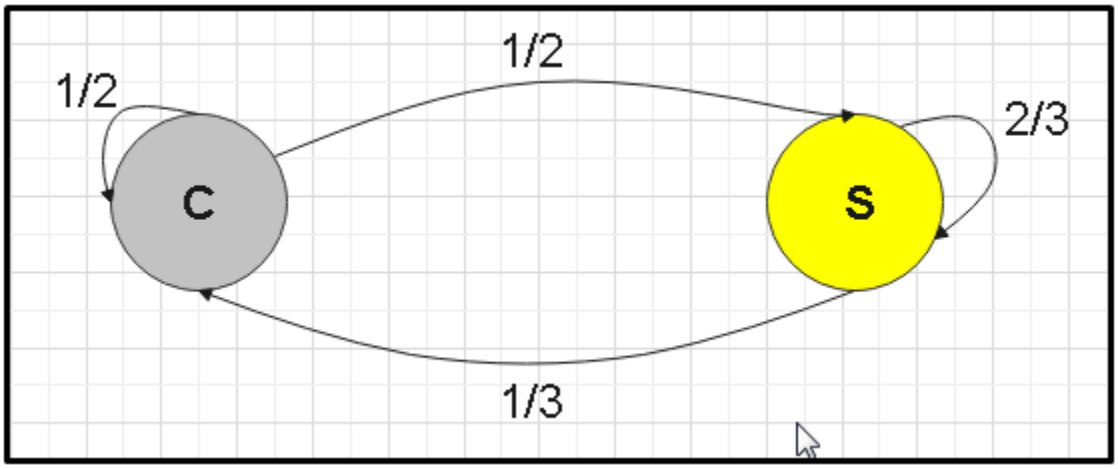
Since t and s are scalar numbers, we can extract them from the matrix

Therefore, each solution vector can be generated by means of the linear combination of these two solution vectors, so as we give atys values, a new solution vector will be generated and it is important to take into account that both Vectors are linearly independent of each other and they also generate a solution space for the system. So now we can extract the core of the solution and describe it as follows:

Once we have learned the corresponding handling of linear algebra for solving these types of problems, we can return to the topic that matters to us and that is the long-term probability of Marcov chains.

Let’s go to an example: In a certain region we have the following sequence of atmospheric weather, we will call “S” when the day is sunny and we will call “C” when on the contrary, it is cloudy. On the other hand, we have knowledge that if there is a cloudy day, most likely the next day it will also be cloudy. But if the day is sunny, there is a 2/3 probability that the next day it will also be sunny. Suppose that today the day is cloudy:

- What would be the probability that in three days it will also be cloudy?
- What would be the probability that it is sunny?
- What would its behavior be in the long term?
- Will your long-term behavior depend on how you are on the day we take as your initial reference?




```
Leaves
    C   S
C   1/2 1/3
S   1/2 2/3
```

It reaches

In the initial situation, the day is cloudy, so the initial vector will be:

The probability that it will be sunny three days later will be 59.72%, while the probability that it will be cloudy that day will be 40.27%

We now go with the long-term behavior and for this we must find the null space of the matrix (P - I), then let's first find the result of it and remember that I is the identity matrix

To find the null space of the resulting matrix, it is best to express the extended matrix, whose last column is made up of null elements, that is:

Now we will have to perform the necessary operations to scale the matrix, to row 1 I will add row 2 and the result will be placed in row 2

As we know, to stagger the matrix, the numbers on its diagonal must all be 1, so I will multiply row 1 by scalar 2 and the result will be my new row 1.

x -2/3 y = 0

y = y

Clearance x:

x = 2/3 y

I change the parameter and set that:

y = t

The system looks like:

As it is very uncomfortable to work with fractions, I extract (1/3) from the vector and we are left with:

Therefore:

But remember that the long-term vector is going to be a stationary vector, that is, an eigenvector of P associated with the self-value = 1, but the stationary vector must be a probability vector and this implies not only that its elements must be greater than or equal to zero, but also, when adding the column of the vector, the result must be unity (1).

As we can see, in this case the sum of the vector gives us 5, so to find the stationary vector what we have to do is find a multiple of that vector, whose sum of elements gives us as a result (1). We can realize that if we multiply the vector by (1/5), we can obtain the vector that meets all our expectations, in this case the stationary vector remains:

By adding 2/5 + 3/5 = 1

This vector will indicate that the long-term behavior of the weather in that region is a 40% probability that the day is



cloudy.



While the probability that that day is sunny will be 60%. Once we know the method, we will try to find the long-term behavior of two problems that we developed in the previous article.

Remember when we were looking for the probabilities that a student will spend his time studying mathematics or physics?

Well, starting from the transition matrix that we calculated previously, we are going to try to find the long-term probability, to see which of the two subjects the student will end up spending more time on.

Recall the transition matrix P

Let's apply the method again for long-term behavior, the first thing we must do is look for the matrix (P- I), so that by

subtracting the identity matrix from P we obtain:

Doing the operations between the rows, we are going to add row one with row two, to place the result in our row two and I am also going to multiply row one by (-2) to convert its first element to (1), since As we know, to scale the matrix we must have the unit in all its diagonal.

To find the null of this array I must extend it with null elements

As we realize we have “y” as a free variable, therefore the system will be equal to:

x - (4/3) y = 0

y = y

We make a parameter change:

y = t

We substitute in the system:

x = 4 / 3t

y = t

We can express it as:

For convenience we extract 1/3 of the vector and we have:

The space will be as:

Again we realize that the vector generated is not a probability vector, since the sum of its elements gives us the number 7 instead of the unit (1), so again we will have to find a multiple of the vector so that we gives as a result a new vector, whose sum of elements is (1).

If we multiply the vector by (1/7) we will achieve the proposed

As we can see: 4/7 + 3/7 = 1, therefore we have already reached the probability vector that represents the long-term behavior

Recall that the first row represented the time spent studying mathematics, while the second row indicated the study time for physics.

With this result we can deduce that in the long term, the student has a 57.14% probability of studying mathematics and a 42.85% probability of spending his time studying physics.



Let's keep looking for the long-term behavior of exercises that we performed in the previous article. Remember the problem with the trucks moving between Brisbane, Sydney and Melbourne?

Now we are going to see the probability of the number of trucks found in each of these cities, but in the long term. Recall its transition matrix P

We are now going to calculate the matrix (P- I)

Now we do the operations between rows to try to scale the matrix, in this case we are going to add row 1 with row 2, to place the result in row 2.

We are now going to expand the matrix to find the null of (P- I)

This matrix is translated into two equations:

x - y = 0

y - z = 0

z = z

Remember that "z" is a free variable, because we have three equations with two unknowns, so we set "z" as our free variable.

We now carry out the parameter change where z = t and we solve for the rest of our variables

x = y

y = z

z = t

By mathematical transitivity, if z = t and y = z, then y = t, the same happens with "x", so:

x = t

y = t

z = t

We can then represent it as follows:

So that our space will be generated by this last vector and therefore:

As we can see, this vector is not exactly a probability vector, since when adding its elements it gives us 3 instead of 1, so we look for a multiple of this vector that allows us to find three elements that when adding them gives us the result number 1).

This indicates that in a long time there will be the same number of trucks in each of the cities, with a probability of 33.33%, that is, there is 33.33% that the trucks are both in Brisbane, in Sydney or in Melbourne.



CHAPTER

FORTYTHREE

MARKOV CHAINS

The number of people that make up a population is determined both by the number of births and the probability that individuals have of dying within this population. For this, it is important to know the ages of the people that make up the population under study, that is, how the individuals are divided according to their age and also to know their probabilities with respect to fertility, mortality and survival. Then it will be necessary to make what we call a life table where the number of females that can mate is reflected first, to know the fertility terms of that publication.

It is then when we must use a classical probabilistic model based on matrix algebra, such as Markov chains, we are now going to explain what these chains consist of.

We are going to suppose that we toss a coin and we will designate the event If it comes up heads and If it comes up tails, but it does not matter if we repeat this action t times, the probability of obtaining will not depend on what has come up in the previous event, since both events are independent. But there are many other events that are represented by independent variables and in 1907 Marcov dedicated himself to studying these situations where an event will depend on the immediately preceding event and that is precisely what we will see in this article.

Suppose again that we have a sequence of "n" experiments or tests and in each of them we obtain a set of possible results, which we will consider finite and also designate by , , , … Being between them, mutually exclusive. When we carry out an experiment and obtain the result , then we can say that the system is in the state E_i, but we will use as the representation of the event but after t amount of tests. Therefore its probability will be given by

After t experiences that the system is in state .

On the other hand, we will call the probability of the system is in state but this time when the test t is conditioned to a previous test t - 1 and it is what we will call a state , therefore:

However, when we have a succession of events

that are also mutually exclusive, that is when a Markov chain is constituted:

This means that the probability that the object in the test t is in the state , will only depend on the state , of the previous test t-1 and that it is also independent of the previous tests or experiments. Somehow it is as if the system lacks "memory".

The probability is evident that it depends on 3 variables that are: the events , and the time "t", therefore:

For the particular case where the probability is independent of t, we can say that the Markov chain is stationary or homogeneous, in that case we can say that: . So from now on we will consider the homogeneous chains as is a certain probability that meets:

1.
2.
3.

43.1 Stochastic matrices

Stochastic matrices or also called probability matrices, are those that meet the condition that each of their rows ends up being a probability vector. It is important to emphasize that stochastic matrices are a case of Minkowski matrices, which in turn are also a specific case of non-negative matrices.

Now, a stochastic or probability vector is the one that fulfills that all its components are particularly non-negative and also the sum of them is always equal to 1, that is, given the case that

is a probability vector, then:

1.

2.

Given these circumstances, stochastic matrices are a particular case of what we call Minkowski matrices, let's define the latter, Monkowski matrices are non-negative and square matrices, where the condition that the sum of their elements is either from each column or each row, are less than or equal to the unit, therefore, if

is a Minkowski matrix, then it must be satisfied that:

1.

2.

Non-negative matrices: As their name indicates, they are those matrices made up of non-negative elements, so that if

is a non-negative matrix, then it must be true that:

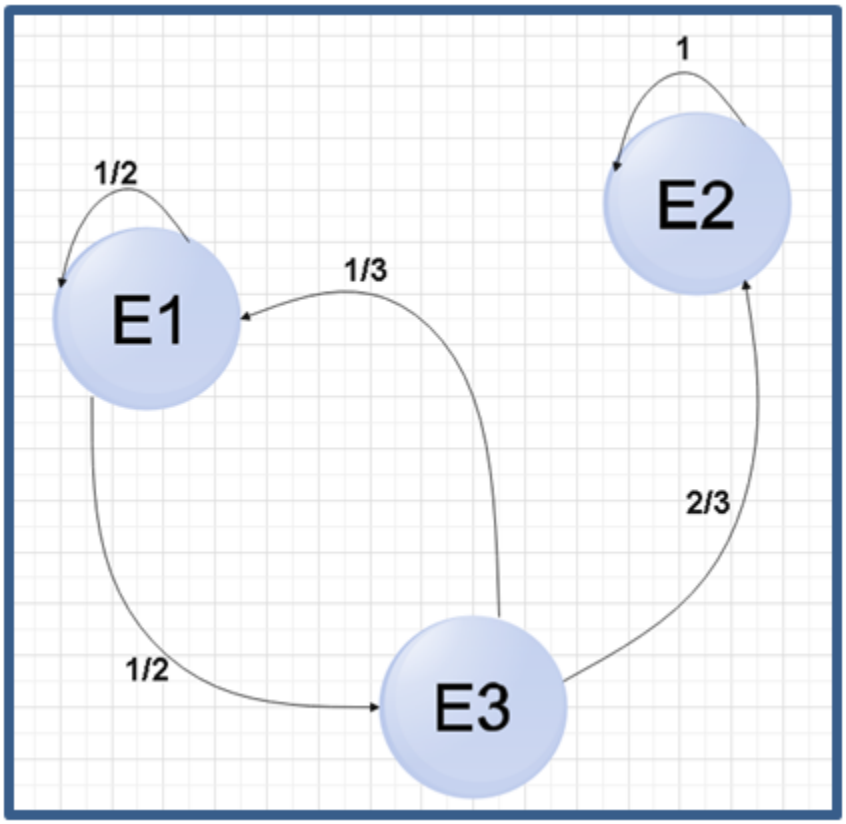
1.

43.2 State diagrams

We can represent the different relationships that exist between the states of a Markov chain through a diagram made up of nodes and arrows that are oriented by the transition probabilities and this type of diagram is known as state or transition diagrams.

Let's suppose that we have a stochastic matrix such as:

The corresponding state diagram would be:



Now let's go with an example: A pet store sells fish and has a guarantee, so if you buy a fish and it dies before three months, the store replaces the fish for free, yes, once the fish has been replaced once, the warranty is terminated.

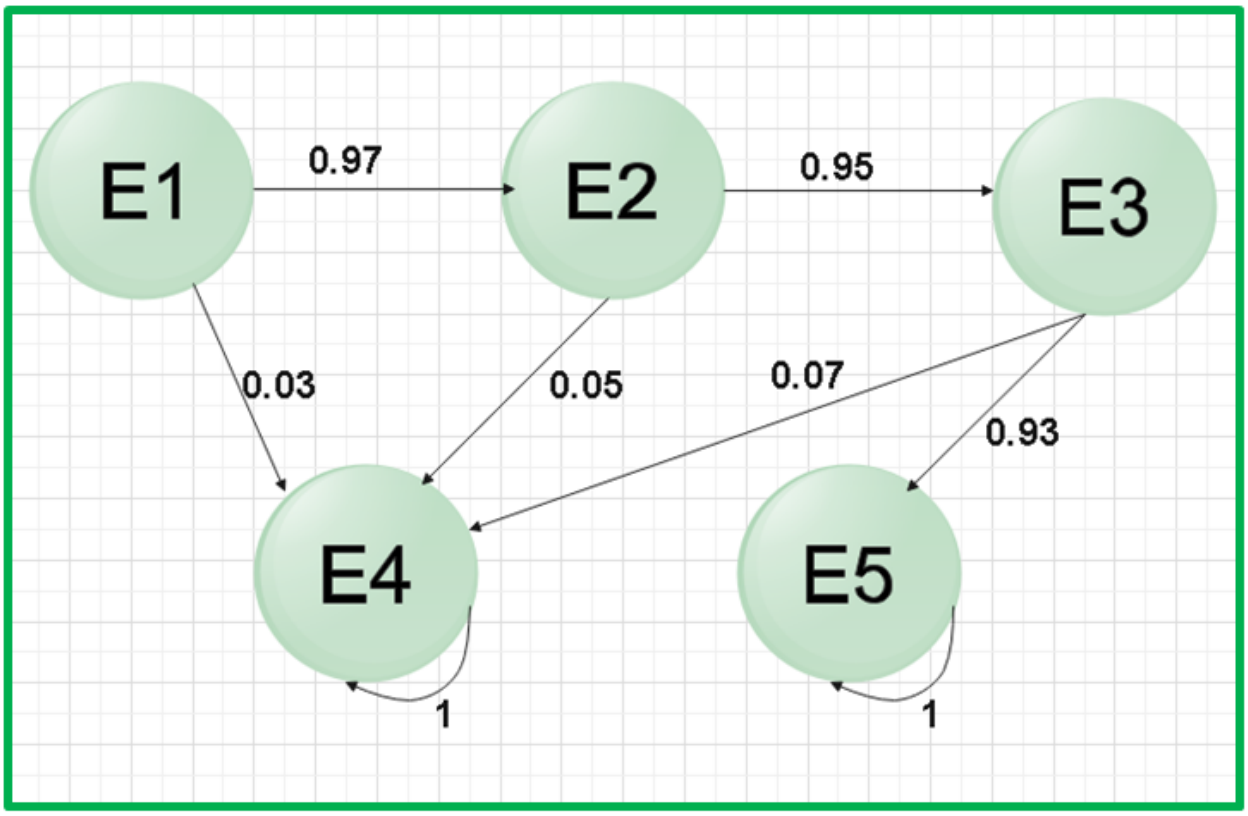
We also have the following data:

1. During the first month 3% of the fish die
2. Between the first and second month, 5% of the fish die
3. Between the second and third month, 7% of the fish die

Let's represent the pet store situation using a Markov chain state diagram: The nomenclature used will be the following:

1. Fish
2. The months will be i = 1, 2, 3 of guarantee
3. Fish that has been replaced and therefore no longer has the guarantee
4. Fish without warra
5. nty for having been sold more than 3 months ago

We are going to make the state diagram



43.3 Markov regular chains

Let us remember that until now we have considered a finite number of experiments, but it is not interesting to develop in a similar way for a long-term behavior, since the transition matrix solves the problem of finding the probability law. In the new proposed case, that is, to use the Markov chain but studying a long-term behavior, we must find the limit of the chain when time tends to infinity.

Being A^n\ the nth power of the transition matrix A, we can then say that:

If we have any two values i, j = {1, 2,. . . , m} using the induction method we have:

Let's now suppose that the theorem is true for n-1, we can say that:

Using the law of total probability we have that:

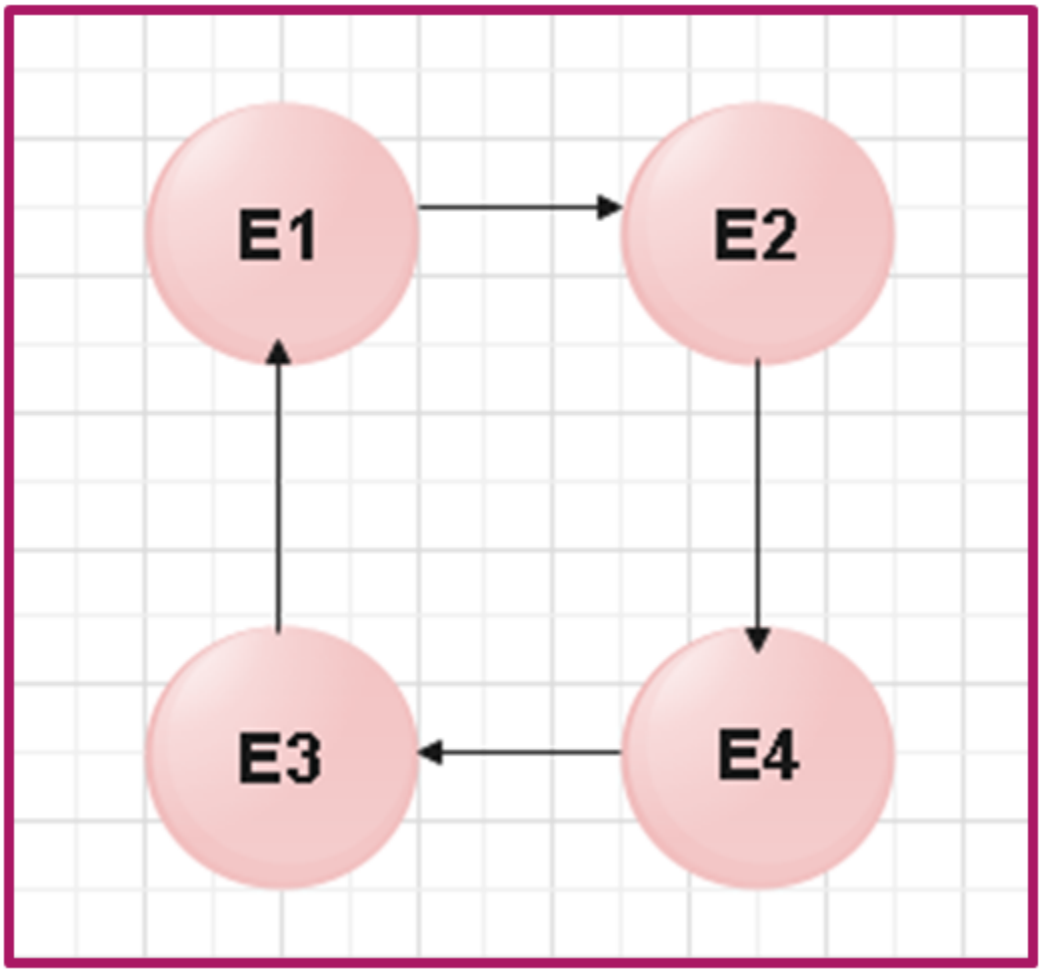
If we use the induction hypothesis:

In addition to the definition of the Markov Chain

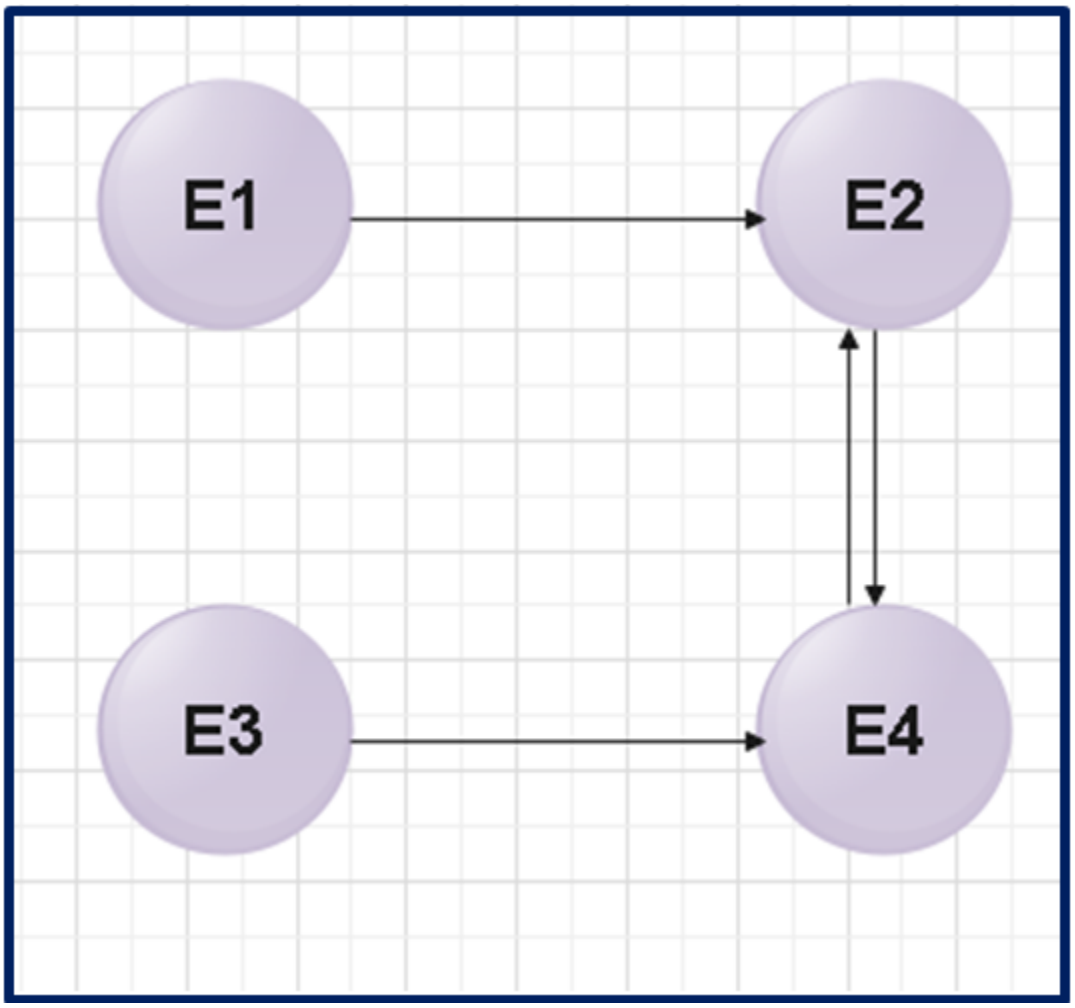
We can say then that:

This corresponds to row i column j when we obtain the product of the matrices

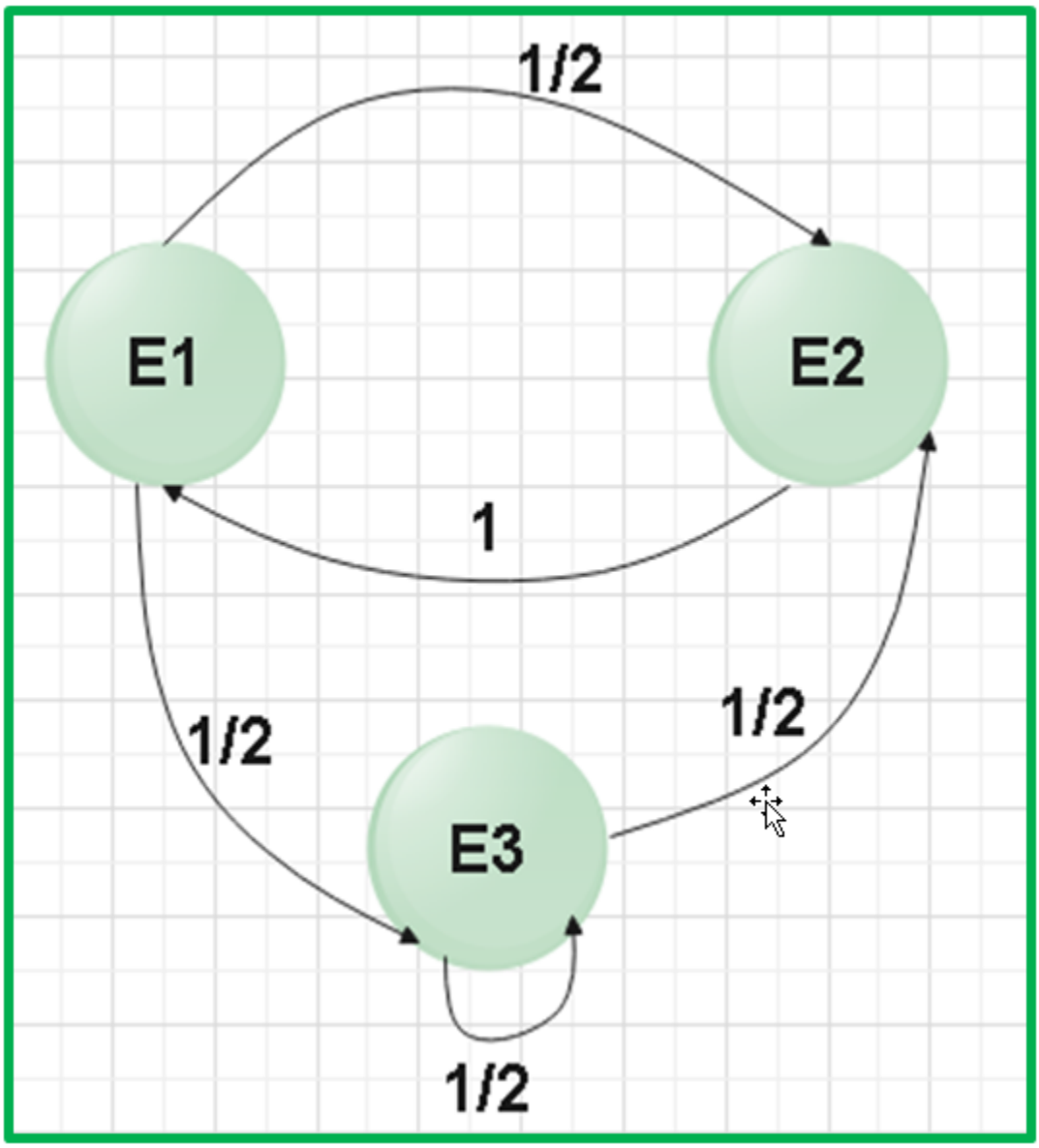
Let's see graphically how to recognize if a Markov chain is regular or not:



This Markov chain is not regular because it only has one cycle



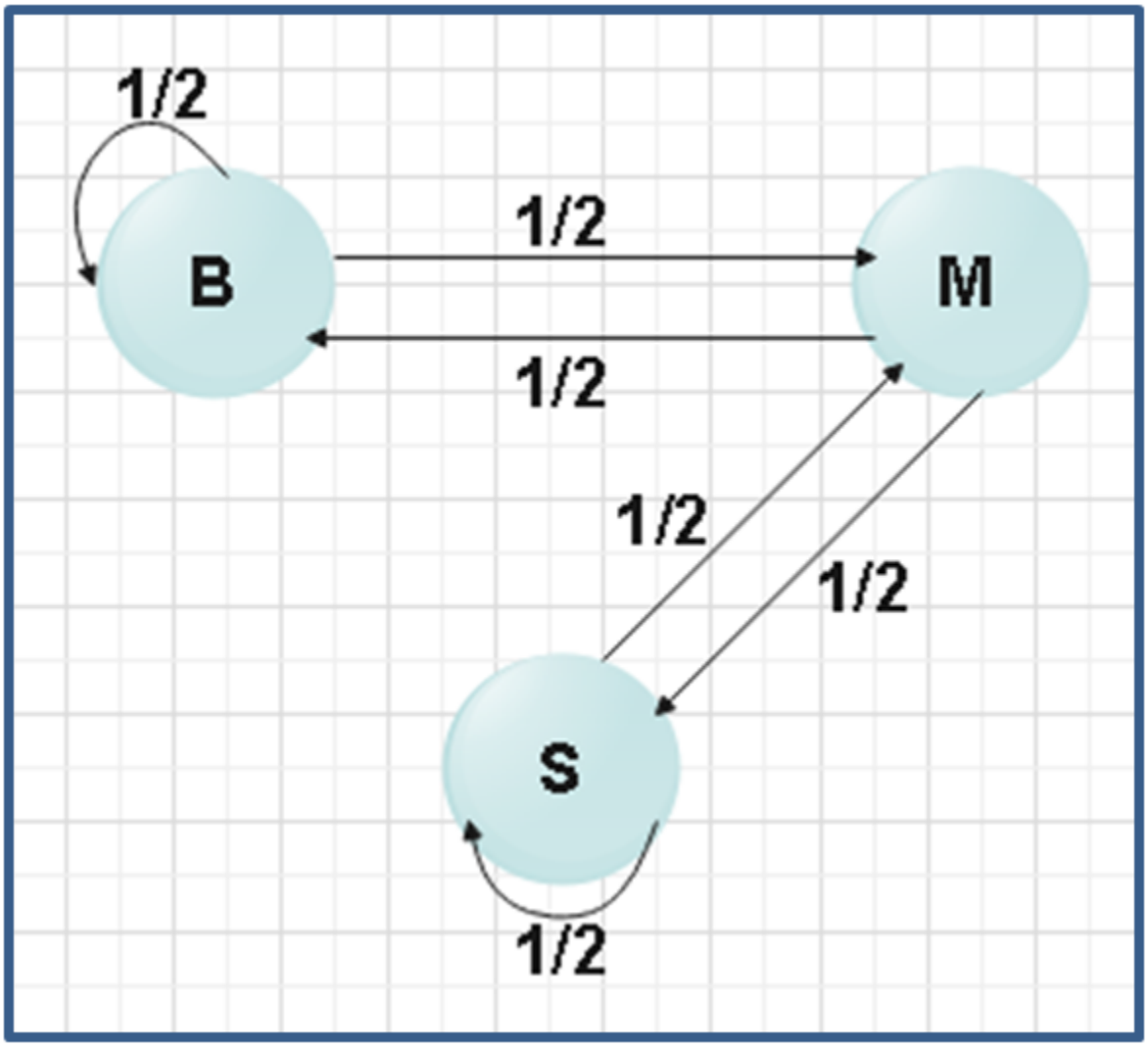
This Markov chain is also not regular because both state E1 and state E3 do not have access from any other state



This Markov Chain is regular, since all its states are accessible.

Let's go with an example: suppose a company has three trucking centers that are located in Brisbane, Sydney and Melbourne. Every month, half of the trucks in Brisbane and Sydney go to Melbourne, while the other half stay at the same site. However, the trucks found in Melbourne are divided equally between Brisbane and Sydney. If initially the company had 100 trucks in Brisbane, 300 in Sydney and 200 in Melbourne, we want to know the distribution of trucks after the first month and after two months in each of the cities.

The first thing we must do is make the state diagram:



The nomenclature will be as follows:

Number of trucks in Brisbane, number of trucks in Sydney and number of trucks in Melbourne after k months.

For the first month we have to:

+ 50 + 100 = 150

+ 50 + 150=200

+ 150 + 100 = 250

For the second month the distribution of trucks will be:

+ 75+100=175

+ 75+125=200

+ 125+100=225

We can perform these same calculations in a more convenient way, using matrix notation. We are going to call the vector that represents the probabilities in month K, then the denotation would be:

The calculation for the first month can be represented in a matrix as follows:

Then yes:

We can express the above equation as:

So as:

Therefore:

To generalize, we can express the equation as follows:

We can conclude that a Markov chain is finite and comes from an evolutionary process of a finite number of states, which we can denote as: State 1, State 2, State 3,..., State n. For each point in time, the process will be in one of the states and already changing state by means of fixed probabilities, which are what we call transition probabilities.

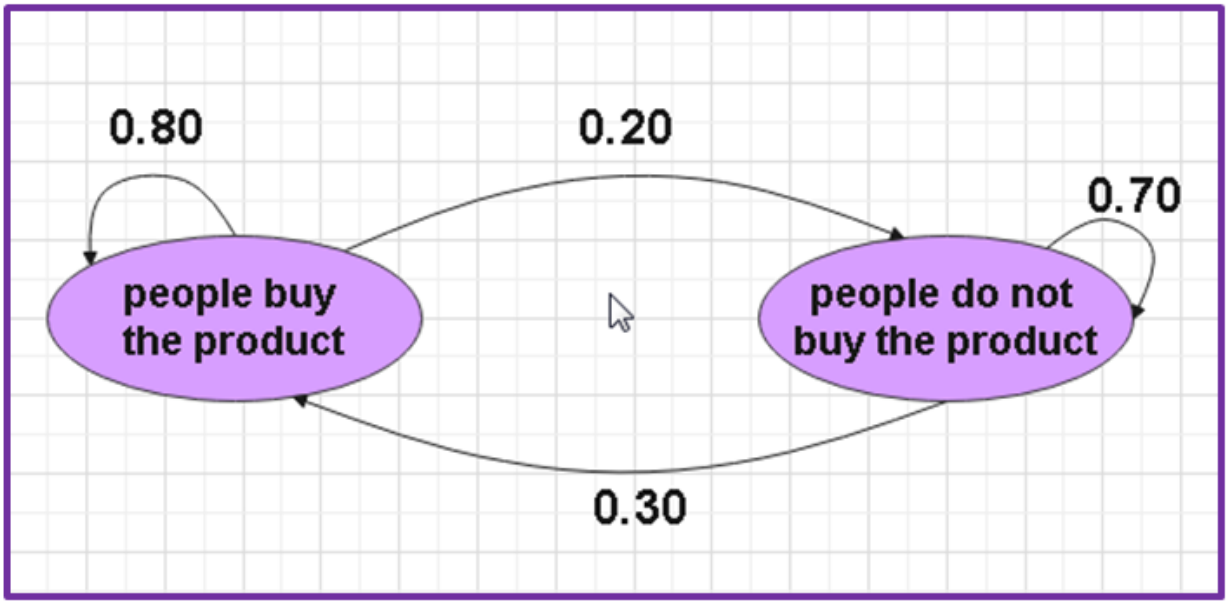
Therefore, there is a vector for each time k and represents the probability of being in the different states for a time K, that is:

Let's go to an illustrative example:

The department in charge of market research for a certain factory has estimated that 20% of the people who buy the manufactured product one month will not buy it the next month. They have also determined that those people who do not buy the product one month will buy it the next month. If out of a population of 1000 people, 100 of them buy the product the first month, how many people will buy the product next month? How many people will buy it two months later?

Of the 100% of people who buy the product in one month, 20% will not buy it the following month, that is, 80% will continue to buy it the following month and in the same way 100% of people who do not buy it in one month, only 30% will buy it the following month, so 70% will not buy the product.

As always, we will make the state diagram



Our transition matrix will then be:

In the initial state we know that out of 1000 people, 100 bought the product, so that 900 people did not buy the product, our initial vector will be:

For the first month 350 customers will buy the product, while 650 customers will not buy it.

These calculations indicate that for the second month 475 customers will buy the product and 525 will not buy it.

Another example:

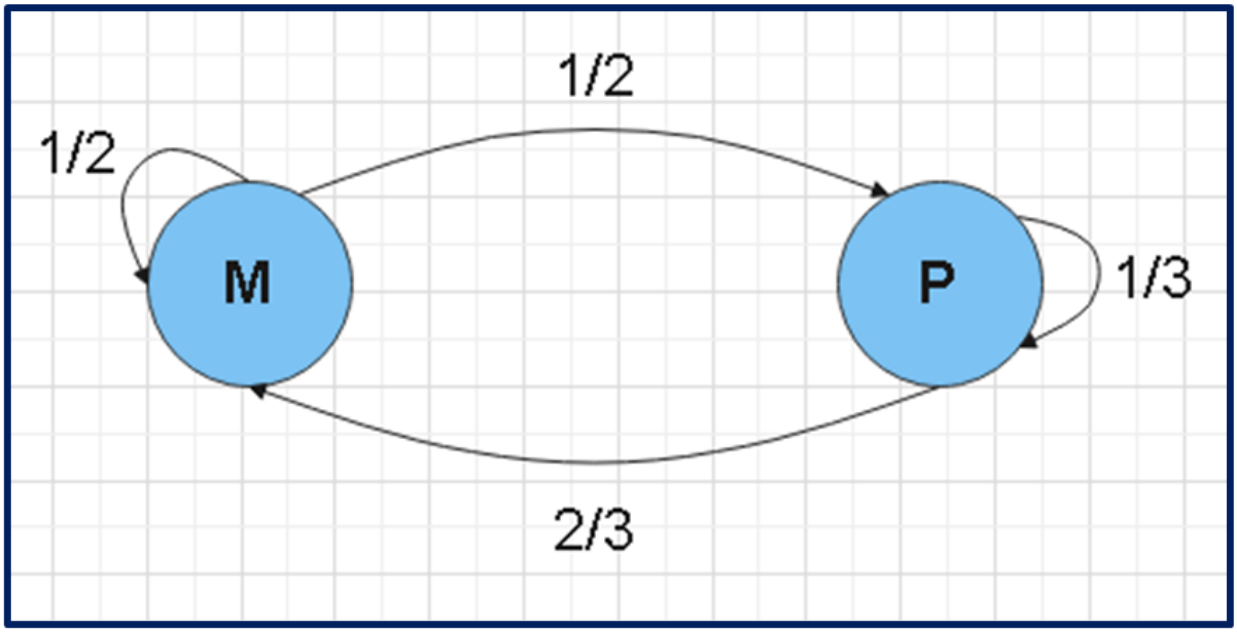
A student is taking math and physics courses this semester. The student decides to follow the following patterns when studying these subjects:

If one day she studies math, the next day she will spend 1/2 of her time studying math and the other 1/2 time studying physics.

If you study physics one day, the next day you will spend 2/3 of your time studying mathematics and the other 1/3 of your time studying physics.

If the student spends the Monday of a week studying physics, how likely is the student to spend his time on Thursday of the same week studying mathematics?

We are going to make the state diagram:



In a Markov chain the important thing is to find:

1. The transition matrix
2. The initial state to find the transition matrix it is advisable to make a table

So from there we can write the transition matrix:

We can then verify that this matrix is stochastic, since it is made up of probability vectors, we know that they are probability vectors because their elements are greater than or equal to zero and when adding their components, the result is unity. When I add 1/2 + 1/2 = 1 and in the same way 2/3 + 1/3 = 1.

We are now going to find the vector that represents the initial state, for this the established order is important, that is, in our table we place mathematics first and then physics. Now, the question we must answer in the problem begins with the statement “If one day he studies physics”, so that is where our initial state begins. This implies that that day he studied physics and not mathematics, therefore our initial vector will be given by a null time dedicated to the study of mathematics and the total time studying physics, that is:

Once we have the transition matrix and the initial state, we can answer the question posed. As we know, our initial day is Monday and we assign a value of K = 0 to that day, therefore, for Tuesday K = 1, Wednesday K = 2 and we are specifically interested in Thursday when K = 3. Remembering the formula what interests us:

Therefore:

We already calculated the study probabilities for Thursday, but the question is how much study time he will dedicate to mathematics, as we know that subject is the first one we place in our vector, therefore, the probabilistic study time of mathematics for Thursday it will be 57.41% of your time.

CHAPTER

FORTYFOUR

MULTIVARIATE STATISTICS

Multivariate or multivariate statistics is an area of statistics that is based on the simultaneous analysis and observation of several variables, in addition to understanding how the different variables are related to each other.

Multivariate statistics at the time of its practical application has determined many problems in particular, it can take into account several types of multivariate analysis to achieve an understanding of the relationship between the variables and the relevance of their relationships, specifically in the problem at hand. doing research.

Multivariate statistics, in turn, are based on multivariate probability distributions and their usefulness in representing the distributions of the observed data, but also how we can arrive at the inference of different quantities, when they are of interest to us for the same analysis.

The applications of this type of multivariate statistics are found in different branches of science, but also in market research, in order to determine the characteristics of the individuals who buy a certain product.

It can be studied the resistance of crops to damage caused by droughts and pests in agriculture, while in psychology, it can be used to study the relationship between the attitudes of parents and the behavior of their adolescent children. In finance, they can help you to know the economic development of a certain territory in relation to other areas, as well as in sport, multivariate statistics can be used to obtain the best results, based on the knowledge of anthropometric measurements. In short, multivariate statistics have endless applications, in different areas of our daily lives.

When several characteristics of interest are measured for the same individual, that is when the multivariate data appear. Let us remember that an individual is any object worthy of study and is what we call experimental units, for example: land, people, countries, animals, companies, etc.

The main objectives of using multivariate techniques are:

1) Simplification: The set of techniques that allow us to visualize and interpret large amounts of data, whether of individuals or variables, is what we call multivariate methods and we can understand them at a glance, thanks to the fact that they help us to reduce or simplify these data.

2) The relationship between variables: find the possible relationships that exist between individuals among themselves, the characteristics and between both.

2.1.- Relationship between characteristics: It is possible to relate these variables when they have common characteristics, for example: we are going to suppose that mathematics, physics and chemistry tests are carried out on a certain group of high school students. If each student that makes up the sample obtains high marks, measures and low marks in the three tests, then we can conclude that there is a relationship between the tests of these three subjects. The characteristic that they could have in common is the measure of intelligence of the individual in general, for the beginning of a certain university career.

2.2.- Relationship between individuals: The relationship between individuals exists if they are similar to each other, for example: Let's suppose that we are evaluating different types of beers with respect to the level of acceptance they have. Then we measure the consumption of each of them for different age groups. You can try to measure the relationship that exists between light and dark beers, or if on the contrary, they do not keep any type of relationship between the different evaluations.

Although it is true that we start from the assumption that the variables are related when we refer to studies with respect to individuals, we realize that they can also be independent. Furthermore, we start from the assumption that the set of variables involved in the analysis have a multivariate normal distribution. However, this assumption is capable of allowing a multivariate analysis, but which in turn develops in parallel to the univariate analysis that is based on a normal distribution.

Classification of multivariate methods:

1) Those motivated or directed by the variables: These methods are focused on the relationships between the variables, such as factor analysis, correlation matrices, principal component analysis, and regression analysis.
2) Those motivated or directed to individuals: These methods focus on the relationships that exist between different individuals, for example: multivariate analysis of variance, discriminant analysis and cluster analysis. Multivariate exploratory analysis

Descriptive and multivariate statistics describe the behavior of a group or set of data, where the most important are:

- The sample variance
- The sample mean
- The sample correlation
- The scatter diagram
- The main components

We call statistical inference to the approximation of certain population characteristics, which are called parameters, and statistics are in charge of summarizing the information found in the sample of a population.

Now, remembering a little what the point estimate is, it is one that consists of supplying a value where the parameter of our interest approximates. We have point estimation methods such as the maximum likelihood method and the moment method.

How to test a hypothesis?

When it comes to contrasting hypotheses in statistics, we must do tests that measure two hypotheses, to know which of them is correct and the decision is based on the information provided by the sample.

When we refer to the most important hypothesis test in multivariate data, we must simply test whether the correlation between two variables is significantly different from zero.

Confidence intervals

When we make estimates by intervals, we must establish what is the confidence interval where the set of values that are closest to our parameter are found. In the same way as in hypothesis tests, the confidence interval with the greatest interest is the one where the greatest correlation between two variables is found.

We can use correlations when grouping variables, since when we have a large set of variables, it is most likely that there are relationships between some of these variables and the correlation coefficient between two variables allows us to group these variables, of so that the variables that are in the same group may have high correlations, while the variables that are in different groups will have low correlations with each other.

Let's explain a little the techniques used for multivariate analysis

1. Dependency Methods:

1.1.- The regression method allows us to investigate up to when the behavior of a variable can be predicted from another variable, for example, what economic benefits in a film can be obtained depending on production expenses and marketing expenses.

1.2.- Canonical correlation analysis tries to analyze the possible relationships that exist between two groups of variables.

1.3.- When we carry out a discriminant analysis, we can obtain a discriminant function that we can use to differentiate between two or more groups and thus be able to make decisions based on it.

1.4.- There is an extension of the analysis of variance (ANOVA) for those cases where there are several dependent variables, this extension is what we call the multivariate analysis of variance (MANOVA).

1.5.- When the response or dependent variable is dichotomous, the logistic regression method allows us to develop a regression analysis that serves both to estimate and to test the influence that one variable has on another.

2. Methods of Interdependence:

2.1.- The first method of this type is the principal component analysis, which determines another smaller system of variables and which is capable of synthesizing the original system.

2.2.- Cluster analysis is responsible for classifying a sample of variables or individuals into small groups, so that the characteristics of a certain group are very similar to each other and, at the same time, very different from the rest. It is important to take into account that it disagrees with the discriminant analysis, in that the composition and number of these groups is unknown.

2.3.- The iconography of the correlations.

3. Structural Methods:

3.1.- Structural equation models are in charge of analyzing the relationships that exist between a set of variables that are symbolized by a system of simultaneous equations, where it is assumed that some of these equations that we will call "constructs" are they measure from other variables that are observable and which we will call "indicators", yes, the modeling always has a small error between the constructs and the indicators.

We are going to delve a little into each of the methods, how they are applied and we will include some solved exercises that help us better understand the method.

1) Multiple regression analysis: Regression is used in research to model the relationships that exist between those variables that are capable of directly influencing a phenomenon in our reality. For example, an economist might be interested in verifying the relationship that exists between the financial indices of a certain company and a possible scenario of economic instability or, on the contrary, of financial equilibrium.

In a much broader sense, regression is intended to model a set of data. In other words, the regression formula is used to approximate the relationship that exists between the variables, regression is used not only as a descriptive tool, but also as an inferential instrument.

The researcher must find the best linear equation that adapts to what he wants to predict and must also be able to control the set of factors that are present in the phenomenon, in order to evaluate it.

On the other hand, the researcher evaluates a sample of observations, in order to be able to make the necessary estimates of the population parameters and verify in this way, if there really is a linear relationship or not, between the dependent variable and the independent variable.

Let's go with the first example of multivariate regression:

In a gym, the weight and height measurements of some clients chosen at random are taken, to generate a function that allows us to predict, the same measurements in other clients just by knowing their age, the data obtained is as shown below:

Years Old	Weight (Kg)	Tall (cm)
32	96	174
39	59	178
39	100	180
31	79	185
26	72	184
33	95	177
45	51	182
42	68	169
27	65	170
33	72	162
20	96	176
38	98	171

To do multivariate linear regression using Excel, we need to install the Data Analysis Add-in. For this, it will be necessary to open a new Excel sheet and pour our data into it, then we go to the upper menu in "file" and in the drop-down menu we will choose "options", a box opens and in the menu on the left we click on "add-ons", where again the add-on options on the right side of the box are opened, there we must select "tools for VBA analysis" and then go to the "go" button and press it.

Another small box opens where we must enable the boxes corresponding to: "tools for analysis" and "tools for VBA analysis" and then click on the "accept" button. Once this procedure is done, we already have the main tool to do our multivariate linear regression.

Now, we return to our Excel sheet and in the upper menu we choose "data", if we have installed the add-in correctly, the option "data analysis" should appear in the upper right, we open this option and a new one will open Box with the functions for analysis, among them is the "regression" function, which is precisely the one we must choose.

Once the "regression" option has been chosen, we click on the "accept" button and a new box will be displayed where we must position ourselves with the mouse over the "Input Y Range" option and that is when we select all the data that make up our first column (the age of our sample).

In the same way, we will position ourselves later on the option "Input X Range" and this time we will select the following two columns where the data corresponding to height and weight are found.

To obtain the regression analysis without deleting our data from the table, we must choose the option "output range" and position our mouse over the small box, where then we must choose a cell in our Excel sheet, which will be reflected in the box and that is where our analysis data will appear, then we only have to "accept".

The summary of our multiple regression will appear, where the values of interest will be the intercept coefficients of the variable X1 and the variable X2:

	Coefficients
Intercept	50,61447947
X Variable 1	-0,136780324
X Variable 2	-0,034295856

The function that represents the multivariate regression of this problem will be given by:

Y = Intercept + coefficient of variable X1 (Weight) + coefficient of variable X2 (Height)

Substituting the data we have that our function is:

Y = 50.6145 - 0.13678 (Weight) - 0.03429 (Height)

This exercise is only intended to show how the multivariate linear regression method works, but in the next exercise, we are going to elaborate a bit more on what the data we obtained in the summary of our multiple regression means.

Exercise 2:

Suppose we obtained the consumption data for chicken, beef, pork, and per capita income in dollars, between 1960 and 1982 for a certain population of our interest. We want to know how the price of beef, the price of pork, the price of chicken, and per capita income influence chicken consumption over all these years. The nomenclature to be used will be the following:

Y = Chicken consumption per capita in pounds

X1 = Per capita income available in dollars ($)

X2 = Price of chicken in US cents per pound of weight

X3 = Price of pork in cents per pound of weight

X4 = Price of beef in cents per pound of weight

The data we obtained were the following:

Year	Y	X1	X2	X3	X4
1960	27,8	397,5	42,2	50,7	78,3
1961	29,9	413,3	38,1	52	79,2
1962	29,8	439,2	40,3	54	79,2
1963	30,8	459,7	39,5	55,3	79,2
1964	31,2	492,9	37,3	57,4	77,4
1965	33,3	528,6	38,1	63,7	80,2
1966	35,6	560,3	39,3	69,8	80,4
1967	36,4	626,6	37,8	65,9	83,9
1968	36,7	666,4	38,4	64,5	85,5
1969	38,4	717,8	40,1	70	93,7
1970	40,4	768,2	38,6	73,2	106,1
1971	40,3	843,3	39,8	67,8	104,8
1972	41,8	911,6	39,7	79,1	114
1973	40,4	931,1	52,1	95,4	124,1
1974	40,7	1021,5	48,9	94,2	127,6
1975	40,1	1165,9	58,3	123,5	142,9
1976	42,7	1349,6	57,9	129,9	143,6
1977	44,1	1449,4	56,5	117,6	139,2
1978	46,7	1575,5	63,7	130,9	165,5
1979	50,6	1759,1	61,6	129,8	203,3
1980	50,1	1994,2	58,9	128	218,6
1981	51,7	2258,1	66,4	141	221,6
1982	52,9	2478,7	70,4	168,2	232,6

As we already have the data analysis component added to our Excel, we will only have to go to our top menu and choose “data”, to repeat the previous steps again, that is:

“Data analysis” → “Regression” → “OK”

Once the regression box appears, we must position ourselves in the input Y Range and choose all the data that we have in our “Y” column.

Subsequently we position ourselves in the input Range X and we choose with the mouse the rest of the data found in columns X1, X2, X3 and X4, we mark the round of Output Range and we position ourselves on the box, and then choose the initial cell where we want the summary of our multiple regression to be reflected.

SUMMARY OUTPUT									
Regression Statistics									
Multiple R	0,969979188								
R Square	0,940859625								
Adjusted R Square	0,92771732								
Standard Error	1,982250001								
Observations	23								
ANOVA									
	df	*SS*	*MS*	*F*	*Significance F*				
Regression	4	1125,201024	281,3003	71,59015031	8,3792E-11				
Residual	18	70,72767117	3,929315						
Total	22	1195,928696							
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*	
Intercept	36,97088492	3,758130818	9,837573	1,14839E-08	29,07534506	44,86642	29,07535	44,86642	
X Variable 1	0,005023609	0,005002657	1,004188	0,328597208	-0,005486583	0,015534	-0,00549	0,015534	
X Variable 2	-0,601444556	0,165682545	-3,6301	0,001914576	-0,949530667	-0,25336	-0,94953	-0,25336	
X Variable 3	0,193694269	0,065098036	2,975424	0,00810697	0,056928371	0,33046	0,056928	0,33046	
X Variable 4	0,071008283	0,05238227	1,355579	0,191999328	-0,039042783	0,181059	-0,03904	0,181059	

In the summary obtained, the first data that we must take into account is the coefficient of R Square, which as we can see gives us a value of 0.9408.

R Square	0,940859625
Adjusted R Square	0,92771732

This coefficient indicates that the model is capable of explaining the behavior of the variable that concerns us (in this case is the per capita consumption of chicken) at 94.08%.

On the other hand, the Adjusted R square gives us a value where it indicates that the variation in chicken consumption has a 92.77% chance of depending on the rest of the independent variables, that is, both on per capita income and the price of chicken. chicken, pork and beef prices.

Now, the analysis of variance helps us to accept or reject the null hypothesis, that is, if p 0.05 we can accept the null hypothesis, this p-value is given in the analysis of variance by “the critical value of F ”And we can then observe that: p 8.3792E-11, therefore, p is a value much less than 0.05, so we must reject the null hypothesis and then we can reach the conclusion that at least one of our independent variables affects our dependent variable, which is the per capita chicken consumption.

We are now going to make our model that will depend on the intercept coefficient and the coefficients of the variables X1, X2, X3 and X4:

	Coefficients
Intercept	36,97088492
X Variable 1	0,005023609
X Variable 2	-0,601444556
X Variable 3	0,193694269
X Variable 4	0,071008283

Y = Intercept + variable X1 (Income) + variable X2 (Chicken price) + variable X3 (Pig price) + variable X4 (Beef price)

Substituting the values we have that our model for chicken consumption that will depend on the rest of the independent variables is:

Y = 36.971 + 0.005 (Income) - 0.6014 (Chicken Price) + 0.1937 (Pig Price) + 0.0710 (Beef Price)

As we can see, the sign of the coefficients has a lot to do with the result, when we talk about per capita income, the logical thing would be to think that the higher the income, the greater the consumption of chicken, that is why the model indicates a positive coefficient, for On the contrary, if the price of chicken increases, of course the consumption of chicken will decrease and therefore, in the model the coefficient of the variable X2 is negative.

In the same way that we reasoned the previous items, it is expected to think that if the price of pork and beef increases, the consumption of chicken will increase, since when the prices of the competition rise, people will prefer to buy chicken (which is cheaper).

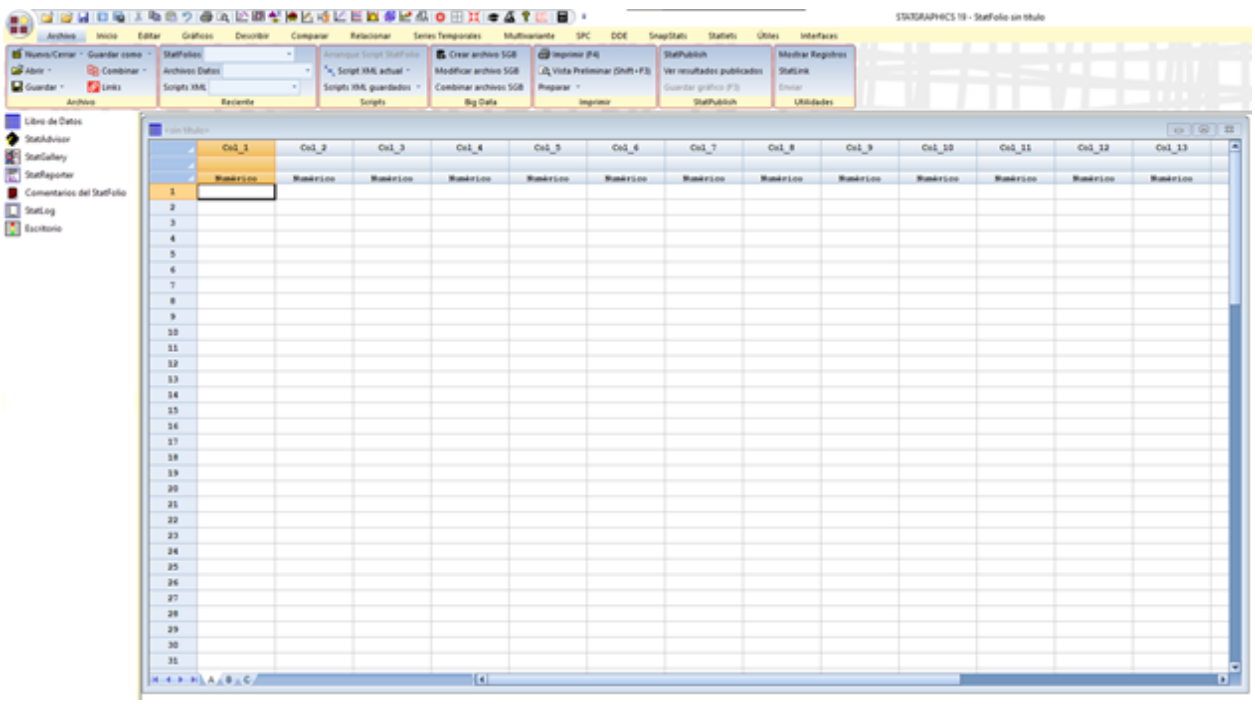
Statgraphics a statistical program:

This is a program created to facilitate statistical analysis and that we are going to use from now on, to save time when using statistical methods and models. This program can analyze and interpret our data in a practically instantaneous way and you can find it at http://www.statgraphics.com, where you can get a free trial version for 30 days and if you can cancel a small fee, you will get the license .

Since I got the free trial, they don't offer it to me in the multilingual version, so I have it in Spanish and will try to translate your comments into English.

Once you have purchased the program that will help us, I will give you a short introduction on how to use it with the same data from exercise 2 that we saw previously, so that you realize that we obtain the same results. But in addition, from now on we will be able to analyze the data of any sample, with a greater statistical vision and with significant details, so that we can make decisions, with a greater number of analysis elements.

When opening Statgraphics we find the following environment:



Where we can extract the data from Excel to avoid copying it again. The way to do it is to go to File → Open → Open data source → External data file → Browse → We look for the place where we have saved our data from exercise 2 in

Excel and open it, immediately the empty cells will be filled with the data that we obtained in the sample and we can visualize them as follows:

As you can see, the names of the columns are brought with them from Excel, but if we are going to enter the data one by one, we must position ourselves at the beginning of the column and double-click, where the following box will appear:

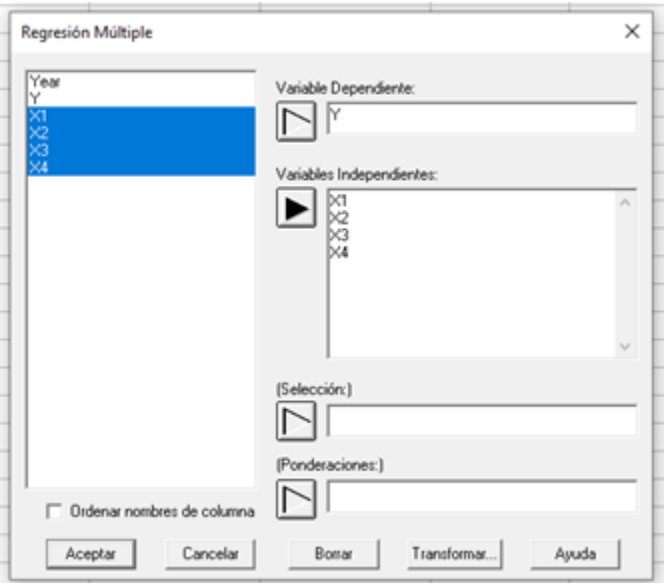
In this window where it says "Name" we can identify our variable, in "Comment" we can place the units of the variable and at the bottom, where it says "Type" we must choose the corresponding box, that is, if the variable is numeric, character (for non-numeric variables), date, etc.

A character type variable is, for example, gender or sex, which as we know is not a numeric variable, since it would correspond to female, male or others.

Once we have entered all our data, it is advisable to save our file, for this we go to File → Save as → Save data as and a box opens where we can place the identifier name. It is important to take into account that by default, the program saves the file with an extension ".sgd", which comes from Statgraphics save data, but we can save it with other extensions, for example, as a text or Excel file.

We must take into account that if we save the file with a ".sgd" extension, we will not be able to open it with other programs.

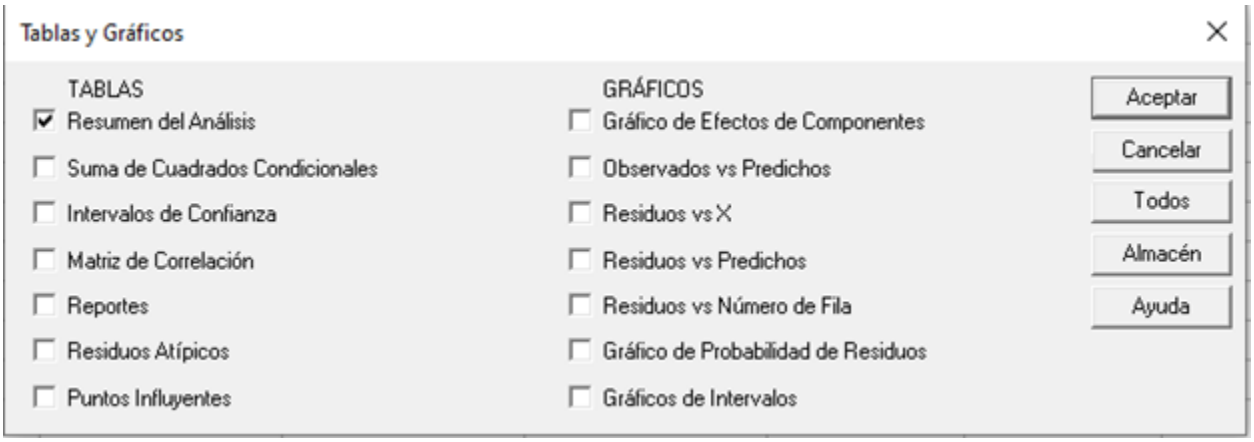
Returning to the case that concerns us, remember that it is a multiple regression, so we go to the top and look for the display From "Relate", there we go to "R^2 Multiple Regression Models" and 3 options are displayed, where we will again choose "R^2 Multiple Regression Models", then a box will appear as follows:



There we will position ourselves on the box corresponding to the dependent variable and click on Y, while for the independent variables we will repeat the process, but this time choosing the rest of the variables, that is, X1, X2, X3 and X4, and then "To accept".

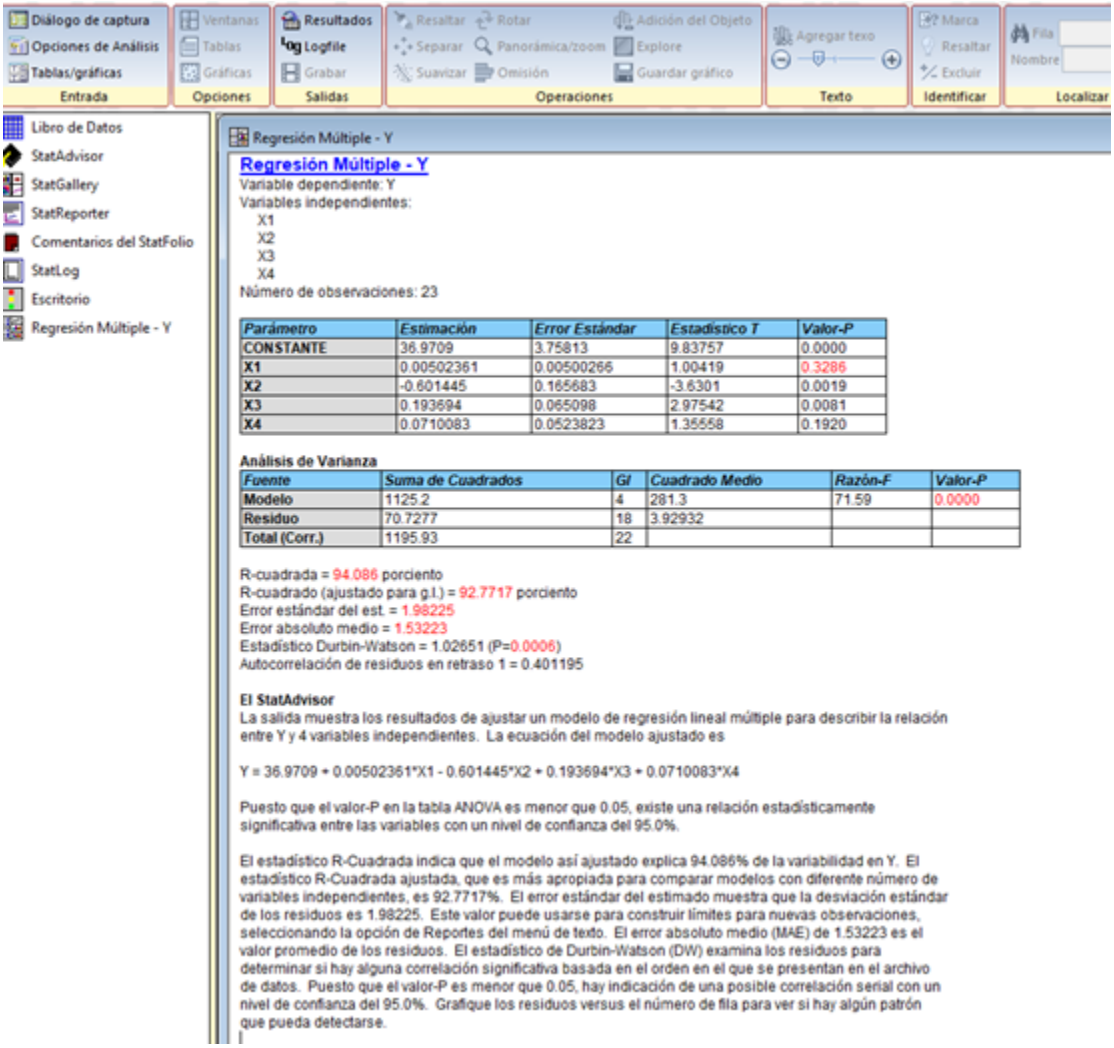


Again another box of "Multiple regression options" will appear, where by default it already has the boxes marked: Ordinary least squares, constant in model and the value of "Power" is 1, it is recommended for this case, to leave that same configuration and again "OK".



A new window opens where we will simply have to check the "Analysis summary" box and uncheck the rest of the boxes that are selected by default, to "Accept" again.

It is then that the summary of the multivariate analysis appears:



We can realize that the program not only offers us the interception and the coefficients of the variables X1, X2, X3 and X4 that we had previously obtained with Excel, it also directly gives us the linear regression formula and also perfectly explains the model, the meaning of the numbers obtained, the linear regression model and some recommendations to take into account.

For this specific case, the program gives us the following information:

R-squared = 94.086 percent

R-squared (adjusted for g.l.) = 92.7717 percent

Standard error of the est. = 1.98225

Mean absolute error = 1.53223

Durbin-Watson statistic = 1.02651 (P = 0.0006)

Autocorrelation of lagged residuals 1 = 0.401195

The StatAdvisor

The summary produced by the program shows the results of fitting a multiple linear regression model that describes the relationship between Y and the rest of the 4 independent variables. The fitted model equation is:

```
Y = 36.9709 + 0.00502361 * X1 - 0.601445 * X2 + 0.193694 * X3 + 0.0710083 * X4
```

Since the p-value is less than 0.05, there is a statistically significant relationship between the variables and also with a confidence level of 95.0%.

The R Square statistic indicates that the adjusted model explains 94.086% of the variability in Y with respect to the rest of the independent variables. The adjusted R Square statistic, which is more appropriate for comparing models with different numbers of independent variables and in this case is 92.7717% of fit. The standard error of the estimate shows that the standard deviation of the residuals is 1.98225. This value helps us to establish limits for new observations, if we select the Reports option in the text menu. The mean absolute error (MAE) of 1.

53223 is the mean value of the residuals. As we can see, the p-value is less than 0.05 and this indicates a possible correlation with a 95% confidence level.

To determine if the model can be simplified, note that the highest p-value of the independent variables is 0.3286, which corresponds to X1. Since the p-value is greater than or equal to 0.05, that term is not statistically significant, with a confidence level of 95.0% or greater. Consequently, consideration should be given to removing X1 from the model.

So far are the recommendations and analysis provided by the StatAdvisor of the Statgraphics program, but we can realize other important points to take into account, with the summary provided by the program.

Let's go back to looking at the multivariate linear regression:

```
Y = 36.9709 + 0.00502361 * X1 - 0.601445 * X2 + 0.193694 * X3 + 0.0710083 * X4
```

By interpreting a little the coefficients that accompany each of our independent variables, we can also observe that the smallest of the coefficients is effectively the one that accompanies X1 and therefore, the least significant when it comes to influencing our dependent variable Y. It is therefore, the program recommends that we eliminate this variable from our model.

On the other hand, as we can see, the highest coefficient in absolute value is (-0.601445) which is the one that accompanies X2, remember that: X1 corresponds to the per capita income of the population, while X2 is the price of chicken, X3 the price of pork and finally X4 which is the price of beef. We can say then that the increase in the price of chicken is the variable that affects the consumption of chicken the most and does so negatively, as we deduced previously, as the price of chicken increases, its consumption will be lower.

We can also realize that the next significant variable is the price of pork, since we can see that the coefficient that accompanies it is greater than the coefficient of beef. Then we can interpret that the increase in the price of pork has a positive impact on a higher consumption of chicken and in the same way with the increase in beef, although to a lesser extent.

44.1 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

FORTYFIVE

NEGATIVE BINOMIAL DISTRIBUTION

When we refer to probability theory and statistics, this type of negative binomial distribution is of discrete probability and it is important to refer to it as including the Pascal distribution. Also being an extension of a geometric distribution, which is used in processes where it is necessary to repeat the test until a number of favorable cases is achieved, that is, the first success.

The negative binomial distribution measures the number of successes in a sequence of n number of Bernoulli trials, but which are also independent of each other and that there is an occurrence of successes with a probability p of those trials.

Let us remember that in a Bernoulli distribution, the main characteristic is that it is dichotomous and therefore there are only two possible outcomes.

When we refer to a geometric random variable, it is because a number of Bernoulli trials are needed to obtain the first success.



However, if what we want is to know the number of trials necessary to achieve n successes, the random variable is then a negative binomial. A random variable that has a negative binomial distribution whose parameters are r and p, it can be said that it is the number of Bernoulli experiments with parameter p and that they are also independent, which are repeated until the r-th success is obtained. In the specific case of a negative binomial distribution when r = 1, we are referring to a geometric distribution. The necessary conditions to apply this process are:

1- An indefinite number of tests must be carried out and the process will end, when it is possible to have a certain number of favorable results r.

2- It is important to take into account that the tests can give two possible results and that they are also mutually exclusive, for example, A and not A.

3- The probability of obtaining A as a result is called p and the probability of obtaining the result “not A” is called q, but we also know that p + q = 1.

4- On the other hand, p and q are independent and also constant in each test.

5- If we determine that X is “the amount of tests that are necessary to achieve x successes or obtain A as a result”, we can then say that X follows a negative binomial distribution whose parameters are p and r.

6- The nomenclature to use for this type of distribution is:

X ~ BN (p)

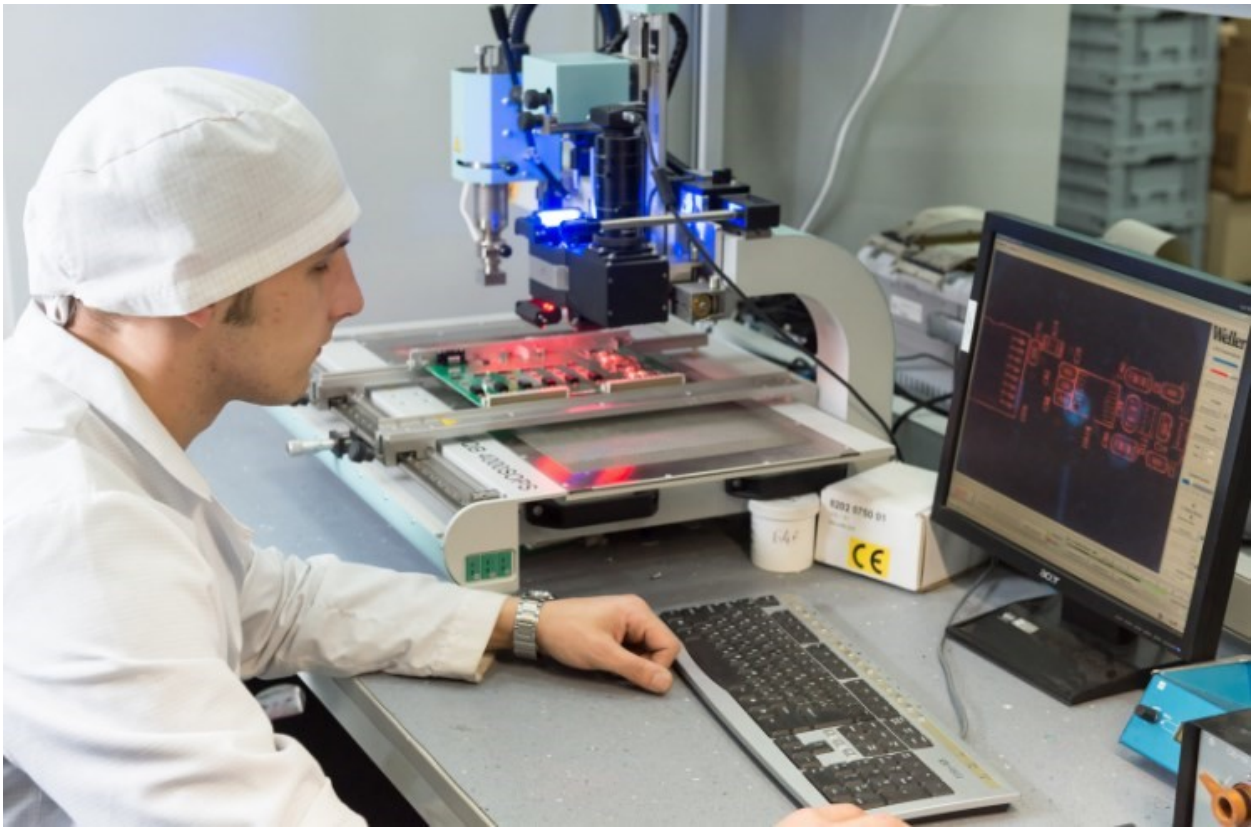
Being:

X = the number of Bernoulli trials required to obtain the ith success

$$F(x) = \binom{x-1}{r-1} p^r (1-p)^{x-r} \text{ where } x = r, r+1, r+2, \ldots \; 0 < p < 1$$

7- The probability function X is given by:

Let's go with the first example of a negative binomial distribution: suppose we have an electronic component whose chance of passing the quality control is 0.9. If we assume that among the results there is independence with respect to quality control and in view that they are different electronic components.



Two questions are posed to us:

1- Calculate the probability that by checking 5 electronic components it can be obtained that 3 of them pass the quality control

2- Calculate the probability that when checking less than 5 electronic components, 3 of them pass the quality control.

Answer to question 1:

The first thing to do is determine the random variable:

X = number of components to be reviewed until 3 that pass the quality control

We also know that X is distributed as a negative binomial of probability p:

X ~ BN (p)

Being p the probability that the quality control passes, that is:

p = 0.9

The r-th success is the number that we determine as the success to be achieved, in this case:

r = 3

Since they propose to review 5 components, then we must find the probability for x = 5

P (x = 5) =?

Let's substitute the values into the negative binomial distribution formula:

$$P(x = 5) = \binom{x-1}{r-1} p^r (1-p)^{x-r} = \binom{5-1}{3-1} 0{,}9^3 (1-0{,}9)^{5-3} = \binom{4}{2} 0{,}9^3 0{,}1^2 = 0{,}04374$$

Answer to question 2:

The question we must ask ourselves mathematically is:

P (x < 5) =?

To find the probability of all variables less than 5, we generally calculate each of the probabilities when x = 1, x = 2, x = 3, x = 4 and add them together. But it is important to take into account that for a binomial distribution x = r, r + 1, r + 2, …, this implies that x starts from the value r = 3, so in this case P (x <5) only goes to consider the values x = 3 and x = 4, therefore:

$$P(x < 5) = P(x=3) + P(x=4) = \binom{3-1}{3-1} 0{,}9^3 (1-0{,}9)^{3-3} + \binom{4-1}{3-1} 0{,}9^3 (1-0{,}9)^{4-3} = 0{,}9477$$

Example 2 of negative binomial distribution: a clinical study is carried out in which the volunteers are analyzed, because they have a variant of a gene that is capable of increasing the risk for a certain disease. The probability is 0.1 for a person to be a carrier and there are two questions:



1- What is the probability that 4 or more people must be analyzed in order to find 2 of them with the variant of the gene?

2- How many people must be analyzed to be able to detect 2 people who have the variant of the gene?

Answer to question 1:

The first thing we must do is identify the values that we must substitute in the formula and determine the random variable X = number of volunteers who must be analyzed to find 2 people who have the variant of the gene We know that the probability is:

p = 0.1

r = 2

Question 1 expresses mathematically is:

P (x 4) =?

Let us remember that one of the ways to solve this type of probability is taking into account that the sum of the probabilities is equal to unity, so to find P (x 4) we can express it as follows:

P (x 4) = 1 - P (x <4) = 1 - [P (x = 3) + P (x = 2)]

It is important to take into account that the probability P (x = 0) and P (x = 1) are not possible, since we must find at least 2 volunteers with the variant of the gene, that is why we start from r = 2 and the probabilities are discarded when x = 0 and x = 1.

Let's separately calculate the probabilities for x = 3 and x = 2

$$F(3) = \binom{x-1}{r-1}p^r(1-p)^{x-r} = \binom{3-1}{2-1}0{,}1^2(1-0{,}1)^{3-2} = \binom{2}{1}0{,}1^2 0{,}9^1 = 0{,}018$$

$$F(2) = \binom{1}{1}0{,}1^2 0{,}9^1 = 0{,}01$$

Substituting in the initial formula we have:

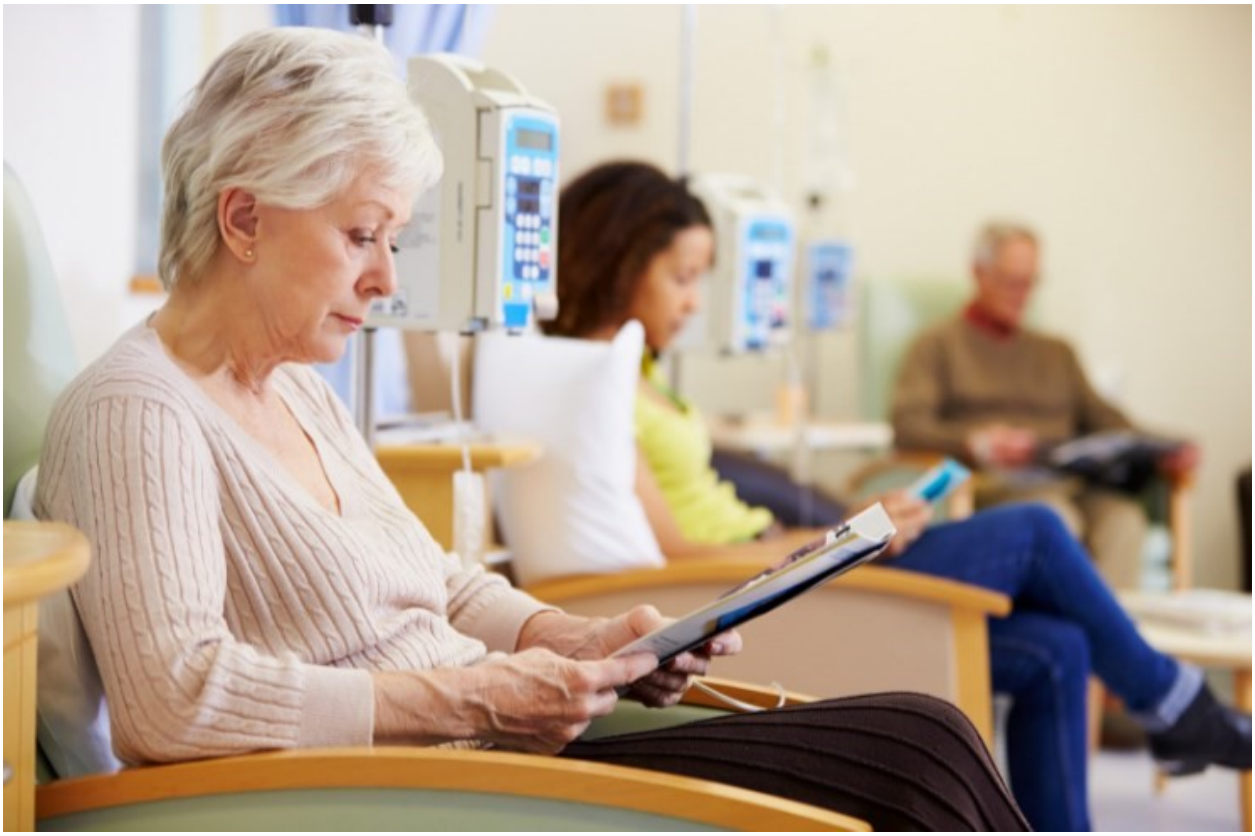
P (x 4) = 1 - (0.018 + 0.01) = 0.972

Answer to question 2:

What the second question asks us is to calculate the mathematical expectation or the mean value of the negative binomial distribution and for this we must use the following formula:

$$E(x) = \frac{r}{p} = \frac{2}{0{,}1} = 20$$

This indicates that 20 volunteers are expected to be analyzed to find 2 carriers of the gene.



45.1 Geometric distribution

This type of geometric distribution is quite convenient for those processes where the tests are repeated, until the desired success or result is achieved, it also has endless applications for the samplings that are carried out in this way. Of course, it also implies that there is a dichotomy in the possible outcomes and the tests must be independent of each other. The geometric distribution can come from a Bernoulli or pure experimental process, which also has the following characteristics:

1- The process must consist of an undefined amount of experiments or tests that can be separated or separable and this process will end when the desired result is obtained for the first time (success).

2- Each test can give one result or another mutually exclusive, that is, A and not A.

3- In the same way as in other distributions, the probability of obtaining a successful result A will be called p and we will call the probability of obtaining a result other than A q, also being p + q = 1. The probabilities both p and q are constant in all the experiments and therefore the tests are independent. In the event that there is an extraction process, the extracted individual must be replaced.

4- The random variable must be determined by X = the number of tests required to obtain the desired result for the first time and this variable must be determined by a geometric distribution of parameter p, the nomenclature used is:

X ~ G (p)

5- The same assumptions as the binomial distribution are fulfilled, only that in this case n is not fixed. To see the difference we are going to suppose that we have an expert marksman and we want to know after 10 attempts how many times does he hit the target? In this case we would be facing a binomial distribution since we are establishing the number of attempts, but if we are facing a geometric distribution the question could be in which attempt does the first failure occur? Or in which attempt does the shooter achieve his first hit hitting the target? How to get the amount function As we expressed before, the variable x is the amount of tests necessary to obtain the first success. So the random variable will take

positive integer values from the number x = (1, 2,. . .). The quantity function is in charge of matching for each value of X the possibility of achieving the first success in the x-th test and for this it will be necessary to use the following formula:

$$P(x,p) = (1-p)^{x-1}p$$

Being:

k = the number of failed attempts before obtaining the first success

p = the probability of success of each test

We now go to the first example of Geometric Distribution: suppose we are in the presence of an expert marksman who has a 95% probability of hitting the target and we want to know what is the probability that he misses his 15th shot for the first time?



The first thing to observe is that this problem satisfies all the conditions of a geometric distribution: We do not realize that there are only two possibilities: they are to hit the target and obtain a success or failure. Later we observe that each shot is independent, so that if a shot hits or misses this will have nothing to do with another shot being successful or missing and we also realize that the probability of success is constant and the 95%.

As we can see, so far all the conditions of a binomial distribution have been met but they do not specify the number of shots, since all we want to know is the probability that it fails for the first time in its 15th attempt and therefore, this small difference makes that we are in the presence of a geometric distribution.

We can realize that:

X = 15 because it is in that attempt where we want to see the failure, but our success in this case would be that it fails.

p = 0.05 since there is a 95% probability that it succeeds, but what we are looking for is that it fails and its probability would be 5%.

$$P(x, p) = (1-p)^{x-1}p$$

$$P(x = 15) = (1 - 0{,}05)^{15-1} * 0{,}05 = 0{,}95^{14} * 0{,}05 = 0{,}0244$$

Applying the formula we would have:

If we take it to percentages, we have a probability that he will miss for the first time on his fifteenth shot is 2.44%. Geometric distribution example 2: Suppose that in a certain manufacturing process the probability of obtaining a defective part is 2%, we want to know what is the probability that the first defective part is the eighth inspected part?



Again we are facing a dichotomous case since the part is defective or it is not defective. On the other hand, the fact that one part is defective does not imply that the next one is defective or not, so each case is independent and finally, that the probability that the part is defective is constant and is equal to 2%.

x = 8

p = 0.02

$$P(x, p) = (1-p)^{x-1}p$$

$$P(x = 8) = (1 - 0{,}02)^{8-1} * 0{,}02 = 0{,}98^{7} * 0{,}02 = 0{,}0174$$

We apply the formula:

In this way, we conclude that the probability of the eighth piece being defective is 1.74%. Geometric distribution

example 3: suppose that a telephone exchange of a certain company is always busy. If the probability of making a call at times of greatest congestion is 6%, you want to know what is the probability that 10 attempts will have to be made to communicate.



x = 10

p = 0.06

$$P(x = 10) = (1 - 0{,}06)^{10-1} * 0{,}06 = 0{,}0344$$

Interpreting the answer, we can reach the conclusion that the probability that 10 attempts will have to be made to communicate with the telephone exchange at times of greatest congestion is 3.44%.

Boltzmann distribution

In both mathematics and statistical mechanics the Boltzmann distribution is a distribution of probability or frequency of particle distribution, which is measured during its various possible states and is expressed as follows: The state function is proportional to $e^{\frac{-E}{kT}}$

Being

E = The energy of the state and also varies between one level and another

k = Boltzmann constant

T = thermodynamic temperature

The Boltzmann distribution in statistical mechanics is a probability distribution where a system is balanced as a function of the energy found in that state and also the temperature of the system, it can be expressed as:

$$pi = \frac{e^{\frac{-\varepsilon i}{kT}}}{\sum_{j=1}^{M} e^{\frac{-\varepsilon j}{kT}}}$$

Being

pi = The probability that state i has

i = The energy that state i has

k = Boltzmann's constant

M = The number of states of the system

T = The temperature of the system

It is important to take into account that here the term system has a very broad meaning, which can be from a macroscopic system such as a storage tank that can have natural gas or simply an atom. As you can see, the Boltzmann distribution is applicable to solve a wide range of problems. This type of distribution tells us that states that have lower energy, in general, have a higher probability of being occupied than those states that have higher energy.

A Boltzmann distribution that is calculated for two states has a proportion called the Boltzmann factor, which will only depend on the difference between the energy of the two states.

This distribution is named after Ludwing Boltzmann who was able to formulate it in 1868 for the first time while conducting his studies of statistical mechanics in the thermal equilibrium of gases. Subsequently, it was investigated in 1902 by Josiah Willard Gibbs in a much broader way. Starting again from the distribution formula:

$$pi = \frac{e^{\frac{-\varepsilon i}{kT}}}{\sum_{j=1}^{M} e^{\frac{-\varepsilon j}{kT}}}$$

The denominator of this formula is also called Q which represents the canonical partition function and some authors call it Z. So the Boltzmann distribution can also be written as:

$$pi = \frac{e^{\frac{-\varepsilon i}{kT}}}{Q}$$

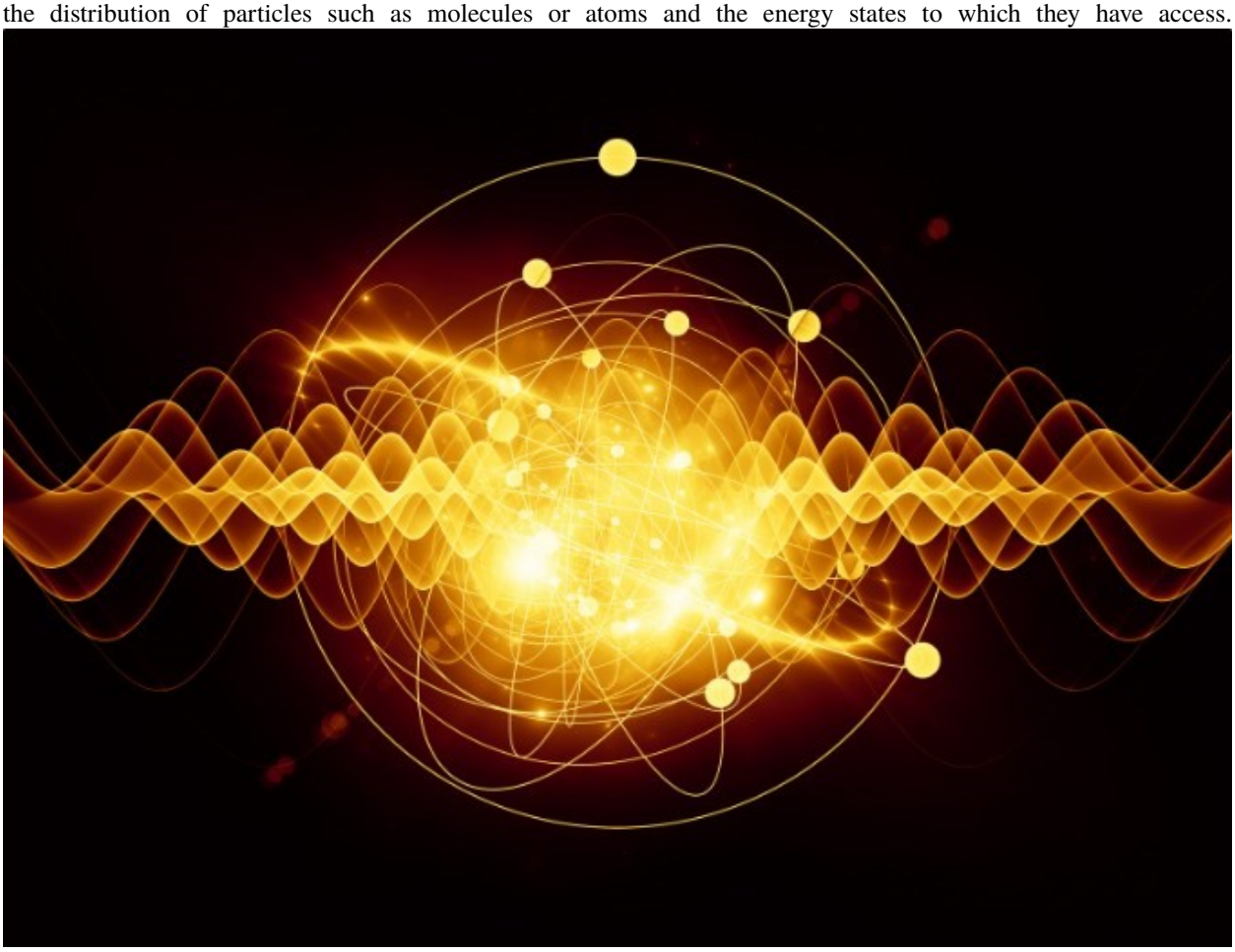
We can calculate the partition function if we know the energy that each of the levels of our system of interest have. If we want to know the partition function for atoms, we can find their values in a database called: NIST Atomic Spectra.

This distribution offers us the quantitative relationship that exists between the probabilities of both states that are occupied and we can establish this relationship of probabilities between states i and j as:

$$\frac{pi}{pj} = e^{\frac{(\varepsilon j - \varepsilon i)}{kT}}$$

Being pi and pj the probabilities of state in i and j respectively and in the same way i is the energy of state i and j of energy of state j. The Boltzmann distribution is frequently used to determine

the distribution of particles such as molecules or atoms and the energy states to which they have access.



Suppose we have a system that is composed of endless particles, the probability that a particle has of being in state i is similar to the probability of choosing a particle at random in the system and checking at what level a state is. and we will realize that it is in state i. To find this probability we must divide the number of particles that are in state i by the total number of particles that the system has, this fraction is given by:

$$\text{pi} = \frac{Ni}{N}$$

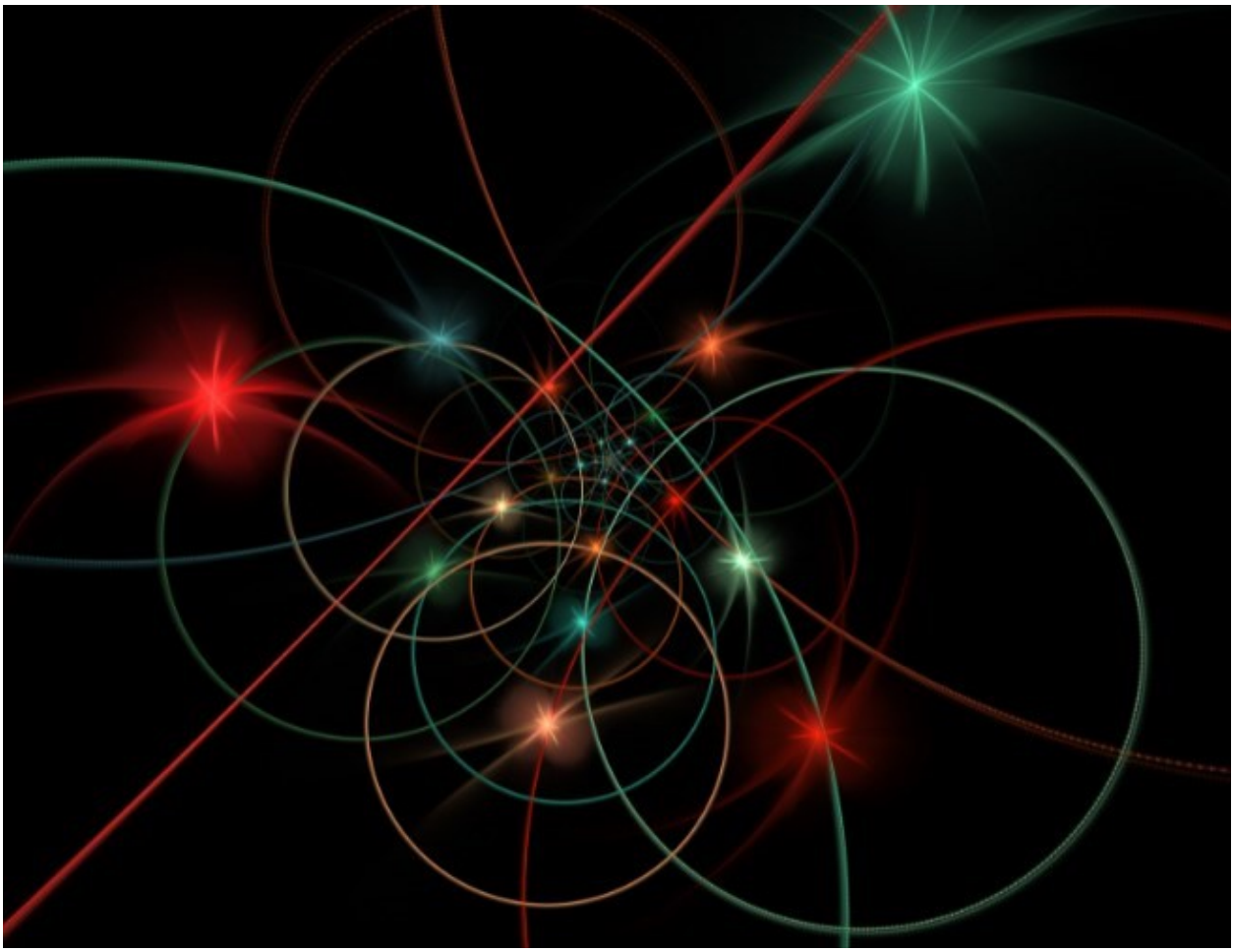
Being N the total amount of particles that make up the system and Ni the amount of particles that are in state i, but we can also express it in terms of energy and the equation would be as follows:

$$\frac{Ni}{N} = \frac{e^{\frac{-\varepsilon i}{kT}}}{\sum_{j=1}^{M} e^{\frac{-\varepsilon j}{kT}}}$$

This formula is very important in spectroscopy, there you can observe a spectral line where the molecules or atoms move from one state to another and that is why certain particles that are in the first state undergo a transition, where this condition can be expressed through the fraction of particles for the first state. Since the transition is negligible, it is most likely not reflected in the temperature that was used to perform the calculation. Generally, when there is a larger fraction in the first state, this implies a greater number of transitions that will occur in the second state. A more robust

spectral line will be the result, but there are other factors that can influence the strength of a spectral line, such as when the transition crosses the "forbidden line".

We speak of a forbidden line in physics and chemistry when the spectral line emitted by the particles subjected to energy transitions, break the selection rules established by quantum mechanics. This implies that the process does not follow the most efficient route and although the transition is nominally "forbidden", the fact that it occurs spontaneously is not exactly impossible, when the molecule or the atom are in an excited state.



Applied to statistical mechanics

In statistical mechanics, the Boltzmann distribution is used when we study isolated systems of fixed composition that are also in thermal equilibrium, that is, in energy exchange equilibrium, and the most widely used application is when we use the Boltzmann distribution for the canonical set . This distribution is even used in certain special cases that derive from the canonical assembly, but which also intervene in the distribution in different aspects:

For the general case of the canonical set: in statistical physics, the canonical set is one that allows describing the states that occur in a macroscopic system that has a certain number of particles, temperature and volume. When the canonical set does not interact with a smaller subsystem: in this case, it is advisable to find the statistical frequency of a subsystem of a given state. The canonical set has the property of separability in the case that it has been applied to any of the following conditions: when those systems that are in interaction have not fixed their composition and therefore, each subsystem is independent of the rest and therefore , the expected frequency distribution of these subsystem states has the Boltzmann form.

When the particle system does not interact and we are in the presence of a Maxwell Boltzmann distribution of classical gases: in particle systems, many times the particles share the same level and regularly change places with another particle. In statistics, the Maxwell Boltzmann distribution gives us the opportunity to calculate the expected number of

particles that are in a given state and these particles do not interact when they are in equilibrium within a classical case. In this way, the distribution of the expected number of particles has the Boltzmann shape. Although it is true that the aforementioned cases have certain similarities, it is important to know how to distinguish them, since they generalize in a different way when changing the following crucial assumptions:

1- When a system is in thermodynamic equilibrium with respect to the exchange of particles and the exchange of energy, in some way the fixed composition relaxes and instead of a canonical set, a large canonical set is obtained. On the other hand, if both energy and composition are fixed, a canonical micro set is applied instead.

2- When the subsystems interact with each other within a canonical set, then the expected frequencies of the subsystems of the states no longer tend to a Boltzmann distribution. They may not even have an analytical solution, however, this distribution can still be applied to the states if the system is considered as a whole and also, it must be considered that the system is isolated and in thermal equilibrium.

3- When we refer to the particles of quantum gases that do not interact in equilibrium, the amount of particles that are in the state of a given particle does not have the Maxwell Boltzmann distribution, but there is also no simple and closed form in the canonical set for quantum gases. On the other hand, depending on whether these particles are fermions or bosons, they will be described by the Fermi Dirac or Bose Einstein statistics, respectively.

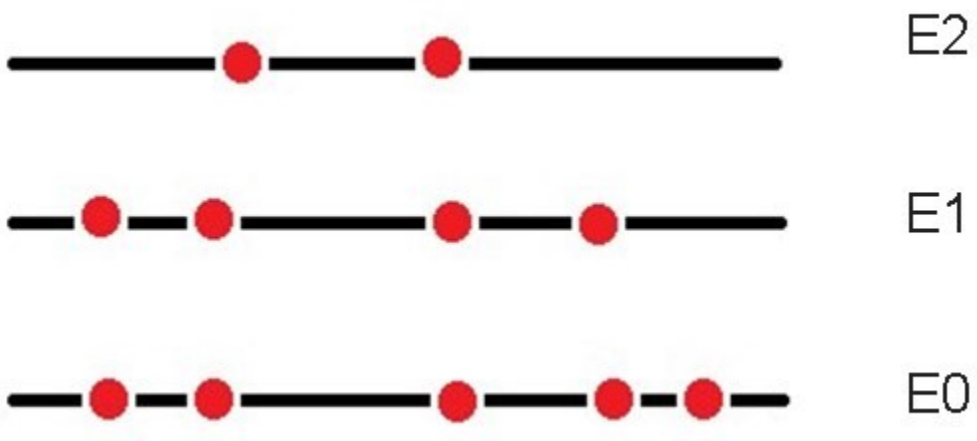
The Boltzmann distribution in mathematics

The Boltzmann distribution in the field of mathematics is also called as the Gibbs measure, however, in machine learning and in statistics and what is called the linear model register, while this distribution is used in stochastic neural networks regarding: Boltzmann machines in general, deep and restricted Boltzmann machines.

45.2 Particle distribution in levels or states

When a system is isolated and is made up of a set of particles, each particle can occupy any of the energy levels, Ei = i The energy of level i and The difference in energy between consecutive levels.

As the particles are distributed among the different levels, the particle n0 will have the energy of the E0 level, while all the particles that are at the E1 level will have the energy of that level.



The total number of particles is:

N = n0 + n1 + n2 +… + n11

The total energy of the system remains constant since it is isolated and can be defined as:

U = n0E0 + n1E1 + n2E2 +…

Thanks to the collisions and interactions that exist between molecules, the particles are continually changing level. However, in each macroscopic state of the system there is a particle distribution that is more likely than some other distribution and once this distribution is reached, that is when the system is said to be in equilibrium.

The particles n0, n1, n2, ... can fluctuate around the equilibrium situation without producing macroscopic effects. We are now going to determine the way in which the particles are distributed in an isolated system between the energy levels.

Microstates and macrostate

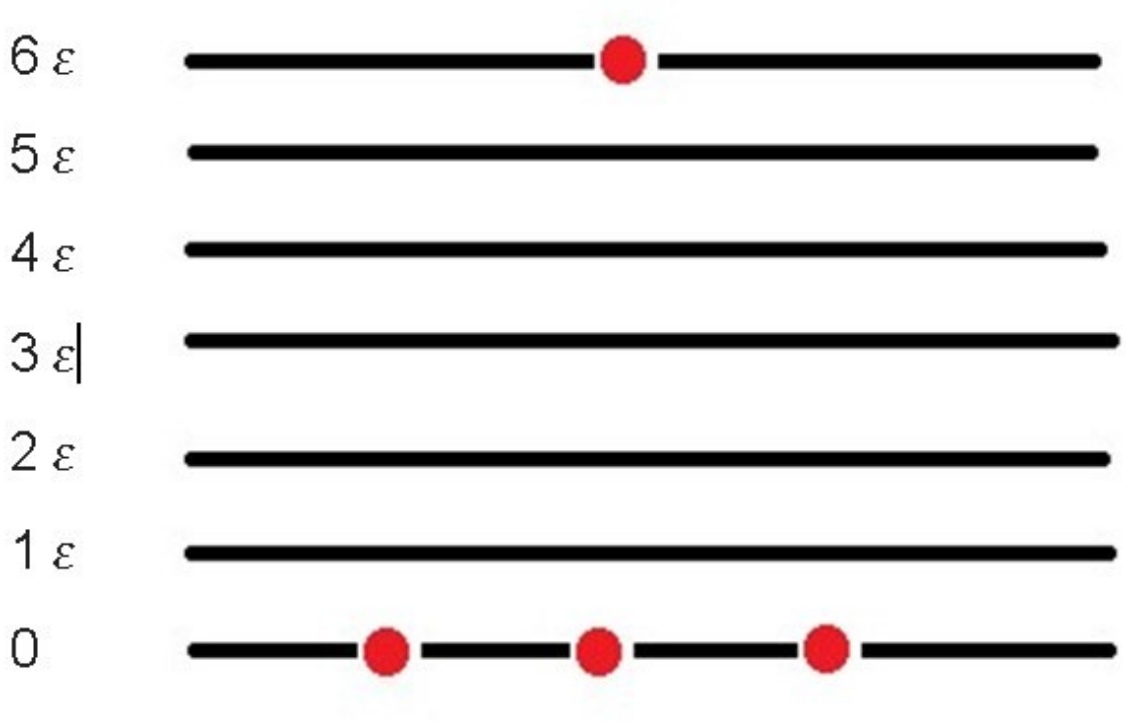
The particles in the classical statistics of a system are equal but indistinguishable, this implies that we cannot distinguish one particle from any other on a macroscopic scale, but we can come to imagine individual particles on a microscopic scale.

It is important to be able to differentiate between microstate and macrostate. In the macroscopic state, macroscopic properties such as temperature and pressure interfere, while experimentally in microstates that correspond to the same macrostate, they are indistinguishable from each other at the experimental level.

For the same macrostate there may be different conformations of microstates and we can know the possible amounts of microstates that can be formed, through the following formula:

$$P = \frac{N!}{n0!\, n1!\, n2!\, n3!...}$$

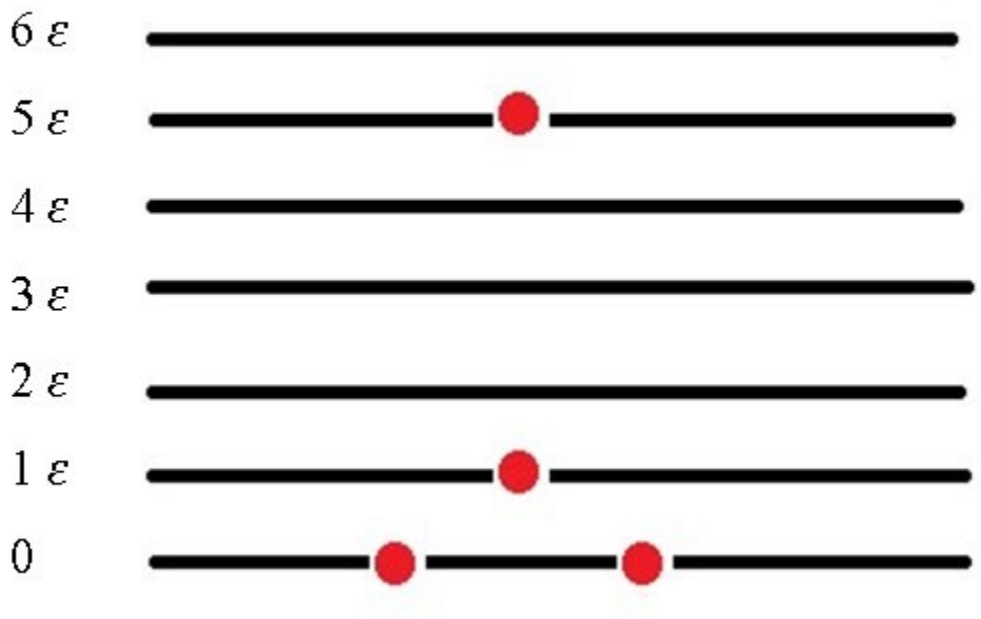
Where N is the total amount of particles in the isolated system and n0, n1, n2, etc. the particles that intervene in the system. Suppose we have three particles at the zero (0) energy level and a single particle at level 6. The number of possible microstates for these four particles is:



$$P = \frac{4!}{3!0!0!0!0!1!} = 4$$

This means that at level zero there are three particles, no particles at levels 1, 2, 3, 4, 5, and one particle at level 6, for a total of four possible microstates. Since each of the particles that is in the zero state can be exchanged with the particle that is in level 6 and give way to a different microstate, in addition to the one initially proposed.

Suppose we have two particles in the zero state, one particle in state 1 and a last particle in level 5



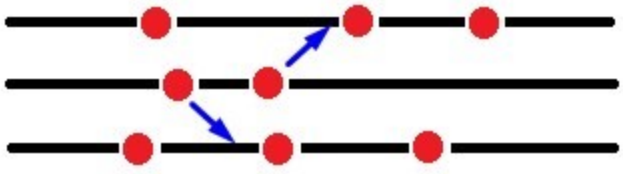
$$P = \frac{4!}{2!1!0!0!0!1!} = 12$$

In statistical mechanics the fundamental postulate tells us that for a system in equilibrium, there is the same probability that it can be in any of its allowed microstates and the distribution of particles for which P yields the highest value, will be the distribution more likely to have the particles within the system.

We are going to consider a distribution of particles where in the fundamental level (0) there are 2002 particles, while in the first level there are 1002, 102 in the second level and 52 in the third level, if we calculate the amount of microstates for this macrostate in particular we have to:

$$P1 = \frac{N!}{2002!1002!102!\,52!}$$

But suppose that at the first level there are two interacting particles, where one of them gains one unit of energy and rises to the second level, while the other loses one unit of energy and goes to the fundamental level (0).



As we can see, the total energy of the system does not change, since the energy of the particles both before and after the interaction is exactly the same. What will change is the number of microstates that will correspond to the new macrostate and will be given by:

$$P2 = \frac{N!}{2003!1000!103!52!}$$

If we calculate the quotient between the two we will have:

$$\frac{P2}{P1} = 4{,}86$$

As we can see, some small changes in the initial macrostate generate large variations in P and this implies that the system is far from being in equilibrium. A system is near equilibrium when small changes in the initial macrostate distribution do not substantially change the value of P.

Now suppose that two particles of the first level interact in such a way that one of them gains a unit of energy, while the other loses, but the amount of particles that exist in each level are:

n0 = 4016

n1 = 1354

n2 = 458

n3 = 155

The quotient of the variation of P would be:

$$\frac{P2}{P1} = \frac{4016!1354!458!}{4017!1352!459!} = 0{,}994$$

In this case, the number of microstates hardly changes and we can realize that in a system that is in thermal equilibrium, the collisions between the particles change towards a macrostate that has almost the same amount of microstates as the initial one.

If we want to find the most probable distribution that the isolated system can have, then we must calculate the maximum of P whose number of particles and energy in the isolated system remain constant, then it is enough to condition the variables for this to happen.

CHAPTER

FORTYSIX

NONPARAMETRIC TESTS (PART TWO)

When we need to analyze the data for an investigation, we must choose the appropriate analysis method, to avoid at all costs reaching erroneous conclusions. To select the most appropriate analysis technique, different aspects must be taken with respect to the nature of the data to be quantified and the study design. It is also necessary to take into account the number of groups and observations to be compared, if the samples are independent or not, if there are repeated observations with respect to the same individuals, if the variables are qualitative or continuous, and their probability distribution. All these elements are decisive before deciding which statistical technique to use.

When the normal distribution is not obvious or simply cannot be assumed since the sample size is small, the variable of interest is usually transformed to achieve symmetry in its distribution, or robust techniques that are not very sensitive to the absence of normality.

But nonparametric methods are easier to implement and do not require a normal distribution of data, and can also be used with small sample sizes.

For two samples that are independent, the Wilcoxon rank sum or Mann Whitney test can be used (It is the same test).

There are circumstances where it is necessary to test if the distribution of a certain variable "x" is the same for two different populations or if this variable tends to be lower or higher in one of the two populations. For example, you can try to compare the weight loss in people subjected to two different types of diets or the level of pain in patients with osteoarthritis, where one group receives a treatment, while the other group receives a placebo.

To perform this type of comparison in traditional statistics, the t-student could be used, but tests not for metrics such as the sum of the Wilcoxon or Mann Whitney ranks can also be used. In short, given the case that there are observations in two different populations of the same variable "x" with samples of sizes n1 for the first population and n2 for the second.

One way to proceed is by ordering the observations from lowest to highest regardless of the source population, and then assigning ranges to each of the data after they have been ordered. The observation that has the smallest value will be assigned rank 1, the immediately subsequent observation as regards value, will be assigned rank 2 and so on. In the case that there is a repetition of values, that is, when two observations have the same value, each of them will be assigned the average of the ranges according to the position they occupy.

In the case that there are no differences between the two populations, the ranges will simply be mixed randomly between the two samples. But if the sum of the ranges that are assigned to the specific observations of a population are ultimately much greater than the sum of the ranges of another population, this then indicates a difference in terms of the distribution of the variable "x" between both populations.

When the variable is measurable and on an ordinal scale, the ideal non-parametric test is the Wilcoxon test, in addition to being the most powerful. The null hypothesis is established as that the samples of the two populations have the same probability distribution, while the alternative hypothesis indicates that there are differences in the central tendency of both populations, either directionally or bilaterally (two tails).

The contrast can be observed with the differences in the scores between the elements of each associated pair and it is necessary to take into account not only the magnitude of the difference, but also the sign. Given the case that the difference between the scores of any of the associated pairs is null because both values are equal, this pair is eliminated

from the analysis and also from the sample size, that is, the number of pairs whose difference is null are subtracted. of the number of observations "n" for the effects of the formulas to be used. On the other hand, when assigning ranges, only the absolute value of each element is taken into account, regardless of its sign. However, the signs of each observation will be taken into account when adding the corresponding ranges, in order to obtain the sum of positive differences on the one hand and negative differences on the other.

If it is the case that the null hypothesis is true, both populations will have the same central value and therefore the ranges are expected to be randomly distributed between their positive and negative differences. This directly implies that the sums of their ranges are approximately equal. On the other hand, the test statistic that we will call "T" will be taken as the smallest value that exists between the two sums of the ranges, both positive T (+) and negative T (-).

When we have a number of observations greater than 15, that is, n > 15, it can be assumed that the null hypothesis that is established for the value of the sampling distribution of T, approaches a normal distribution. So we can assume that the test statistic for this type of case is Z. With the required level of significance, the null hypothesis will be rejected, when Z is found in any of the critical sections located in the two tails (if it is the case) or in the region established for a single tail, always depending on the alternative hypothesis.

Therefore, the formulas used in these cases are:

$$\mu_T = \frac{n(n+1)}{4}$$

$$\sigma_T^2 = \frac{n(n+1)(2n+1)}{24}$$

$$Z = \frac{T - \mu_T}{\sigma_T}$$

Now let's go with an illustrative example:

A certain inventor claims to have devised a gasoline additive that increases fuel efficiency. A potential product funder runs two tests on 18 different cars that are driven under the same conditions, one test with the additive and one without the additive, and the results are shown below:

With additive (1)	Without additive (2)
24.26	25.64
38.34	38.10
35.52	37.16
21.64	23.52
34.23	23.99
19.76	18.58
22.82	22.58
20.23	23.29
25.87	27.99
31.05	30.58
42.57	42.57
17.64	19.05
22.35	23.05
25.64	25.64
20.46	24.23
35.52	38.10
31.52	30.58
28.93	32.46



The alternative hypothesis is the one that proves what is to be demonstrated, that is, that with the additive the performance is increased and therefore, the median of the tests with the additive must be greater than the median of the tests without the additive.

Ha: Me1 > Me2

In contrast to the alternative hypothesis we can establish the null hypothesis

Ho: Me1 Me2

As we can see, the number of observations is greater than 15 and therefore, we can assume that it behaves as if it had a normal distribution and for this we will use the formulas described previously. But first, we must subtract both paired samples and place the value of the subtraction in the next column, and then establish the ranges according to the absolute values obtained from that difference. The smallest value regardless of whether it has a positive or negative sign, will be assigned rank 1, the next smallest value will be assigned rank 2, and so on.

With additive	Without additive	X1 – X2	Rank	Sign
24.26	25.64	-1.18	7.5	-
38.34	38.10	0.24	2	+
35.52	37.16	-1.64	10	-
21.64	23.52	-1.88	11	-
34.23	23.99	0.24	2	+
19.76	18.58	1.18	7.5	+
22.82	22.58	0.24	2	+
20.23	23.29	-3.06	14	-
25.87	27.99	-2.12	12	-
31.05	30.58	0.47	4	+
42.57	42.57	0	-	0
17.64	19.05	-1.41	9	-
22.35	23.05	-0.7	5	-
25.64	25.64	0	-	0
20.46	24.23	-3.77	16	-
35.52	38.10	-2.58	13	-
31.52	30.58	0.94	6	+
28.93	32.46	-3.53	15	-

As we can see, the smallest absolute value of differences is 0.24, but it is repeated three times occupying positions 1, 2 and 3 in the range, so we take the average = 1 + 2 + 3/3 = 2 and that will be the range for those three values. The next value (0.47) will directly occupy the place of rank 4. Then the absolute value (0.18) is repeated again so we repeat the operation, as both occupy ranks 7 and 8, the average between these places will be 7.5 , and then place the absolute value that will occupy the range 9. Later we add the last column with the signs corresponding to each difference, and then add the positive values to obtain the value of T (+) and the negative values to obtain T (-)

T (+) = 2 + 2 + 7.5 + 2 + 4 + 6 = 23.5

T (-) = 7.5 + 10 + 11 + 14 + 12 + 9 + 5 + 16 + 13 + 15 = 112.5

Remember that the values that are not positive and negative, that is to say zero (0), are subtracted from the number of observations, if before we had 18 observations, now they will be n = 16.

As the alternative hypothesis states “Greater than”, the first thing that comes to mind is that it is a single-tailed test and that in addition, we must take the largest of the values between 23.5 and 112.5, therefore: T = 112.5

Applying the normal distribution formulas since the number of observations is greater than 15 we have:

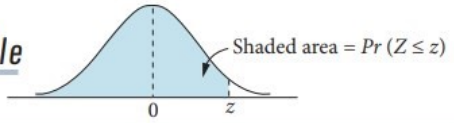
$$\mu_T = \frac{n(n-1)}{4} = \frac{16\,(16+1)}{4} = \frac{16*17}{4} = 68$$

$$\partial_T = \sqrt{\frac{n(n+1)(2n+1)}{24}} = \sqrt{\frac{16(16+1)(2*16+1)}{24}} = \sqrt{\frac{16*17*33}{24}} = 19.339$$

$$Zcal = \frac{T-\mu_T}{\sigma_T} = \frac{112.5-68}{19.339} = 2.301$$

If we look within the table for the value of = 0.05 and we look at the values found both in the row and in the column, we can establish the value of Z for this level of significance.

Table A.1: Standard Normal Distribution Table



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
– 3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
– 3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
– 3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
– 3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
– 3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
– 2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
– 2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
– 2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
– 2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
– 2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
– 2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
– 2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
– 2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
– 2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
– 2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
– 1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256 here	0.0250	0.0244	0.0239	0.0233
– 1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
– 1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
– 1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
– 1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
– 1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
– 1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823

As we can see, from the left side we obtain the value -1.6 and the value found in the upper columns are 0.04 and 0.05 that represent the columns of the values that are between 0.0505 and 0.0495 (interpolating these values we will obtain the = 0.05) thus than average both values we will have = (0.04 + 0.05) / 2 = 0.045. If we add those hundredths to the value obtained in the row, we will have the critical value of Z = -1.645 for this level of significance. Now we must compare it with the value of Zcal. Given the case that the critical Zcal> Z obtained in the table, the null hypothesis will be rejected and this is ultimately what happens, since:

2,301> -1,645

By rejecting the null hypothesis we can reach the conclusion that we will accept the alternative hypothesis and that therefore, gasoline will have a higher performance with the additive and that the researcher achieved his mission.

46.1 The Kruskal-Wallis test

This test is also known as the H test and is the non-parametric alternative for unpaired data of the one-way ANOVA test. Many think that it is the extension of the Wilcoxon rank sum when it involves more than two groups and, therefore, it is a test that uses the ranks to contrast a hypothesis with k number of samples that have been subtracted from the same population. .

Although it is true that in the ANOVA test the means are compared, in this Kruskal Wallis test what is contrasted is if the different samples are equally distributed and that therefore, these samples belong to the same population. Under certain simplifications it can be said that this test compares the medians.

Ho: All samples come from the same population

Ha: At least one sample comes from a population, whose distribution is different from the others.

The Kruskal-Wallis test is appropriate when the data have a natural order and must be ordered to make sense of it. It can also be used when the conditions do not exist to apply the ANOVA test. For example, when a study is required on the difference between men and women in a certain university degree, two types of data are available: when we refer to the time of each participant, the ANOVA test should be used. But if what is required is to know the positions in which each participant in the race has arrived, it is advisable to use the analysis of Kruskal Wallis.

Requirements and conditions to be able to apply this test:

- The samples that are contrasted need not come from a normal distribution.
- Homoscedasticity: Given that the null hypothesis proposes that all groups belong to the same population and that therefore they will have the same medians, it will be an essential requirement that all groups have the same variance. This can be verified through graphical representations or using the Levenne or Barttlet tests.
- They must all have the same distribution: Although it is true that the distribution of the groups does not necessarily have to be normal, it is necessary that it be the same in all the groups. For example, all groups show an asymmetry to the right.

If these conditions are met, the requirements to apply the Kruskal Wallis test or the H statistic will be:

When k is the size of the groups is equal to 3 and the number of observations for each group is not greater than 5, one must resort to tabulated tables with the theoretical values of H.

For the rest of the cases not specified in the previous point, the H statistic is assumed to follow an X2 distribution (Chi square) and that it also has k - 1 degrees of freedom.

In almost all the bibliography consulted, the ANOVA test is considered quite robust for medium or large samples, whose distribution is not normal. In general, they recommend the use of the Kruskal Wallis test when the populations to be compared are clearly asymmetric and also fulfill the condition that they all have a homogeneous variance and are in the same direction.

Given the case that the variance between populations is not homogeneous, the most appropriate test may be an ANOVA with Welch correction and it is important to note that when dealing with only ordinal data, the ANOVA test is not an option.

Nomenclature used in formulas:

N = number of total observations, including the combination of all samples

k = number of samples

R1 = The sum of the ranges, but only from sample 1

n1 = The number of observations from group or sample 1

The nomenclature is repeated for the rest of the samples or groups, that is, R2 will be the sum of the ranges but of group 2 and its number of observations will be n2 and so on with the rest of the groups or samples.

The test statistic H for non-repeating data is defined by:

$$H = \frac{12}{N(N+1)}\left(\frac{R1^2}{n1} + \frac{R2^2}{n2} + \cdots + \frac{Rk^2}{nk}\right) - 3(N + 1)$$

$$H = \frac{12}{N(N+1)}\sum_{i=1}^{k}\frac{R_i}{n_i} - 3(N + 1)$$

Once the test statistic is obtained, it is compared with the chi-square test (X2). But what is the chi-square test?

This test is within those belonging to descriptive statistics and in this case, it focuses on extracting information from the sample as opposed to referential statistics whose information is extracted from the population. This test is used to determine the dependency or independence between variables. It is important to take into account that the independence between variables implies that they are not related and that therefore, one variable does not depend on the other and vice versa.

To determine if there is any type of correlation between variables, there is a table to consult. The chi-square test does not allow us to know the intensity of the correlation, since it takes values between zero and infinity and although it is true that as the sample increases, the value of chi-square also increases, that does not mean that there is a higher correlation.

This type of test belongs to the so-called contrast or goodness-of-fit tests, since their objective is to decide whether the hypothesis that a given sample comes from a population can be accepted, but also with a probability distribution that is specified in the null hypothesis. A null hypothesis is established that indicates a specified probability distribution, such as, for example, the sample can be the mathematical model of a population that has generated the same sample.

Once we have the hypothesis, then we will carry out the contrast and it is necessary to have the data found in a frequency table. To do this, the empirical or observed frequency is indicated for each value or interval. Starting from the assumption that the null hypothesis is true for a certain value or interval of values, then the expected frequency is calculated.

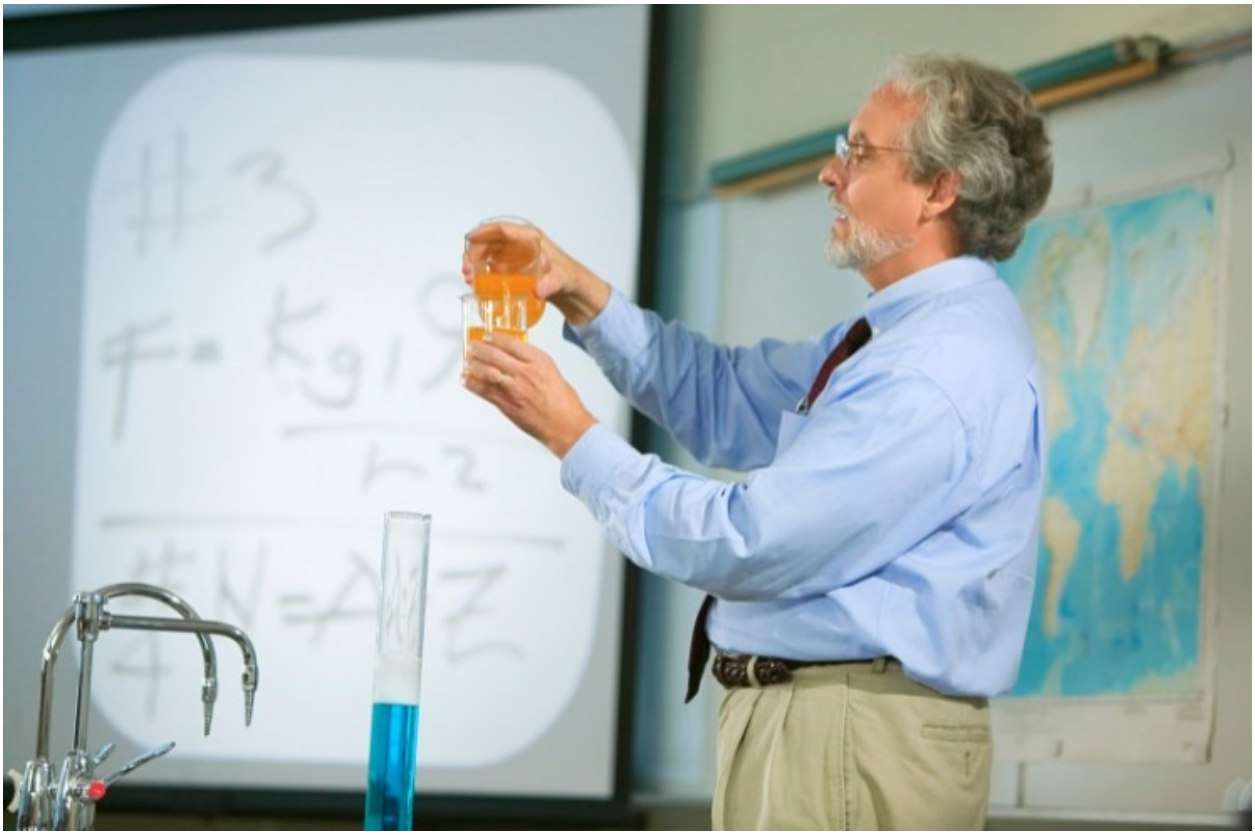
When the chi-square statistic takes a value equal to zero, it can then be said that there is a perfect agreement between the expected and observed frequencies. On the contrary, if the statistic takes a large value, there will be a large discrepancy between both frequencies and therefore the null hypothesis must be rejected.

The chi-square tables to find the critical value must be entered with the significance level and the degrees of freedom, the latter represented by the value (k-1).

Let's do an example:

The annual salaries in dollars of some university professors from different states whose qualifications and experience are similar are compared, where the following results were obtained:

Salaries in State 1 universities	Salaries in State 2 universities	Salaries in State 3 universities
31000	20200	27000
25500	20300	32000
28000	20600	36000
25000	20900	36000
22900	22200	35200
26700	20300	35300



The null hypothesis establishes that there is no substantial difference between the salaries of university professors in the three states. A significance level = 0.05 should be used.

In this case, I have to check if the three means are equal, so the null hypothesis is:

Ho: 1 = 2 = 3

Ha: At least one of the means is different

To carry out the exercise, we must order the salaries from lowest to highest including the data of the three states and it will be necessary to place a column with the state to which they belong. To then assign rank 1 to the lowest of the salaries, the salary that follows will be assigned rank 2 and so on.

State	Salaries	Rank
2	20200	1
2	20300	2.5
2	20300	2.5
2	20600	4
2	20900	5
2	22200	6
1	22900	7
1	25000	8
1	25500	9
1	26700	10
3	27000	11
1	28000	12
1	31000	13
3	32000	14
3	35200	15
3	35300	16
3	36000	17.5
3	36000	17.5

As in previous exercises, if certain values are repeated we will have to average the range with the positions they occupy. For example, in cells 2 and 3 the salary 20300 is repeated, so we must average: (2 + 3) / 2 = 2.5 and both cells will have that range. The next box will start from rank 4. The same happens in the boxes that occupy places 17 and 18 where the salary is also repeated, when averaging we have that each of these boxes will be with rank 17.5.

Now we must calculate the sum of the ranks of the states or groups 1, 2 and 3

R1 = 7 + 8 + 9 + 10 + 12 + 13 = 59

R2 = 1 + 2.5 + 2.5 + 4 + 5 + 6 = 21

R3 = 11 + 14 + 15 + 16 + 17.5 + 17.5 = 91

We are now going to calculate the statistic that we will call Hcal:

$$Hcal = \frac{12}{N(N+1)}\left(\frac{R1^2}{n1} + \frac{R2^2}{n2} + \frac{R3^2}{n3}\right) - 3(N + 1)$$

Where:

N = 18

n1 = n2 = n3 = 6

k = 3

Substituting the values in the formula we have:

$$Hcal = \frac{12}{18(18+1)}\left(\frac{59^2}{6} + \frac{21^2}{6} + \frac{91^2}{6}\right) - 3(18 + 1)$$

Hcal = 14.3625

The null hypothesis is rejected if the Hcal is greater than the chi-square value located in the tables with = 0.05 and the specified degree of freedom, that is, k-1 = 3 - 1 = 2

Chi-Square (χ^2) Distribution

Degrees of Freedom	Area to the Right of Critical Value									
	0.995	0.99	0.975	0.95	0.90	0.10	0.05	0.025	0.01	0.005
1			0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.071	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.299
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801

With these values we go to the chi-square table and intersecting both values we obtain that X2= 5.99

As we can effectively observe the Hcal is greater than X2 since:

14.3625 > 5.99 and therefore, the null hypothesis is rejected. In this way we can conclude that not all the means of the wages of the three states are equal and that there is at least one of the means of the wages of some state, which is different from that of the others.

46.2 Friedman rank analysis of variance

It is also called the Friedman Xr test and like the previous ones shown in this article, it is a non-parametric or free distribution test. This test is in charge of comparing the differences in related groups that have more than two observations. In other words, the same group is evaluated on more than two occasions, which may be before, during and after a certain intervention. In this way, the change that occurred in the group will be evaluated after being intervened.

It is important that the data we are evaluating are at an ordinal level of measurement and that the sampling does not necessarily need to be random.

Steps required to perform the Friedman Xr Test

1- As we explained previously, this test is performed on related samples, that is, we are going to evaluate a single group in more than two moments. Therefore, each participant in our research will have two or more measurements and it will be necessary to place these measurements in a table.

2- Subsequently, ranges from lowest to highest are assigned to each of the measurements of each individual or participant. Given the case that the value is repeated in the same individual for two different moments, each of the moments will be assigned the average of the two positions they occupy, as we have done in previous exercises. This procedure will be carried out with each of the individuals, unlike the previous tests, where the ranges were established including all the observations.

3- The third step will be to add the ranges of each column and therefore we will have the sum of the ranges for each of the moments or conditions.

4- The fourth step is to apply the Friedman equation that we will specify below:

$$Fr = \frac{12}{nk(k+1)} \left(R_1^2 + R_2^2 + \cdots + R_k^2\right) - 3n(k+1)$$

Where:

n = number of individuals or subjects

k = number of moments or conditions

Rk2= Sum of ranges for each moment or condition, but squared.

5- Now we calculate the degrees of freedom and for this it will be necessary to subtract k - 1

6- The next step is to find the critical value of Xr in the table, where it will be necessary to enter the level of significance () and the degrees of freedom.

7- The last step is the statistical decision making, for this it will be necessary to compare Fr with the critical Xr obtained in the table. If Fr > Xr, the null hypothesis will be rejected, accepting the alternative hypothesis.

Now let's go with an example:

A researcher wants to find out if there are differences in relaxation levels for a group of people between different conditions: with noise, in silence and with music. For this, the participants are given a certain scale from 1 to 5, where it is established that 1 means that the person is not relaxed at all, while the answer 5 is for the person who is very relaxed and the scales 2, 3 and 4 are the reflection of intermediate points between both conditions.

After applying each of the conditions to 8 people, the following results were obtained:

Person	Condition 1 (noise)	Condition 2 (silence)	Condition 3 (music)
1	2	5	4
2	1	5	3
3	3	5	5
4	3	5	2
5	2	3	5
6	1	4	4
7	5	3	2
8	1	4	3



Ho: There are no differences between the 3 different conditions in the relaxation levels

Ha: There are differences in the 3 conditions as far as relaxation is concerned.

Now we are going to establish the ranges for each of the people and for this we will add a column for each condition. For example, for person 1 the lowest value among the 3 conditions is 2, to that value we will assign rank 1 that will be placed in the column to the right, the next value in ascending order is 4, then we will assign rank 2 and finally the highest of the 3 values is 5, to which we will assign the rank 3. We will have to carry out this same procedure, for each of the people and then we will have to add the ranges of each column for each of the conditions.

Person	Condition 1 (noise)	Rank (1)	Condition 2 (silence)	Rank (2)	Condition 3 (music)	Rank (3)
1	2	1	5	3	4	2
2	1	1	5	3	3	2
3	3	1	5	2.5	5	2.5
4	3	2	5	3	2	1
5	2	1	3	2	5	3
6	1	1	4	2.5	4	2.5
7	5	3	3	2	2	1
8	1	1	4	3	3	2
$\sum R$	$\sum R_1$	11	$\sum R_2$	21	$\sum R_3$	16



In person 3 the values are repeated in their conditions 2 and 3, which should also occupy ranges 2 and 3, so we will make an average: (2 + 3) / 2 = 2.5 and this number will be the range for both values. Exactly the same case occurs for person 6 and again the ranges of conditions 2 and 3 will be 2.5 for each one. We calculate Fr:

$$Fr = \frac{12}{nk(k+1)}(R_1^2 + R_2^2 + \cdots + R_k^2) - 3n(k+1)$$

Being:

n = 8

k = 3

We substitute the values in the formula:

$$Fr = \frac{12}{8 * 3(3+1)}(11^2 + 21^2 + 16^2) - 3 * 8(3+1)$$

$$Fr = \frac{12}{24*4}(121 + 441 + 256) - 24*4$$

$$Fr = 6.5$$

We enter the chi square table with the value of the degrees of freedom: k - 1 = 3 - 1 = 2 and with a significance of = 0.05, we obtain that the critical value is 5.991

The Table

	0.995	0.99	0.975	0.95	0.9	0.5	0.2	0.1	0.05	0.025	0.02	0.01	0.005	0.002	0.001
1	0.0000397	0.000157	0.000982	0.00393	0.0158	0.455	1.642	2.706	3.841	5.024	5.412	6.635	7.879	9.550	10.828
2	0.0100	0.020	0.051	0.103	0.211	1.386	3.219	4.605	5.991	7.378	7.824	9.210	10.597	12.429	13.816
3	0.072	0.115	0.216	0.352	0.584	2.366	4.642	6.251	7.815	9.348	9.837	11.345	12.838	14.796	16.266
4	0.207	0.297	0.484	0.711	1.064	3.357	5.989	7.779	9.488	11.143	11.668	13.277	14.860	16.924	18.467
5	0.412	0.554	0.831	1.145	1.610	4.351	7.289	9.236	11.070	12.833	13.388	15.086	16.750	18.907	20.515
6	0.676	0.872	1.237	1.635	2.204	5.348	8.558	10.645	12.592	14.449	15.033	16.812	18.548	20.791	22.458
7	0.989	1.239	1.690	2.167	2.833	6.346	9.803	12.017	14.067	16.013	16.622	18.475	20.278	22.601	24.322
8	1.344	1.646	2.180	2.733	3.490	7.344	11.030	13.362	15.507	17.535	18.168	20.090	21.955	24.352	26.124
9	1.735	2.088	2.700	3.325	4.168	8.343	12.242	14.684	16.919	19.023	19.679	21.666	23.589	26.056	27.877
10	2.156	2.558	3.247	3.940	4.865	9.342	13.442	15.987	18.307	20.483	21.161	23.209	25.188	27.722	29.588
11	2.603	3.053	3.816	4.575	5.578	10.341	14.631	17.275	19.675	21.920	22.618	24.725	26.757	29.354	31.264

If the calculated Friedman value is greater than the critical value obtained in tables, then the null hypothesis is rejected and we can realize that we are facing precisely this case since:

6.5 > 5.991

By rejecting the null hypothesis, the alternative hypothesis is then accepted in which it is established that there are indeed differences in the relaxation levels, depending on each of the sound conditions.



46.3 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

FORTYSEVEN

NUMERAL SYSTEMS

Before the invention of writing, humans spent a good deal of time developing the first attempts of civilization by settling in convenient places, selected because of water sources, good soils for agriculture, abundance of animals for hunting or climate. These small human groups started growing and relationships changed from tribal societies to small town complexities, making it necessary to develop some ways to control quantities. They needed to count people, food, animals, days, distances etc.

No doubt, the first ways used to count (after the obvious use of the fingers) involved small pebbles. As a matter of fact, the word "calculus" originally means "small rock". The first approach to this way of representing quantities was probably a "one-to-one" relationship between the rocks and the numbers, so to register the number 50 you needed 50 small rocks. Not very practical but thinking about this from our advantage position in the XXI century is not fair. To develop a better numeral system requires a good deal of ingenuity, to a point that some humans groups never did it.

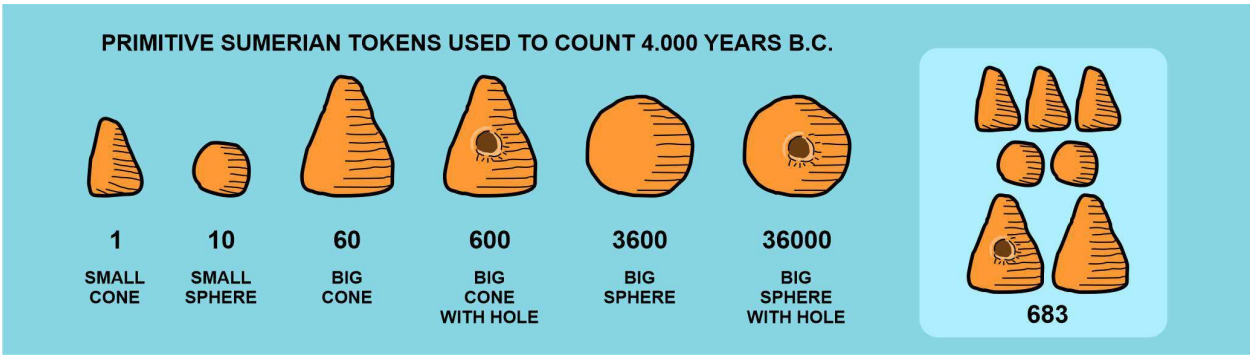
Even in the present days, there are some isolated tribes which have not numeral systems. The Piraha tribe from Brazil just don´t have any word for the numbers, they just have concepts for small or large (one bird is a small bird, several birds are a large bird), and they just reject the possibility to learn about quantities, they say then don´t need such a thing. The Vedda tribe, at Sri Lanka, and the Caquinte tribe at Peru, have only numbers for one and two. For greater quantities the use something like "one more" or "many". The Munduruku people, an Amazonian tribe, has numbers only up to five, so let´s not assume that it´s an easy task to develop a practical numeral system.

Humans started counting by using their fingers. The word "digit" has its origin in the Latin for finger, "digitus", and that´s the reason why so many cultures developed numeral systems with a basis on the number ten. Nevertheless, 10 can only be divided by 2 and by 5, so it´s not a good number when it comes to divisions into smaller parts. Twelve is better in this department, so it´s frequent to use dozens, and when more divisions are useful, 60 and 360 are great; 60 can be divided by 2, 3, 4, 5, 6, 10, 12, 15 and 30, and when large quantities are involved 360 has all the same divisors as 60 and many more, and it has another advantage: 360 is very close to the number of days in a year, so it can even be used as the basis for a primitive calendar. Primitive Persians had a 360 days calendar, 12 months of 30 days, and every six years they would add a ritual additional month to keep the years synchronized with the stars and the change of seasons. The ancient Egyptians had a similar calendar. Obviously, they liked the 360 number because how easy it was to get exact subdivisions.

47.1 A hard decision

The first numeral system we find at the dawn of history is the Sumerian, just like the first samples of writing were found on the same area. Sumerian civilization was very advanced for it´s time, so it´s no surprise they had a sophisticated development of mathematics and astronomy. What numeral system did they embrace?

Well, apparently the decision was so hard they just didn´t decide. They used both the 10 and the 60 in a very convenient fashion. They represented the numbers in an additive way (much like the Roman numeral system, centuries later). It means they added numbers to represent quantities, and these numbers they used were only 1, 10, 60, 600, 3600, each represented by a different "token", like small pebbles made with clay. Number 1 was represented by a small cone of clay, number 10 by a little ball, 60 by a large cone, 600 was represented by a large cone with a hole on it, 3600 by a large ball and when the large ball had a hole it represented 36.000.



We can see that this system can represent a number like 683 without the need of 683 tokens; they just needed 7 tokens. It was a great improvement over direct relation, a magnificent idea, to assign different values to different tokens and, to represent any number without an assigned token, you just add as many tokens as needed. This system is known as an additive system and it was used by most civilizations for the longest part of our history. Europe used the Roman system until the XIV or XV centuries.

47.2 The Roman numeral system

The Roman numeral system is derived from the Etruscan system. Etruscan people inhabited the Italian peninsula before the VIII century B.C. and around 750 B.C. Rome was founded. Romans developed the Latin alphabet and adapted the Etruscan numerals using these characters. They assigned the "I" to number one, "V" to number five, X to number ten, "L" to number 50, "C" to number 100, "D" to number 500 and "M" to number 1.000. These symbols worked in an additive way, and the bigger number should always be written to the left; the smaller numbers should go to the right, and when a smaller number was written to the left of a bigger number, it was not to be added but subtracted. So "VI" means six, but "IV" means four.

This Roman system was very useful, but it had the inconvenience that arithmetic operations were too complex, and large numbers required too many symbols to be written. This fact can be observed in the present because Roman numerals are still in use for some specific applications, like in classic style clocks, chapter numbers in some books or when they register the year when a movie was made. Usually when we watch a movie, at the end of the credits list, the year makes its appearance in Roman numerals, and we can see how hard it is to make this large list of letters into a number. For instance, the 1988 classic, "Who Framed Roger Rabbit" shows this at the end of the credits: MCMLXXXVIII. When you have figured out the first 4 characters, the credits scrolling is over.

What kind of advance in the conception of the numeral systems was necessary to represent large quantities with just a few characters, and on the other hand, to make arithmetic operations easy and straightforward? Additive numbers were not enough, more consistency was needed. If you were to add two numbers, you would need to put one on top of the other and operate one character at a time, but when using Roman numerals, this way of adding up produced confusing results, not consistent with the inherent rules of Roman numerals. The same happened when subtracting, and if we tried to multiply or complete a division, operations became a nightmare.

The solution had been in use since around the V or VI century at India, possibly inspired by an older Chinese system. Two important advances made the difference.

A) Positional numeral values: It means the value of a character is not always the same, it depends on its position. The basis of the positional numeral system is the number of different characters or digits the system uses (like 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 in our decimal system which has its basis on ten and have ten different digits), and the positions of the digits means they will be multiplied by different powers of the base number.

B) The invention of zero: The positional system cannot work properly without some way to fill positions which should not be added. The first character used at India to fill positions which didn´t represent any quantity was just a dot. It was the first character for zero.

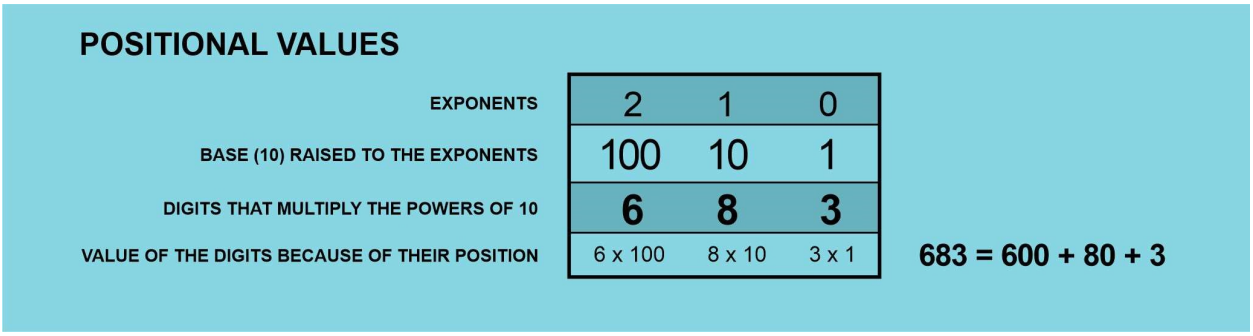
What does it all means? Let´s see it in more detail.

47.3 The power of Powers

Using increasing powers on the base number has the advantage that powers grow very fast when you raise them.

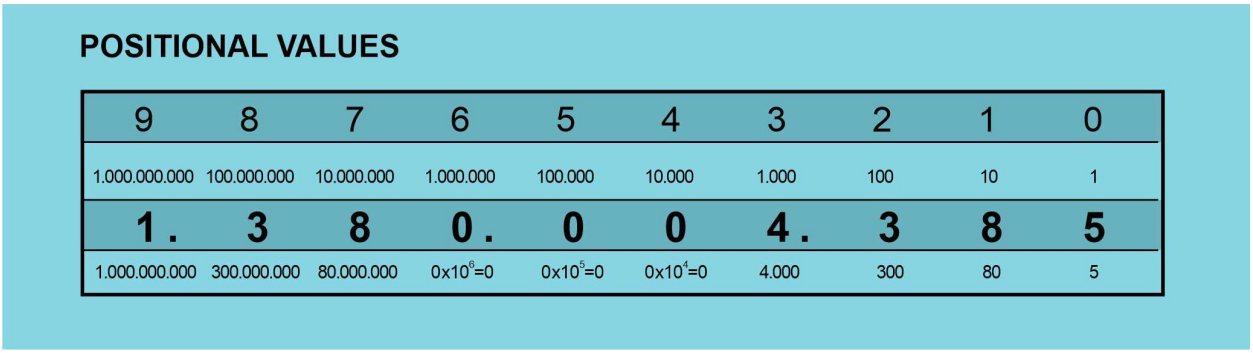
- 100=1
- 101=10
- 102=100
- 103=1.000
- 104=10.000
- 105=100.000
- 106=1.000.000

Only by reaching the sixth power of ten, we are in the zone of millions, not bad. Can we use these powers to represent any number? Yes, of course we can, this is when the other digits enter the ballroom. Remember we used 7 clay pebbles to write down the number 683? We can see that our decimal system only needs 3 digits to write it down: 6-8-3. Let´s see how it works.



This is how we use powers of ten to represent any number in our positional system; the exponents for each position grow from right to left (2, 1, 0), this is why the digit 8, second position, multiplies 10. Ten is the second power of 10 (101) since the first one is 1 (100). It means the numeral 683 contains 8 tens. The complete meaning for 683 would be 6 hundreds + 8 tens + 3 units.

This way we can write down any number, no matter how big. If we need to represent the population of India (1.380.004.385 people), we do it like this:



Where again, the numbers in the first row, going backwards from 9 to 0, are the exponents, and in the second row we have the base number, ten, raised to the exponents.

The third row shows the digits which represent the number, the population of India, and the fourth row shows the results of multiplying these digits and the powers of ten. By adding up all the numbers on the fourth row we get the total number.

1.380.004.385 = 1.000.000.000 + 300.000.000 + 80.000.000 + 0 + 0 + 0 + 4.000 + 300 + 80 + 5

47.4 The importance of Zero

In the previous example, we can notice the total number has three zeroes in the positions for tens of thousands, hundreds of thousands and millions. It means these powers of ten are not needed to represent our total number, the population of India so these positions should be "empty" but, if we had no zero to be used in these positions, the number would look like this:

1.384.385

Only 1.38 millions instead of 1.38 thousand of millions!!

So, the zeroes are important to keep track of the positional value of each digit. This idea of a digit representing "nothing" is what the Romans didn´t think, it would have helped them develop a better numeral system. Zero was in the first place used at China by the 4th century B.C. and one century later at India, but to develop a complete positional system including zero the Indians took as far as the fifth century A.C., the beginning of western middle ages.

All through this time, western civilization had been using Roman numerals. By 813, a Persian astronomer published some astronomical tables using zero, and by 976, an Iranian author explained how to use zero when doing arithmetic operations. This way, he said, the rows can be kept in order.

The decimal system reached Europe through Spain, which was occupied by Arab people by 11th century. This is why we know the decimal digits as "Arabic numerals". An Italian mathematician, Fibonacci, did his best to make the Arab system known and by the 15th century it was commonly used by mathematicians, but regular people didn´t embrace the system until one century later.

47.5 Other numeral systems

We are so much used to live with the decimal system that it´s very easy to think it´s the only numeral system, we count with our 10 fingers, and we operate with the 10 Arabic digits. Nevertheless, when we study mathematics it´s common to have some lessons on numeral systems and how any number can be used as a base, not only ten; but even in this case, we hardly come back to this subject, a simple curiosity.

We use other numeral systems as well, without giving it too much thinking, when we count time (hours, minutes, seconds) with roughly a base 60, or when we measure angles (360 degrees, base 360). But it was the invention of computers which gave a huge importance to other numeral systems. Computers don´t use 10 digits, not at their very core. Computers use electronic components which only can have 2 possible states: On-Off or 1-0. So the whole arithmetic system inside computers needs to have only two digits, a base 2 system which we know as the binary system. It works exactly in the same way as the decimal system, but the base is 2, and we work with powers of 2, and only 2 digits: 0 and 1.

Let´s see how it would work when applied to the number we used before, 683.

POSITIONAL VALUES - BASE 2

EXPONENTS FOR THE BASE (2)	9	8	7	6	5	4	3	2	1	0
POWERS OF 2	512	256	128	64	32	16	8	4	2	1
DIGITS REPRESENTING THE NUMBER 683 BASE 2	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**1**
THE POWERS OF 2 MULTIPLIED BY THE DIGITS	512	$0x2^8=0$	128	$0x2^6=0$	32	$0x2^4=0$	8	$0x2^2=0$	2	1

683 = 512 + 0 + 128 + 0 + 32 + 0 + 8 + 0 + 2 + 1

We can see that the binary (base 2) digits for this number are 1010101011, and this is how a computer ultimately stores numbers. Number 2 is the lowest one which can be used for a numeral system, and a memory position inside a computer which stores a 0, or a 1 is the smallest piece of information, and it has received the name Bit.

Usually, computers use groups of 8 bits to define characters or instructions, so these groups of 8 bits are known as Bytes.

47.6 Octal and Hexadecimal

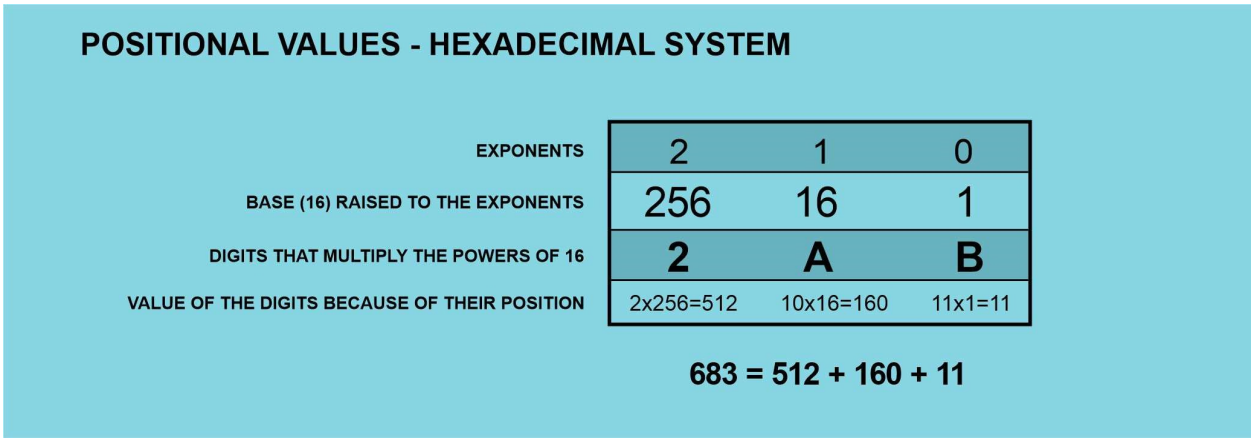
There are two more important numeral systems related with computers. Back in the 1960´s there were some primitive computers, like Univac or the IBM Mainframe which used for some operations a base 8 numeral system (Octal system) because of the way they packaged groups of bits. Since Octal system has base 8, it only uses 8 numerical symbols: 0, 1, 2, 3, 4, 5, 6, 7

In the present days, computer programmers use another numeral system, Hexadecimal (base 16). This system was selected because 16 is a power of 2 so in a way, Hexadecimal keeps a relation with binary system. Groups of 4 bits correspond to one Hexadecimal digit so, in certain cases, using Hexadecimals can make it easier to read information than a long list of ones and zeroes.

Being the base 16, we need 16 different numerical symbols, and the convention dictates we use numbers from 0 to 9 plus A, B, C, D, E, F.

Any number below 10 is represented the same in decimal or Hex, but if we want to write down ten in Hexadecimal, we use A. B is for eleven, C is for twelve, D is for thirteen, E for fourteen and F for fifteen.

Sixteen is represented as 10 in Hex system. Let´s see how the same number we used before can be represented in Hexadecimal system.



Then, we can represent 683 with only 3 digits: 2AB

Hexadecimal system is one we will find frequently in programming literature because it´s a very short way to write down long binary numbers or lists of bits. Memory locations, media access control addresses, codes for error messages are some examples of information expressed in hexadecimal; also colors on the screen or all the different characters that can be displayed or printed.

As we have seen, there are countless ways to count but the more efficient, coherent and useful for arithmetic operations are the positional systems which include zero. This number we all take for granted, it looks so obvious today that we forget it took about 20 centuries to evolve and travel from ancient China and India to the Western civilization.

Next time you buy a wristwatch, don´t bee fooled by the idea that watch spheres with Roman numerals are more elegant. There is nothing more elegant than the clean efficiency of positional systems, and the use of zero.

47.7 About the Author

Jorge Araica is a Graphic Designer with technical background, an old school pro with some knowledge in the engineering and programming fields and also a promotor of critical and rational thinking as a way to spread a scientific attitude towards knowledge. Freedom is his other passion, and he will stand for it at every opportunity he gets.

CHAPTER

FORTYEIGHT

PARAMETRIC STATISTICS

Parametric statistics is part of statistical inference and uses resolution criteria that are based on known distributions.

But what is statistical inference? They are a set of methods that allow us to promote, through a statistical sample, the behavior of a certain population. Statistical inference leads us to study how the application of these methods in the data of a sample cannot provide conclusions regarding the parameters of a certain population of data. As well as it is in charge of studying the degree of reliability of the results obtained from a study or investigation.

It is important to understand these three concepts:

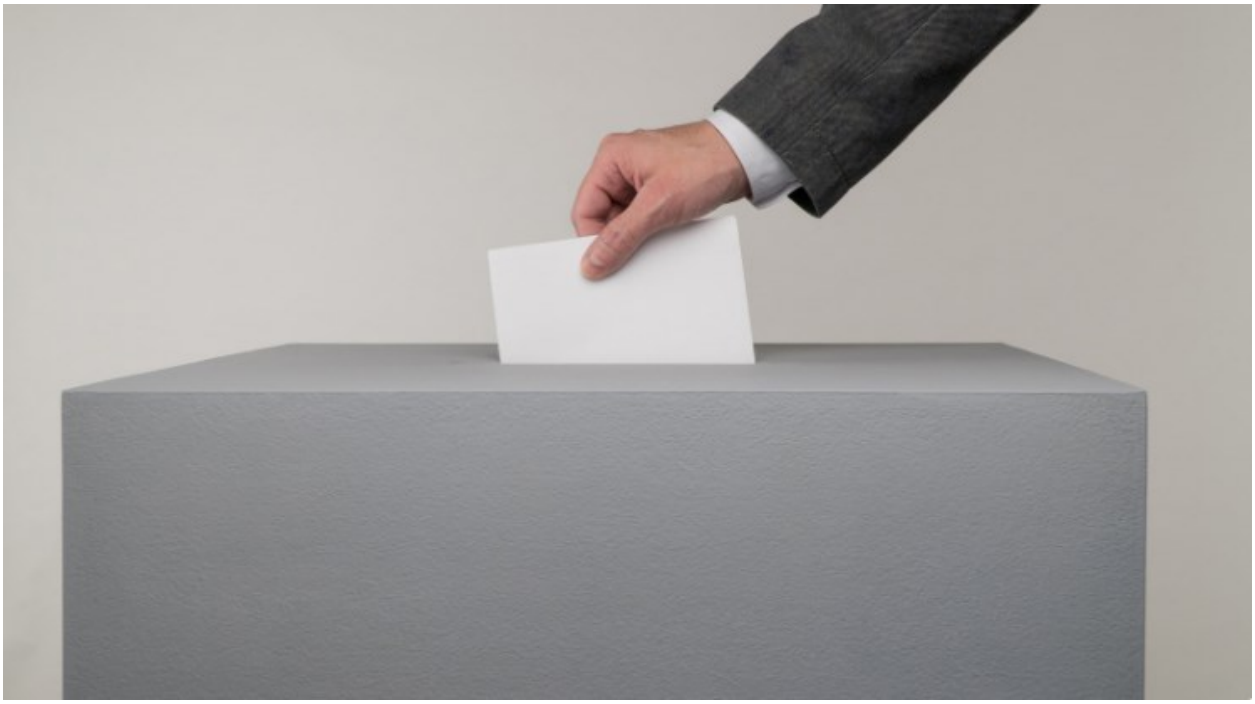
1.- Inference: It means that from certain assumptions it is possible to draw conclusions or judgments, either particular or general.

2.- Population: The total data set that exists on a certain variable is what we call a data population.

3.- Statistical sample: It is a part that is chosen within the data population.

Once we are clear when we refer to the concept of inferring, one of the main doubts falls on the fact of choosing a sample, instead of a population.

In general, statistics work with a large amount of data and among them it is necessary to use a sample of the population. For example, if we want to infer regarding the results of certain elections, it will be impossible for us to investigate the entire population of a country.



To solve problems of this type, a representative and varied sample is chosen, which can lead us to extract an estimate regarding the final result. It is important to choose a suitable sample and it will be necessary to use some sampling technique.

Statistical inference methods

The methods of statistical inference are divided into two large branches, which are: hypothesis testing methods and parameter estimation methods.

- Hypothesis testing methods: their main premise is to check when an estimate corresponds to population values and in all hypothesis testing, there are always two assumptions that are: the null hypothesis where it is established that a certain value has a predetermined value. Given the case that the null hypothesis is rejected, then the alternative hypothesis must be accepted.

- Parameter estimation methods: they are in charge of assigning a value to the parameter that characterizes the study subject. Of course, as it is an estimate, it must be taken into account that there is a certain error and to access estimates adapted to reality, what is done is to create confidence intervals.

Parametric statistics tries to estimate certain parameters in a sample of the data population. It is important to note that parametric statistics base their calculations on the assumption that the distribution of the variable is known.

On the other hand, a probability distribution is a tool that tells us precisely how the probabilities are distributed and depending on the structure that this distribution has, the distribution can be of one type or another.

The best known of all probability distributions is the normal distribution and it is the one that applies around most random phenomena, since many of these phenomena tend to behave as a normal one, when repeating the data a large Number of times.

We can find distributions such as the Chi square one that was developed by Pearson. This distribution represents those random variables made up of strictly positive values and is usually used to see the structure of the variance of a certain random variable. It should be noted that the variance is always positive.

Different types of distributions that can be found in parametric statistics

Among the best known distributions used in parametric statistics are:

The discrete probability distributions:

- Uniform distribution

- The binomial distribution

- Bernoulli's distribution

- The geometric distribution

- The hypergeometric distribution

- The negative binomial distribution

- The Poisson distribution

Continuous Probability Distributions

- The Chi square distribution

- The exponential distribution

- Continuous uniform distribution

- The Gamma distribution

- The normal distribution

- Snecdor's F distribution and

- Student's t distribution

Advantages of parametric tests

- They are more efficient

- According to the information obtained and its characteristics, they are more perceptible

- They have very exact probabilistic calculations

- Errors are unlikely

- As they are commonly used, it can be observed through an analysis, the data obtained

- When the conditions of their application are fully met, they are a very powerful method.

Disadvantages of parametric tests

- They are more difficult to calculate

- Observable data may be limited

- The variables must follow a normal distribution

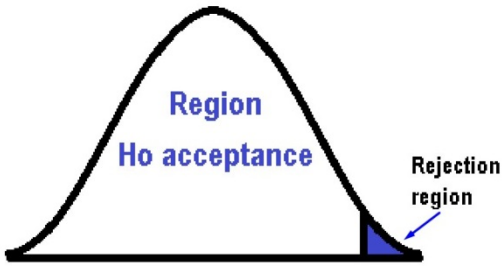
Hypothesis contrast

Statistical inference is based on decision-making where hypothesis testing and estimation are important aspects, which, although it is true that they are differentiated from each other, are complementary.

Hypothesis testing is a test of significance where the process by which we decide whether a proposal regarding a population should be accepted or not is indicated. To do this, it will be necessary to use the decision rule, which tells us when to accept or reject the hypothesis and if the sample data is closely related to the population data.

A statistical hypothesis is nothing more than a proposition regarding the probability or probability density function of one or more random variables. This proposition must address either the estimation, inference, probability distribution, hypothesis testing or the value of the parameter or the parameters that define it. The hypothesis contrast will be based on the information extracted from the sample. Given the case that the hypothesis is rejected, it is important to indicate the data of the sample where its falsehood is evidenced.

In a hypothesis test, two hypotheses are studied, the null (Ho) and the alternative hypothesis (Ha). In this way, the researcher divides the sample data between two zones, an acceptance zone and a rejection zone, depending on where the result is, the hypothesis will be accepted or rejected. In other words, there is a critical region where the null hypothesis is rejected and conversely, there is also an acceptance zone where the null hypothesis is accepted.





On the other hand, the hypothesis is simple when the value of the parameter is perfectly specified and it is compound, if it has two or more parameters. In general, the null hypothesis is usually simple and more concrete, while the alternative hypothesis is the one that can be composed.

Depending on the type of contrast required, the assumptions are made:

- Assumptions regarding the data that are intended to be manipulated or about its characteristics, such as the level of measurement used, the independence of the observations, among others.

- Assumptions regarding the starting distribution that can be normal, binomial, etc.

When a researcher violates the assumptions of the model, he can invalidate the probabilistic model and obtain erroneous decisions, therefore, the researcher must know the consequences arising from the violation of these assumptions. So when making the assumptions, it is important that they are not too demanding, to be able to comply with them.

When we consider a hypothesis test of one direction (one tail), it is one-sided and can be established as follows:

Ho: Me = Meo

Ha: Me > Meo

It can also be set as:

Ho: Me = Meo

Ha: Me < Meo

While in the bilateral or two-tailed hypothesis test, it is of the form:

Ho: Me = Meo

Ha: Me Meo

When a test is directional or one-sided, in order to make the decision to reject the null hypothesis we will only require very large or very small values, when comparing them with the test statistic.

When a test is bilateral, to reject the null hypothesis we must have both very large and very small values (both) with respect to the values of the test statistic. The value will determine the level of risk or significance and represents the probability that the contrast statistic is located in the critical or rejection zone.

In directional contrasts, is concentrated at one end of the distribution, while in bilateral hypothesis contrasts, is distributed or divided between both ends of the distribution . It is important to take into account that the unilateral tests are generally better than the bilateral ones and the choice of any of the tests is conditioned by the alternative hypothesis.

When the latter is greater or less than the test statistic, it is said to be one-sided. But if the alternative hypothesis is different from the test statistic, it is considered two-sided.

Parameter estimation

Before getting into the estimation of parameters, we must remember what a point estimate is. A point estimate is when a single value is used to estimate a population parameter, that is, a specific point in the sample is used to estimate the desired value.

If we estimate a parameter in a specific way, we can know for sure what that value is. Suppose we have a population of 30 people in which we select a sample of 20 people whose ages we know. To estimate the mean age in a specific way, it is as simple as adding the 20 data from the sample and dividing it by the total data, in this case it will be 20 data.



However, if we want to estimate their average height from that same sample, unlike age, we simply do not have the measurements of the heights of these people and that is why we will not be able to make a point estimate, not being able to find the value specific to that average height. It is in this case that we must make an interval estimate, in other words, limit the lowest and highest values corresponding to the heights of the people in the sample, with a certain level of confidence or security.



When we want to obtain a point estimate, we use a statistic that we call the decision function or estimator. Some of the most widely used estimators are: the sample mean, which is very useful for estimating the mean of a population, and on the other hand, the sample standard deviation, which, as its name indicates, is very useful as an estimator of the standard deviation of a population.

Estimation of the mean of a certain population

Let's try to explain this point with an example: Suppose we want to estimate the average number of children that women have in a given population. For this, a sample of 20 women were selected who were interviewed and an average of 3.2 children was obtained as a result with a standard deviation of 0.8. We could make a point estimate with these results and come to the conclusion that there are an average of 3.2 children per woman in this population. But this has a drawback and it is that the error that is being executed is unknown.



It would be advisable to assume an estimation interval with a lower limit and an upper limit than that average of 3.2. This is how an estimation interval is assigned to the result which we will call error (E) and if we also establish the probability that it occurs to the values included in this interval, we will have determined a confidence interval when calculating the average of children that the women of our population have.

Generalizing then what was explained above with respect to the "average number of children", it can be said that to estimate the average of a population, a confidence interval must be made consisting of the following elements: the estimation error and the sample average.

By means of the following formula we can obtain the error when constructing an interval for the average:

Where (S) is the standard deviation of the sample, n is the sample size and t is a value that is searched in the Student t table with two values: and the degrees of freedom that are calculated with (n - 1) = (20 - 1) = 19. If we establish a 95% confidence, this implies that = 0.05 and therefore = 0.025, already having both data we go to the table:

r \ α	0,25	0,2	0,15	0,1	0,05	0,025	0,01	0,005	0,0005
1	1,000	1,376	1,963	3,078	6,314	12,706	31,821	63,656	636,578
2	0,816	1,061	1,386	1,886	2,920	4,303	6,965	9,925	31,600
3	0,765	0,978	1,250	1,638	2,353	3,182	4,541	5,841	12,924
4	0,741	0,941	1,190	1,533	2,132	2,776	3,747	4,604	8,610
5	0,727	0,920	1,156	1,476	2,015	2,571	3,365	4,032	6,869
6	0,718	0,906	1,134	1,440	1,943	2,447	3,143	3,707	5,959
7	0,711	0,896	1,119	1,415	1,895	2,365	2,998	3,499	5,408
8	0,706	0,889	1,108	1,397	1,860	2,306	2,896	3,355	5,041
9	0,703	0,883	1,100	1,383	1,833	2,262	2,821	3,250	4,781
10	0,700	0,879	1,093	1,372	1,812	2,228	2,764	3,169	4,587
11	0,697	0,876	1,088	1,363	1,796	2,201	2,718	3,106	4,437
12	0,695	0,873	1,083	1,356	1,782	2,179	2,681	3,055	4,318
13	0,694	0,870	1,079	1,350	1,771	2,160	2,650	3,012	4,221
14	0,692	0,868	1,076	1,345	1,761	2,145	2,624	2,977	4,140
15	0,691	0,866	1,074	1,341	1,753	2,131	2,602	2,947	4,073
16	0,690	0,865	1,071	1,337	1,746	2,120	2,583	2,921	4,015
17	0,689	0,863	1,069	1,333	1,740	2,110	2,567	2,898	3,965
18	0,688	0,862	1,067	1,330	1,734	2,101	2,552	2,878	3,922
19	0,688	0,861	1,066	1,328	1,729	2,093	2,539	2,861	3,883
20	0,687	0,860	1,064	1,325	1,725	2,086	2,528	2,845	3,850

The value obtained in the table is: t = 2.093

The sample size is n = 20

The standard deviation is S = 0.8

Substituting the values in the formula we will obtain that the error is:

E = t x = 2.093 * = 0.37

Now we are going to construct the estimation interval and for this it will be necessary to add and subtract the error from the average, as we already know the average is 3.2 so that the lower limit will be equal to: 3.2 - 0.7 = 2.83, while the limit higher will be: 3.2 + 0.37 = 3.57

This is how an interval of (2.83, 3.57) is obtained and thus it can be concluded that with 95% confidence, the average number of children in women in our population is between 2.83 and 3.57.

Examples of point estimates

To obtain a point estimate, a statistic is used that is called an estimator or decision function.

The study of populations is determined by a probability function that establishes the random behavior of our variable of interest. In most cases we can know the distribution of the population, but it may be that we do not know the variance in the mean of that population. We can know that our variable of interest is binomial, but we do not know what the probability of population success is. Perhaps in other cases we can know that it is governed by a Poisson process, but that we do not know the number of rare events that exist per interval.

Of course, in all these circumstances the probability function that determines the variable under study is specified by knowing the population parameters and for this it will be necessary to use the so-called parameter estimation methods. Estimating one or several unknown parameters of the population is only possible if we construct probability functions of the random variables or commonly called sample estimators.

These estimators guarantee us an approximation of the population parameter that we do not know. But it is important that they comply with some properties such as: They must have a minimum variance in the data concentrated around the estimated parameter, a maximum of symmetry or unbiasedness and a maximum probability.

Estimator features:

Unbiased estimate: when we have a large number of samples and we obtain the estimator for each of them, the ideal would be for the mean of these estimates to coincide with the value of . When an estimator is said to be unbiased, it is because its mathematical expectation coincides with the parameter to be estimated.

Efficient estimator: An estimator is said to be efficient when it generates a distribution with the smallest standard error. In other words, between 2 unbiased estimators of certain parameters, the one with the lowest variance will be more efficient.

Consistent estimator: An estimator is said to be consistent the moment its value tends towards the true value of the parameter, while the sample size increases. Therefore, the probability tends to 1 as the estimate is the true value of the parameter.

Sufficient estimator: When an estimator is able to extract all the important information from the data regarding the parameter, it is said to be a sufficient estimator.

The density function as a dependency of the parameters

The object of our study is a random variable x whose distribution depends on a parameter and from now on we will use a generic notation to refer to the density function as we will express it below: f (x,)

As we can see, the previous function has two arguments x and . On the one hand, the argument x goes through the values of the variable, while the second argument will go through the possible values of the parameter and corresponds to the density function. We will call the set of values of interest space of parameters R and it is an interval of the real line, as well as it could be a countable or finite set.

It is important to note that we will only be interested in the values of x where

f (x,) > 0

Estimation methods:

Maximum likelihood estimate

This maximum likelihood estimation model is used to estimate the parameters that depend on the observations of the sample, in a probability distribution.

The maximum likelihood estimation takes care of the parameters of the density functions, to maximize them. Suppose we have a sample X = (X1,... Xn) and we have the parameters = (1,..., n), the maximum likelihood function is denoted by the letter L and is defined as:

L

It is important to note that this symbol means that it is a productive and is treated in a similar way to the summation for sums, only that in this case it represents the multiplication of each and every one of the density functions, which in turn depend of the parameters and observations of the sample.

The larger the value of the maximum likelihood function, the more likely the sample-based parameters are.

To simplify the calculations, the natural logarithm function of the maximum likelihood estimate should be used, since the properties of logarithms help greatly in its calculation.

$$LnL(\theta|x)=\sum_{i=1}^{n} lnf\,(x_i¿,\theta)¿$$

By properties of logarithms, the multiplications of the values of the density function become the sum of their natural logarithms and that is why we can change to the summation symbol. This process is called monotonic transformation through logarithms and what you do is simply change the scale to smaller numbers. Furthermore, the estimated value

of the parameter capable of maximizing the probability of the maximum likelihood function with logarithms is perfectly equivalent to the estimated value of the parameter to maximize the probability based on the original maximum likelihood.

That is why we will always work with the monotonous modification, since this way the calculations are facilitated.

Once we calculate the natural or natural logarithm, we must derive the result and set it equal to zero, remember that this is the mathematical way to find the maximum or minimum of a function.

= 0

Once we have derived the function, we will have to solve for and this will be my maximum likelihood parameter.

Let's go with an illustrative example:

Suppose we have a probability function with a Poisson distribution. This function has a maximum point that is given by the average. The first thing we must do is determine the Poisson function that is given by the formula:

f(x) =

Being the parameter, so = and if we use the maximum likelihood formula we have:

L

There is a property for the productory that states that:

=

So if we take as a constant since it does not depend on the changing value (i) we can say that the first element of the function remains as: = .

While = this last term rises to the summation since it is a multiplication of powers of equal base, where the same base is left and the exponents are added, the exponents being the sum of and the factorial term found in the denominator will be replaced by ! and when we put all the elements together, we have that this term would be:

L(

We add the natural logarithm to both sides of the equation so that it does not change and we have to:

Ln L(Ln

By properties of logarithms, the logarithm of a multiplication is the sum of the logarithms and the logarithm of the division is the subtraction of the logarithms, therefore it does not remain that:

Ln L(Ln + Ln – Ln

By properties of logarithms, the exponents can be placed by multiplying the logarithm and the product of a logarithm becomes a summation

Ln L(-n + Ln +

When I apply the logarithm to a function, it preserves the maximums so that the maximum of the function L() that will be reached in a certain and the logarithm of that function LnL() is also reached in the same . So the derivative set to zero of the logarithmic function to find the maximum probability value will be equal if we express it:

= 0

The derivative of Lne = 1 and the derivative of = 1 so the derivative of the first term will be simply (-n) and the derivative of Ln = and the derivative of the last term is zero (0) because if we realize it does not have and therefore it is assumed as a constant.

+

I equal the term to zero and I clear

+

= n

=

This value being the average of all the data and the maximum likelihood value of the problem.

The estimators provided by the maximum likelihood method are better than those obtained.

This value being the average of all the data and the maximum likelihood value of the problem.

The estimators provided by the maximum likelihood method are better than those obtained through many other methods, due to their asymptotically unbiased properties and the maximum disadvantage of this method is that the density function must be known (which is not always known) .

As we understand that the method can be a bit complicated, we are going to perform another exercise

Suppose we have a function: f(x) =

The idea is to try to find an estimator of this function using the maximum likelihood method and we are going to vary the way we do the calculations a bit, to see if we get to a better understanding.

L(

L(* *… *

We can realize that each term that is multiplied repeats (and if we extract it and multiply it n times (one for each term) we have:

On the other hand, if we group: (

=

We need to group: …*

We can realize that each "x" is different from the other, but if they share the same base, so if we apply multiplication of powers of equal base, we leave the same base and add the exponents, therefore the result of grouping this part of the function we are left as:

By joining each of the groupings and compacting them in the maximum likelihood function, we obtain that:

L(

Since this expression is so difficult to derive, it is necessary to apply the natural logarithm to simplify the calculations.

Ln L(Ln

Applying properties of logarithms we have:

Ln + Ln + Ln

Ln L(n Ln 3Ln + Ln e

It should be noted that Lne = 1 and as LnL() = l() to simplify since the logarithmic function has the same maximum value, we have:

n(Ln1 – Ln

Now we must derive this expression and set it equal to zero to extract the maximum value of

But we will derive term by term to better understand the result, then the first term would remain as: -n.Ln2 since Ln1 = 0 and its derivative is a multiplication of two elements –n.Ln2 and by properties of derivatives, the derivative of a multiplication is the derivative of the first element (-n) by the second without derivation, plus the derivative of the second element (Ln2 ^ 3) by the first without derivation. However, the first term does not contain and is therefore

zero (0). While the derivative of (Ln2 is multiplied by its internal derivative that is , but we must multiply this second element by the first without derivative that is –n, recapitulating we have that the derivative of first term is: -n = =

The derivative of the second term is zero since this term lacks and then it is assumed as a constant and for the third term, we must apply the properties of the derivative of a division. Recall that the derivative of a quotient is: The derivative of the numerator () which since it does not depend on () is zero (0) multiplied by the denominator () = 0. without deriving and the derivative of the denominator which is (1) is subtracted by the numerator without deriving , divided by the denominator without deriving squared .

Returning to all the above, the derivative of the third term would be as:

=

The expression of the derivative in total would be:

=+

If we set this derivative equal to zero and solve for

+

CHAPTER

FORTYNINE

PARAMETRIC METHODS TO COMPARE TWO MEANS

In many clinical trials, including most studies, it is necessary to compare characteristics of two or more groups of individuals. Such would be the case when we think that a certain treatment can achieve greater improvement than another treatment that is on the market or simply when it comes to considering whether or not children from different autonomous communities could have the same height or not. In this text we will analyze the comparison of two groups when we have a continuous variable, in addition to choosing an appropriate analysis method for each case, which will depend on the way in which they have been obtained and on the very nature of these data.

Generally, when 2 or more groups are compared there are two types of design. The first refers to two groups of individuals that are independent and in the second case, it is the one where data are collected for the same individuals but under different conditions. Depending on the case in which we find ourselves, the type of methodology will be different and another aspect to consider will be the probabilistic distribution and the type of data.

Parametric methods for independent groups require that the distribution of each group be approximately normal or of a similar variability, if the available data do not have such conditions, they can be transformed by applying logarithms, square root, etc. or resort to non-parametric methods.

Starting from a starting hypothesis that we call the null hypothesis, which generally, as its name indicates, assumes the null effect of interest. For example, it can be assumed that the blood pressure in men and women is the same or that two treatments used for hypercholesterolemia are equally effective. Subsequently and according to the analysis of the observed data, the probability of whether this hypothesis is correct or not can be evaluated. Each statistical test provides us with the possibility of knowing if the value of this probability agrees with the p-value, so that the lower this value, the more unlikely it is to verify the initial hypothesis.

We are going to present the Student's t test used for two independent samples, but if the variability of the two groups is different, the necessary modifications will have to be made.

Student's t distribution

At the beginning of the 20th century, William Sealy Gosset applied his knowledge of statistics to improve and control the quality of both Guinness beer and farm-grown malt. However, Gosset was subject to errors with respect to his estimates, since he worked with small samples and sometimes ran into extreme values in his samples.



Gosset was a friend of Pearson, who decided to help him with the construction of a new probability distribution, which is known today as the Student's t-distribution.

At present, this distribution is one of the best known in statistical inference for small samples and is generally used to contrast the sample mean with the population mean, but also for the comparison between two means.

This distribution is quite similar to a standard normal distribution, unlike the latter, which is determined by its mean and its variance, the Student's t distribution adds the degrees of freedom, these being equivalent to n-1, where n is the sample size.

As well as the normal distribution, the Student's t distribution is also symmetric and flared, however it has somewhat heavier tails than those presented in the Gaussian curve. This implies that the data have a greater dispersion and therefore the estimates are somewhat less precise, while the confidence intervals are slightly wider than those obtained in a normal distribution.

It is important to take into account that the differences between both distributions will disappear as the sample size increases, that is, an approximation can be made to a normal distribution when n is large and with a minimum degree of error. This is because the characteristics of the tails will depend on the degrees of freedom that the distribution has and they are lighter, when the number of degrees of freedom increases, therefore, when the sample size is increased, the degrees of freedom.

In other words, and expressing it in a more technical way, it can be said that as the sample size decreases and therefore also its degrees of freedom, the cumulative probability increases in the tails and vice versa. Suppose we have a Studen t distribution whose degrees of freedom are greater than 30, this implies that it is practically not distinguishable from a normal distribution that has the same variance and the same mean.

The Student's t distribution and its utility

As we mentioned earlier, Pearson was the one who helped Gosset with the tabulation of the distribution and also published the article in his journal called Biometrika. However Pearson did not realize at the time the importance

of Gosset's discovery. The good news is that another of his friends, Ronal Fisher (also well known within the field of statistics) was able to realize how revolutionary his method was. Even Fisher was the person who introduced the degrees of freedom that are so important in this distribution, since they allow adjusting the deviation of the estimates that are produced as a consequence of a small sample size, of course, all this in exchange for less precision and over all with those samples of smaller size.

This is what makes it possible to estimate the population mean in a random variable whose distribution is normal through the Student's t distribution, being the parameter extracted from a small sample and its population variance is also unknown.

On the other hand, when there is equality between the variances (homoscedasticity) of two groups that are contrasted, it is when a hypothesis test between their two means is used and its random variable has a normal distribution.

49.1 Comparison between two independent means

In general, it is usually contrasted if there is a significant difference between the mean of two different and independent populations and for this, the usual thing is for two independent samples to use the Student's t test.

This test is used to compare the means of a certain quantitative and continuous variable obtained for two categories determined by a qualitative variable and is based on the calculation of a statistic, which takes into account the difference between the means to be compared, in addition to their standard error and for this, the following formula is used:

$$t = \frac{|\overline{X1} - \overline{X2}|}{\sqrt{\frac{S1^2}{n1} + \frac{S2^2}{n2}}}$$

Where and (S1)2 are the mean and variance of the first sample and in the same way, and (S2)2 are the mean and variance of the second sample. The assumption of the null hypothesis is that both means are equal, so the value of t will also be equal to zero (0). It is important to emphasize that the further away t is from this value, the less likely it is that both equal means are due to chance.

The conditions that are required to be able to apply this test are the following:

1.- Both groups must be independent and this implies that each individual must belong to only one of the two groups and that in addition, it has no relationship with the individuals of the other group.

2.- The variable to be considered must be continuous and have a normal distribution in both groups.

3.- The homoscedasticity assumption must be fulfilled, that is, the variance must be the same in the two groups.

To verify if the distribution of the variable is normal in both groups, the Shapiro Wilk test can be performed for when the samples are small (less than 50). For large samples, it is best to use the Kolmogorov Smirnof test and in case of having a large sample and not knowing both the standard deviation and the population mean, it is advisable to use this same test but with the modification of Lilliefors.

On the other hand, both normality tests have the disadvantage of assuming a null hypothesis of normality. This implies that when the result is significant, the null hypothesis can be discarded and the conclusion reached that the variable simply does not have a normal distribution. But for non-significant results, this does not allow us to precisely assert the normality of the alternative hypothesis, that is, it only indicates that we cannot reject the null hypothesis.

It is important to emphasize that both tests are not very powerful for small sample sizes and, furthermore, the Student t assumption is more sensitive in the absence of normality. That is why it is advisable to complete the contrast test with some graphic method, such as the theoretical quantile graph or through a histogram.

If we are faced with the situation of not having a normal distribution, we are presented with three possibilities. The first is to test hypotheses by means of a non-parametric test. The second possibility is to try some transformation and

check if the transformed variable is distributed in a normal way and finally, a Student's t test can be performed even if the normality condition is not met, but it will be necessary to apply a correction and it is important to take into account This third option will only be recommended when there are slight deviations from normality and also when the sample size is large (between 30 and 50 individuals per group).

Once we have verified normality, it will be necessary to determine if the two variances are equal and if they fulfill the homoscedasticity assumption. In which case it will be necessary to calculate Snedecor's F and the quotient of the two variances, where the numerator will be made up of the largest variance of both groups and, of course, the smallest of the two will occupy the denominator. Being n the size of each group and the degrees of freedom will be n - 1.

Under the assumption of equality of variances the value of F will be equal to 1 and as the value of F is greater, the probability that the difference between the variances is caused by chance will be less.

It is important to take into account that the Snedecor F test is highly sensitive to the lack of normality and it is in these cases, when it is advisable to use the Levene test.

Once we have verified both the equality of variance and its normal distribution, we will then proceed to use the Student's t-test to carry out the contrast and, given the case that homoscedasticity does not exist, we will have to apply Welch's correction.

49.2 Steps to apply the Student's t test for independent groups of the same size:

The first thing to be clear about is when two groups are independent, they are those whose characteristics are well differentiated, for example: the groups of men and women when measuring blood pressure or two independent groups can also be married people and single people, among others.



The other important thing to take into account is that this test can only contrast the means of two groups at a time, where each group has less than 30 individuals.

Once we have identified two clearly independent groups, we are going to start with the first step, which is to establish the null hypothesis and the alternative hypothesis. Where it is determined in the null hypothesis that the means of both groups are equal, while the alternative hypothesis indicates that both means are different.

$$Ho= \overline{X1} = \overline{X2}$$

$$Ha= \overline{X1} \neq \overline{X2}$$

Step 2: The samples are taken from each of the groups and placed in a table, but in addition two more columns must be added (one for each group) and in these columns, the values of each measurement are calculated squared and the sums for each column. This will later facilitate the calculations of the formulas to be used.

Step 3: I calculate the average or the mean of each of my groups, as we have already seen before, the average is calculated by adding each of the data per column of each group and dividing it by the number of data.

Step 4: The standard deviation of each of the groups must be calculated and for this it will be necessary to use the following formulas:

$$S1= \sqrt{\frac{\sum X1^2}{n} - \overline{X1}^2}$$

$$S2= \sqrt{\frac{\sum X2^2}{n} - \overline{X2}^2}$$

Step 5: Calculate the standard error of each of my samples and for this, it will be necessary to use the following formulas:

$$\sigma_{X1} = \frac{S1}{\sqrt{n-1}}$$

$$\sigma_{X2} = \frac{S2}{\sqrt{n-1}}$$

Step 6: Now I must calculate the standard error of the difference and to obtain it I will have to use the following formula:

$$\sigma dif = \sqrt{\sigma_{X1}^2 + \sigma_{X2}^2}$$

Step 7: We already have all the elements to use the Student's t method, so we are going to calculate all the steps and substitute the results of the formulas obtained in the subsequent equations and finally, we must use the following formula:

$$t = \frac{|\overline{X1} - \overline{X2}|}{\sigma dif}$$

Step 8 = Once we have the value of t, what we must do is contrast with the tables of critical values of Student's t for independent groups, but to enter tables we will need the degrees of freedom and for this, it will be necessary to apply the following formula:

DF = n1 + n2 - 2

Step 9: When we already have the critical value located in the tables, I simply have to follow the rule for decision making which is: Yes and only if the calculated t is greater than or equal to the t obtained in tables, then I can reject the hypothesis null and this implies that I have significant differences.

Let's take an illuminating example: A social researcher wants to know if when a person makes an anonymous donation to a certain charitable foundation or knowing for sure the person who makes the donation, it will influence the amount of money donated.

Following the previously established steps, we must determine that the null hypothesis tells us that there will be no statistically significant differences between the donations made by people who want to remain anonymous and those who allow their name to be made public, that is:

$$Ho = \overline{X1} = \overline{X2}$$

While the alternative hypothesis will determine the opposite, therefore it is established that both types of donors do present significant differences:

$$Ha = \overline{X1} \neq \overline{X2}$$

To contrast both hypotheses, the researcher focused on 12 donors, of which 6 were people who wanted to remain anonymous and the other 6 allowed their names to be made public.



Each of the results refers to the number of times that a certain amount was donated, that is, if the result is 1, this implies that the person donated that amount only once, while if the result is 5, this would indicate us that the person in question donated 5 times the pre-established amount of money. We are going to show the results:

Donor	Anonymous (X1)	$(X1)^2$	Known (X2)	$(X2)^2$
1	1	1	3	9
2	2	4	5	25
3	1	1	5	25
4	1	1	5	25
5	2	4	4	16
6	1	1	5	25
$\sum column$	8	12	27	125
$\bar{X}$	8 / 6 = 1.33		27 / 6 = 4.5	

The data collected by the researcher are those found in the columns “Anonymous” and “Known”, the columns were added (X1)2,(X2)2,a summation row and another that includes the mean of each group, to facilitate the calculations of the formulas.

Now I calculate the standard deviation of each of my groups:

$$S1= \sqrt{\frac{\sum X1^2}{n} - \overline{X1^2}} = \sqrt{\frac{12}{6} - (1.33)^2} = \sqrt{0.23} = 0.48$$

$$S2= \sqrt{\frac{\sum X2^2}{n} - \overline{X2^2}} = \sqrt{\frac{125}{6} - (4.5)^2} = \sqrt{0.58} = 0.76$$

The next step is to calculate the standard error of each of my samples:

$$\sigma_{X1} = \frac{S1}{\sqrt{n-1}} = \frac{0.48}{\sqrt{6-1}} = 0.21$$

$$\sigma_{X2} = \frac{S2}{\sqrt{n-1}} = \frac{0.76}{\sqrt{6-1}} = 0.34$$

Now I must calculate the standard error of the difference:

$$\sigma dif = \sqrt{\sigma_{X1}^2 + \sigma_{X2}^2} = \sqrt{(0.21)^2 + (0.34)^2} = \sqrt{0.04 + 0.12} = \sqrt{0.16} = 0.4$$

We can now calculate Student's t:

$$t = \frac{|\overline{X1} - \overline{X2}|}{\sigma dif} = \frac{|1.33 - 4.5|}{0.4} = \frac{|-3.17|}{0.4} = |-7.93| = 7.93$$

I must look in tables for the critical value of t, to be able to contrast it with the value of t that I have just calculated, for this it will be necessary to calculate the degrees of freedom:

DF = n1 + n2 - 2 = 6 + 6 - 2 = 10

From the way the hypotheses are raised, we can deduce that it is a two-tailed problem and therefore, we must use the value of / 2 = 0.05 / 2 = 0.025 to enter tables

0 t

	área a la derecha de *t*							
	0,0005	0,0025	0,005	0,0075	0,01	0,015	0,02	0,025
g.d.l								
1	636,619	127,321	63,657	42,433	31,821	21,205	15,895	12,706
2	31,599	14,089	9,925	8,073	6,965	5,643	4,849	4,303
3	12,924	7,453	5,841	5,047	4,541	3,896	3,482	3,182
4	8,610	5,598	4,604	4,088	3,747	3,298	2,999	2,776
5	6,869	4,773	4,032	3,634	3,365	3,003	2,757	2,571
6	5,959	4,317	3,707	3,372	3,143	2,829	2,612	2,447
7	5,408	4,029	3,499	3,203	2,998	2,715	2,517	2,365
8	5,041	3,833	3,355	3,085	2,896	2,634	2,449	2,306
9	4,781	3,690	3,250	2,998	2,821	2,574	2,398	2,262
10	4,587	3,581	3,169	2,932	2,764	2,527	2,359	2,228
11	4,437	3,497	3,106	2,879	2,718	2,491	2,328	2,201
12	4,318	3,428	3,055	2,836	2,681	2,461	2,303	2,179
13	4,221	3,372	3,012	2,801	2,650	2,436	2,282	2,160
14	4,140	3,326	2,977	2,771	2,624	2,415	2,264	2,145
15	4,073	3,286	2,947	2,746	2,602	2,397	2,249	2,131

The value given by the t Student table is: 2.228 and I use this value for my statistical decision making, let us remember that if the t cal t critical, the null hypothesis must be rejected and we can observe that this is precisely what it happens since:

7.93 2.228

So we can conclude that by rejecting the null hypothesis, we must assume the alternative hypothesis where it is established that there are significant differences, in terms of donation means, between people who want to remain anonymous and those who prefer to have their name come to light public.

49.3 Student's t test for independent samples of different sizes

For independent samples of different sizes, all the previous procedures are followed up to step 5 (inclusive), only that in this case the standard error of the difference is calculated with another formula and also, it will not be necessary to calculate the standard error of each separately. one of my samples, but we skip this step and directly apply the following formula:

$$\sigma_{dif=}\sqrt{\left(\frac{n1S1^2+n2S2^2}{n1+n2-2}\right)\left(\frac{1}{n1}+\frac{1}{n2}\right)}$$

The rest of the steps are the same as those carried out in the previous exercise.

We are going to carry out an example for this type of case: A social researcher wants to know if there are significant differences between the probability of having an unwanted pregnancy in two different groups, which are university students of psychology and students of medicine.



To do this, the researcher surveyed several students from both majors and raised his hypothesis. The null hypothesis is determined as that there are no differences between the probability of having an unwanted pregnancy between the two groups of students, while its alternative or research hypothesis determines the opposite, that is, there will indeed be significant differences in the unwanted pregnancies among students in both groups.

$$Ho = \overline{X1} = \overline{X2}$$

$$Ha = \overline{X1} \neq \overline{X2}$$

After conducting the surveys, the researcher obtained the following results:

Student	Medicine (X1)	$(X1)^2$	Psychology (X2)	$(X2)^2$
1	1	1	4	16
2	2	4	1	1
3	1	1	1	1
4	3	9	1	1
5	$\sum X1 = 7$	$\sum X1^2 = 15$	2	4
6			2	4
7			1	1
			$\sum X2 = 12$	$\sum X2^2 = 28$

The next step is to calculate the means of each of the groups:

$$\overline{X1} = \frac{\sum X1}{n1} = \frac{7}{4} = 1.75$$

$$\overline{X2} = \frac{\sum X2}{n2} = \frac{12}{7} = 1.71$$

Now we must calculate the variance of each of my groups:

$$S1^2 = \frac{\sum X1^2}{n1} - \overline{X1}^2 = \frac{15}{4} - (1.75)^2 = 0.6875$$

$$S2^2 = \frac{\sum X2^2}{n2} - \overline{X2}^2 = \frac{28}{7} - (1.71)^2 = 1.0759$$

The next thing we need to do is calculate the standard error of the difference:

$$\sigma_{dif} = \sqrt{\left(\frac{n1S1^2 + n2S2^2}{n1+n2-2}\right)\left(\frac{1}{n1} + \frac{1}{n2}\right)} = \sqrt{\frac{(4)(0.6875)+(7)(1.0759)}{4+7-2}} = \sqrt{0.45} = 0.67$$

We already have all the elements to be able to calculate the Student's t, applying the same formula as for the previous case:

$$tcal = \frac{|\overline{X1} - \overline{X2}|}{\sigma dif} = \frac{|1.75 - 1.71|}{0.67} = 0.06$$

To reject the null hypothesis according to the decision rule, the Student's t that we have just calculated must be greater than or equal to the critical t obtained in tables and for this it will be necessary to calculate the degrees of freedom:

DF = n1 + n2 - 2 = 4 + 7 - 2 = 9

Again we are in the presence of a two-tailed process and therefore the tables must be entered with the value of /2 = 0.025 and the newly calculated degrees of freedom.

	área a la derecha de *t*								
	0,0005	0,0025	0,005	0,0075	0,01	0,015	0,02	0,025	0,05
g.d.l									
1	636,619	127,321	63,657	42,433	31,821	21,205	15,895	12,706	6,314
2	31,599	14,089	9,925	8,073	6,965	5,643	4,849	4,303	2,920
3	12,924	7,453	5,841	5,047	4,541	3,896	3,482	3,182	2,353
4	8,610	5,598	4,604	4,088	3,747	3,298	2,999	2,776	2,132
5	6,869	4,773	4,032	3,634	3,365	3,003	2,757	2,571	2,015
6	5,959	4,317	3,707	3,372	3,143	2,829	2,612	2,447	1,943
7	5,408	4,029	3,499	3,203	2,998	2,715	2,517	2,365	1,895
8	5,041	3,833	3,355	3,085	2,896	2,634	2,449	2,306	1,860
9	4,781	3,690	3,250	2,998	2,821	2,574	2,398	2,262	1,833
10	4,587	3,581	3,169	2,932	2,764	2,527	2,359	2,228	1,812

As we can see, the critical Student's t gives us a value of: 2.262 and when we buy it with the t cal, we realize that tcal is less than the critical t since:

0.06 < 2.262

This tells us that the condition to reject the null hypothesis is not fulfilled, so we must accept it and this means then, that there are no significant differences between the probability of having an unwanted pregnancy between medical students and psychology students.

49.4 Student's t test for two dependent samples

As we commented previously, it is important to differentiate the cases when the samples are independent or for those cases, whose data are paired. In this type of case, dependent groups generally emerge when the same data is studied twice for each subject in the sample. These types of observations can be found, in those circumstances where each case will be treated individually, with some type of control.

This means that the study will be carried out for a single group, but evaluated at two different moments and that between both moments, the group has received some type of intervention capable of changing the data. For example, the before and after the application of a salary increase to check the performance of a group or perhaps, measure the benefits of a certain drug applied to a group of patients and for this it will be necessary to obtain the before and after measurements after treatment through random sampling.

For this case, we are going to work directly with an example and for the rest of the cases, simply repeat the steps carried out on the sample that we will propose below: A researcher wants to know if there are differences in the levels of aggressive behavior of a group of six children, before and after watching a television program. To test his theory, the researcher takes a series of measurements capable of measuring aggressiveness before and after watching the program in question.



The researcher obtained the following measurements where 1 represents a low aggressive level and 6 represents a very aggressive behavior:

Kid	Before (X1)	After (X2)	D=(X1) – (X2)	D^2
1	2	5	-3	3
2	1	6	-5	25
3	3	5	-2	4
4	3	3	0	0
5	1	4	-3	9
6	4	4	0	0
$\sum groups$	14	27		47
$\bar{X}$	14/6 = 2.33	27/6= 4.5		

It is important to take into account that the measurements are in the first columns, but for the purpose of facilitating the calculations, two columns were added. The first, with the difference in the values between before and after, which we will call "D", and the second, with those same values squared. We will also add a row with the sum of each column and a last row, with the means of each of my groups.

The next step is to calculate the standard deviation of my sample and we are going to do it using the following formula:

$$S = \sqrt{\frac{\sum D^2}{n} - (\overline{X1} + \overline{X2})^2} = \sqrt{\frac{47}{6} - (2.33 + 4.5)^2} = \sqrt{3.1244} = 1.7676$$

Now I must calculate the standard error of the difference and for this it will be necessary to use the formula:

$$\sigma_{dif} = \frac{S}{\sqrt{n-1}} = \frac{1.7676}{\sqrt{6-1}} = \frac{1.7676}{\sqrt{5}} = \frac{1.7676}{2.23} = 0.7926$$

Con estos valores ya puedo pasar a calcular mi t de Student para grupos relacionados o dependientes y lo único que necesito, es sustituir los valores en la siguiente fórmula:

$$\text{t cal} = \frac{|\overline{X1} - \overline{X2}|}{\sigma_{dif}} = \frac{|2.33 - 4.5|}{0.7926} = |-2.77| = 2.77$$

Será necesario ahora contrastar con el valor crítico que aparece en las tablas y nuevamente, vamos a necesitar calcular los grados de libertad. Para ello será necesario utilizar la siguiente fórmula:

DF = n1 + n2 – 2

Siendo n1 la cantidad de personas a las que se le hicieron las mediciones en el primer grupo y n2, la cantidad de personas a las que se le hicieron las mediciones en el grupo dos. Como podemos observar, el grupo es el mismo sólo que en dos momentos diferentes, pero para efectos de la fórmula se deben considerar el número de personas dos veces, es decir:

DF = 6 + 6 – 2 = 10

Así como en los ejercicios anteriores, vamos a buscar el valor crítico de la t de Student para compararlo con la t que acabamos de calcular y de la misma manera, rechazaremos la hipótesis nula en el caso que:

tcal t cri

Así que nos dirigimos a las tablas sabiendo que es una prueba de dos colas y que por tanto, entraremos en ellas con el valor de los grados de libertad (10) y un /2 = 0.025 Podemos observar que el valor obtenido es de: 2.228 y efectivamente nos podemos dar cuenta que el t cal es mayor que el t crítico obtenido en las tablas, ya que:

2.77 > 2.228

Por tanto, debemos rechazar la hipótesis nula y esto implica que existen diferencias significativas en el comportamiento agresivo de un grupo de infantes, antes y después de ver cierto programa de televisión.

49.5 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

FIFTY

POINT ESTIMATION METHODS

In the previous article we could see how the estimators support through the maximum likelihood method. But now we are going to study another method to obtain point estimators and it is the moment method.

50.1 Moment Method

The idea of this method is to match the population characteristics with the corresponding sample characteristics. Suppose we have a random variable x that has a point probability function for the discrete case p(x) or for the continuous case f(x) with a density function. We will call the moment of order k or population moment E(x^k), if the hopes exist.

When studying the moment-generating function for a random variable. We can see that the moments are related to the parameters that are part of an associated distribution.

Suppose a random sample of order k: x1, x2,..., xn, the sample moment is:

`(_(i=1)^nx_i^k )/n`

Given a random sample x1, x2, x3,..., xn from a distribution whose point probability function or perhaps its density function depends on m number of parameters 1, 2,..., m and the moment estimators are obtained by equating the moments populations with their corresponding sample moments, that is, for this it will be necessary to solve the following system of equations:

`E(x^k)= (_(i=1)^nx_i^k )/n`

On the left side of the equation we have the population moments and they are equal to the right side of the equation, where we will have the sample moments.

If we have a single parameter, we only have to find the first population moment and we will have a single equation:

`E(x) = 1/n _(i=1)^nx_i`

But given the case that we have two parameters, we must solve the system of equations between the first population moment and the second population moment:

1st population moment: `E(x) = 1/n _(i=1)^nx_i`

2nd population moment: `E(x^2)= 1/n _(i=1)^nx_i^2`

Therefore, as many moments are equal as parameters it finds to estimate. It is important to take into account that the sample moments only depend on the random sample, while the population moments will most likely appear in the parameters that we want to estimate, that is, it is from there that we will obtain the equations to clear the parameters that we require estimate.

We are going to find the left side of the equation by calculating the mathematical expectation and in this way we will obtain an equation that contains the parameter to be able to solve it.

50.2 Mathematical hope

When we have a random variable X, the mean value that represents this variable is what we call the mathematical expectation or expected value.

This expected value is obtained by adding the probabilities of a random event, multiplied by the value of that random event. In other words, it is the mean value of a certain data set or the mean value that an event has occurred. When we talk about discrete distributions, we refer to those that have the same probability for each event and in this case the mean will be equal to the mathematical expectation.

50.3 Example of mathematical expectation

Let's go with an example to find the mathematical expectation of an event: suppose that we throw a six-sided die and the random variable is defined by x squared of the result that the die shows when it falls. What would be the mathematical expectation of x?

Since x is the square of the result, the values that the random variable will take are: 1, 4, 9, 16, 25 and 36. On the other hand, what is the probability that any of the heads will fall? Each head has a 1/6 chance.

According to the mathematical expectation formula, we must carry out the summation of the multiplication of the values that x takes multiplied by its probability, that is:

```
E(x) = x.P(x) = 1. 1/6 + 4. 1/6 + 9. 1/6 + 16. 1/6 + 25. 1/6 + 36. 1/6
```

```
E(x) = 91/6  15.17
```

This value being the mathematical expectation of the event

Example 2 to find the mathematical expectation:

Suppose we have a discrete random variable whose probability distribution is given by:

```
P(x) = {(kx x=1,2,3,4 y 5@ k(10-x) x=6,7,8,9)
```

Find the value of the constant k

To find the probability of the values of between 1 and 5, we simply need to multiply them by k. But for the values of x that are between 6 and 9 (both inclusive) we must apply the formula k (10 – x) so:

In order to find the constant k we must take into account that the sum of the probabilities is always equal to unity:

```
P(x)=1
```

```
1k + 2k + 3k + 4k + 5k + 4k + 3k + 2k + 1k = 1
```

```
25k = 1
```

```
k = 1/25
```

Once the value of k is known, we can find the mathematical expectation

```
E(x) = x.P(x)  = 1. 1/25 + 2. 2/25 + 3. 3/25 + 4. 4/25 + 5. 5/25 + 6. 4/25 + 7. 3/25 + 8.
2/25 + 9. 1/25
```

```
E(x) = 5
```

Once we know how to calculate the mathematical expectation, we can carry out a population moment exercise.

50.4 Exercise 1 Of Moments

Let x be a random variable with a probability density function that is given by:

f(x) = {(x^(-1),0<x<1@0, the others x)

Where this function depends on a parameter , which in principle is unknown and with the density function I am going to calculate its expected value, but in this case, we will have to integrate in order to find it since it is a continuous function.

E(x) = _0^1x. x^(-1) dx = /(+1)

It is only integrated in the interval from 0 to 1, since otherwise, it takes the value of zero (0).

Once we have the expected value, I will choose a random sample from my population: X1, X2,. . . , Xn and to find the mean of the sample I use the formula that we put on the right side of our moment equation, that is:

X = 1/n _(i=1)^nXi

It is important to take into account that a circumflex is placed on because it is already being considered as an estimator, now it only remains to clear

 = X /(1- X)

We now go with a second example of the method of moments with two parameters: suppose that we have a random variable whose distribution is normal N (,) where is the mean and has a standard direction . As we already know, the expected value for the first moment is the mean and therefore:

E (x) =

While the second population moment will be equal to the variance plus the mean, both squared, that is:

E (X^2)= ^2+ ^2

Equating the first moment with the sample average and the second moment with the second sample moment we have:

= X (1)

^2+ ^2= 1/n _(i=1)^nX_i^2 (2)

As we can see, we have two equations with two unknowns, since we have two parameters in this exercise. Being our unknowns the parameters and . If we substitute equation (1) in (2) we have:

X ^2+ ^2= 1/n _(i=1)^nX_i^2

^2= 1/n _(i=1)^nX_i^2 - X ^2

Once we solve for we can place the circumflex, because it will be one of the estimators of this situation and also, carrying out the inverse process of the variance we can factor the right side of the equation and therefore we are left as:

 ^2 = 1/n _(i=1)^n(X_(i)- X)^2

It is important to emphasize that it is not just any factorization, since many will think that if we make the notable product of the last equation, we would need a term to arrive at the previous formula, but that missing term would be -2X_(i) X , which By the summation that is ahead we would have 2X (_(i=1)^nX_i)/n = 2(X) X = 2X ^2 that by subtracting X ^(2) I have only one X ^2 and that is why the factorization remains like this.

On the other hand, we can realize that the right side of the equation is nothing more than the variance of the non-grouped data, so substituting we have:

 ^2= S^2 = X

So we already have the value of the two parameters

50.5 Important Concepts When Conducting A Statistical Hypothesis Test

In many situations the researcher, based on his previous experience, has a priori belief regarding the phenomenon he is studying and regarding the parameters of the process. That is why the researcher will be very interested in estimating the values of these unknown parameters. However, the process does not end there, since you will also have to contrast the possible hypotheses regarding the probability distribution of the population under study, from which the available sample was generated.

In general, the hypotheses refer to the sample information and it is necessary to find out if this information is consistent with his belief about the parametric values. Because otherwise, there would be a problem with the sample, in addition there are times when the researcher has two samples and of course he will question whether the information from both samples comes from the same population or from different populations.

The a priori idea of statistical testing is that the researcher has reasons to believe in the certainty of the null hypothesis and the alternative hypothesis is defined by that circumstance incompatible with the definition of the null hypothesis and a probability event that has been considered null. , must be neither in the alternative hypothesis nor in the null hypothesis. So the researcher must ask himself when he is performing a hypothesis test, if he has enough evidence in the chosen sample to accept or reject the null hypothesis.

So we already have the value of the two parameters

50.6 Important concepts when conducting a statistical hypothesis test

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The a priori idea of statistical testing is that the researcher has reasons to believe in the certainty of the null hypothesis and the alternative hypothesis is defined by that circumstance incompatible with the definition of the null hypothesis and a probability event that has been considered null. , must be neither in the alternative hypothesis nor in the null hypothesis. So the researcher must ask himself when he is performing a hypothesis test, if he has enough evidence in the chosen sample to accept or reject the null hypothesis.

As we already know, the null hypothesis is the reflection of a belief of the researcher and he will only be able to reject it in favor of the alternative hypothesis, only if there is sufficient evidence against it. It is important to contrast null hypotheses of which the researcher has founded an a priori belief, since contrasting the hypotheses is not something that should be done mechanically or systematically and it would also be completely absurd to consider an experiment with a high number of hypothesis contrasts. , where they are rejected and approved empirically, but without a pre-established orientation or awareness of what is being done.

To test the null hypothesis, numerical values are assigned to one or more unknown numerical parameters, in comparison with another value that is assigned to the alternative hypothesis. For this, it is necessary to have sample information, in which it is necessary to calculate a statistic that is closely related to the parameter around which the contrast is required. The value obtained from the statistic will indicate whether the hypothesis established a priori is acceptable, with respect to the value of the unknown parameter or, if not, whether the null hypothesis is rejected and the alternative hypothesis is accepted.

Hypothesis testing is carried out in several stages:

1. State the null hypothesis (Ho) and the alternative hypothesis (Ha), both being in reference to the unknown parameter.
2. Decide which statistic is appropriate to summarize the information of the sample, of course, with respect to the parameter on which the test is to be performed.
3. Divide the sample space into two regions, the acceptance region and the critical region.
4. Obtain a sample of an adequate size in which the characteristic of interest can be collected.
5. Calculate the sample statistic.
6. Observe if the statistic falls in the critical zone to reject the null hypothesis or in the acceptance region to approve it.

Let's go to a practical example: Let's suppose that a certain cosmetics company carries out an advertising campaign, which of course represents a huge expense, part of the campaign is about the success of its perfumes in a certain city and you want to verify if the campaign has been effective, in order to implement it at the national level. It is evident that in order to obtain a reliable result, the sample from the city to be studied must be representative since there is no reason to think that the change in the proportion of clients before and after the campaign will be different in the rest of the country than in the pioneer city.



After the campaign, the marketing department of this cosmetics company conducts a survey in the city of interest and

interviews 200 people. The percentage of people who habitually bought their perfume before the advertising campaign was 5%, the company for its part sets a goal of reaching 7% to assume that the campaign has been effective. However, the proportion of consumers after the campaign is not known and the only thing we have is the survey of those 200 people. For this, it will be necessary to calculate an estimate of the proportion of consumers after the campaign and the first thing to do is choose the estimator of the parameter that will be the object of the contrast.

As we already know, the proportion of the sample is an unbiased estimator with respect to the population proportion and therefore, what seems more reasonable is to use the percentage of the sample. Suppose then that 15 people answer having purchased the perfume after the campaign and as we know, this represents 7.5% of the respondents, so that it can be concluded that the campaign has been a success. But proceeding in this way is to assign absolute reliability to the information obtained in the sample and this induces us to compare the estimate obtained in the sample, with the pre-established threshold of 7%. What happens is that the estimate is only a realization of the estimate, which in this case is the sample proportion and it is most likely that if we had taken a different sample, the result could be different, unless we interviewed each and every one of potential consumers in the city.



Treating sample variations appropriately is very important, since nothing prevents us from having an estimate like the one mentioned above, even if the population proportion is practically the same as before launching the advertising campaign. On the other hand, it would be too costly to extend the campaign nationwide if we are not sure that it is actually effective. We could even be incurring a Type I Error, if in the absence of a significant change in the number of consumers before and after the campaign, the null hypothesis is rejected, by assuming the change in proportion in the

sample information.

If, on the other hand, if we obtained only 13 affirmative answers they represent a proportion of 6.5%, this would lead us not to reject the null hypothesis, even when consumption has increased with respect to the existing consumption before the campaign. This is what is called a Type II Error, which consists of not rejecting the null hypothesis, even when it is false.

We are going to formalize the process: we want to test the null hypothesis in which it is established that the campaign has not had an effect and, therefore, that the percentage of consumer customers is not significantly higher than the number of consumers before carrying out the campaign advertising.

The null hypothesis is determined as follows:

```
Ho:  p = 0.05
```

In this null hypothesis, a single value of the unknown parameter is determined and to compare it, we must formulate an alternative hypothesis and in it, the values of the parameter will be collected to accept or reject the null hypothesis. Let's assume for the moment that:

```
Ha:  p  0.05
```

As we can see, the alternative hypothesis in this case is composite, since it includes a whole range of alternative values with respect to the unknown parameter. On the contrary, we can say that the null hypothesis is simple, since it establishes a unique probability distribution and if it is true, the indicator variable of the probability distribution for each person who consumes the perfume will take the value of 1 and if it does not, it will take the value of zero (0). In this way, the probability distribution will be determined as a Bernoulli see distribution with p = 0.05. If we determine a type I error it would be to reject the null hypothesis and accept the alternative, even when Ho is true and a type II error would be not to reject the null hypothesis when the alternative hypothesis is true and therefore Ho is false.

The size of a hypothesis test or its level of significance is the probability we have of committing a type I error and the power of a test would be to reject the null hypothesis in the case of being false, which is precisely what we want. to get. That is why we must reduce the difference in significance of the contrast and raise the power of the contrast as much as possible. Suppose that we denote by the symbol the possibility of committing a type II error, this implies that the power of the test will be equal to 1- since:

```
P [Do not reject Ho / Ho is false] + P [Reject Ho / Ho is false] = 1
```

The first being adding equal to . It is important to emphasize that the way to solve the hypothesis contrast will be different depending on the alternative hypothesis, since the latter can be simple or compound. Given the case that it is composite, then the hypothesis test will be carried out in a different way, since it will depend on the range of the alternative parametric values. For this case, a two-tailed test is applied, in which the null hypothesis is rejected when there is much evidence against it and this occurs when the proportion of the sample differs substantially from p = 0.05. Another important point is that it cannot be accepted that the advertising campaign has a detrimental effect with respect to consumption in a priori way, that is, the proportion of perfume consumers will be lower after the advertising campaign, so the recommended alternative hypothesis is that it is:

```
Ha:  p > 0.05
```

In this case, we will observe evidence against the null hypothesis given the case that we obtain, a proportion of the sample that is relatively high.

When the type of contrast that we are carrying out when the problem is two samples is:

```
Ho:  ph = pm
```

This is an example for the proportion of smokers that exist among the students of the engineering faculty, which is determined as being the same for both men and women and in this case, two samples would have to be drawn, one for each population group . The alternative hypothesis would be that both proportions are simply different:

```
Ha:  ph  pm
```

We can also establish a somewhat stricter alternative hypothesis, which is that the proportion of smokers that exists among male students is higher than that of female smokers:

```
Ha:  ph > pm
```

The way to solve the hypothesis test will be different depending on the specification of the alternative hypothesis. For the case where it is established that the alternative hypothesis is to state that the population of male smokers is different from the population of smokers, a two-tailed contrast would be carried out. While in the second alternative hypothesis, where it is established that the population of smokers is greater than that of female students, a single-tailed test would be carried out.



The idea of this type of problem is not precisely to test a numerical value for both parameters, but only to demonstrate that both are equal to each other. However, as the contrast is carried out, the proportions of each population will also be estimated, if they are potentially different or estimate a single proportion, but using both samples, that in the case of not rejecting the null hypothesis.



Another way of dealing with hypothesis testing is through the equality of variance or mathematical expectations between possible different populations.

50.7 Hypothesis testing regarding proportions

It is important to find the ideal method when carrying out a hypothesis test, for the case we are studying, where we want to test the population proportion. We are going to keep the assumption about the rule of rejection determined a priori, which is if the estimator of the sample proportion after the advertising campaign is equal to or greater than 0.07.

We can commit a type I error when rejecting the null hypothesis being true, since the decision rule is to reject Ho when the proportion of the sample is equal to or greater than 0.07 and is denoted as p = X/n since the level of contrast significance is:

=P(p0.07/ p =0.05)= P(X/n 0.07 / p = 0.05)

X being the number of clients who use the perfume among the people interviewed and n is the number of the sample, which in this case is 200. To find the probability, we use the information that, as is a Bernoulli probability distribution, the sum of the values of X would be a function of B(n,p) and therefore:

=P(p0.07/ p =0.05)= P(X (0.07)(200) = 14 / p = 0.05)

=1- _(i=0)^13P(X=i/p=0.05) = 1 - _(i=0)^13(200¦i) (0.05)^i (0.95)^(200-i)

As we can see, calculating each of the addends is a somewhat complex process, so it is preferable to use the Poisson approximation in the binomial distribution or the normal approximation can also be used, when the probability p is small, however, the product np is quite large, so we have np = (200) (0.05) = 10. With this value = 10 and the number

equal to 13 (which is the maximum value to take), we will go to the tables of the Poisson distribution and from there we obtain:

The probability that the variable takes these numerical values is: 0.8645, so that = 1 - 0.8645 = 0.1355, this being the contrast significance. In the same way, we could calculate the probability of committing a type II error, but for this it is necessary to assume that the population proportion has undergone a change and now has a new value of p '. Let's suppose that now p '= 0.6 and even though it is unknown, we must remember that the null hypothesis is not rejected if X <14, so:

```
 = P( X < 14 / p´ = 0.06) = _(i=0)^13(200¦i) (0.06)^i (0.94)^(200-i) = 0.682
```

When we look for the value in the Poisson distribution tables for = np = (200) (0.06) = 12. But what if we want to calculate assuming that p´ = 0.07, we realize that = np = (200)(0.07) = 14 and when calculating = 0.464. Therefore if we keep increasing the value of p '= 0.8 the value of = 16 and = 0.275. This implies that if the true proportion of current perfume consumers exceeds 5%, the probability that we have of committing a type II error will be less as the difference between the proportion before the advertising campaign and the proportion that is get after the campaign.

Depending on the strategy used to carry out the contrast, the values of and will vary. If the cosmetics company wanted to exceed 7% of consumers after the campaign, it would be being very demanding when rejecting the null hypothesis. While it is true that this implies a low probability of committing a type I error, the probability of committing a type II error would be quite high and this would imply that we would be demanding a lot of evidence against the null hypothesis to reject it, that is, , would increase the probability of not rejecting the null hypothesis even if it is false.

```
=P( X  16/p= 0.05)= 1-_(i=0)^15(200¦i) (0.05)^i (0.95)^(200-i) = 1-0.951 =0.049
```

As we can see, the probability of committing type I error is much lower than that obtained with the 7% threshold, remember that it was = 0.136.

We can then come to the conclusion that depending on the strategy adopted a priori when carrying out the contrast, it will directly affect the probability levels of committing both errors. We can also conclude that by varying the rejection threshold, the probability of committing one of the types of error can be reduced, but always at the cost of increasing the other type of error.

50.8 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

FIFTYONE

POISSON DISTRIBUTION

51.1 Some History

Siméon Denis Poisson was the creator of this distribution, he was a French philosopher and mathematician who was in charge of modeling event frequencies but during a fixed interval of time, but he was also in charge of perfecting and correcting the law of large numbers. This type of distribution is used in the area of operational risk in order to model those situations in which a certain operational loss occurs. The Poisson distribution is also used in the waiting times that exist between financial transactions, for those data of high frequency in the market risk. It is even capable of modeling the amount of bankruptcies on credit risks.



The Poisson distribution is one of the most important ones used in discrete variables and its application in general refers to modeling situations in which it is required to determine the amount of a certain type that can be produced in a certain interval of space. or time, always under some assumptions of randomness and restrictive circumstances. It is important to emphasize that the interval can not only be time, the interval can also be area, distance, volume or another similar unit.

It is also highly used in considering limits of dichotomous processes that happen repeatedly many times, but when the probability of success is very small. This distribution can be derived from an empirical observation process that has the following characteristics:

1. It comes from the observation of certain types of events that happen in a period of time through an observation space.
2. The events that are observed have a random nature and may or may not occur in a non-deterministic way.
3. The probability of obtaining x number of successes in a given amplitude interval will not depend on the origin of the interval, instead it will depend on its amplitude.
4. The probability that exists of the occurrence of a certain event within an infinitesimal interval will be proportional to the width of that interval.
5. The probability that exists of two or more events occurring within an infinitesimal interval is an infinitesimal that belongs to an order greater than two. Therefore, in an infinitesimal interval, 0 or 1 fact can be produced, but never more than one.
6. When in certain circumstances we randomize so that the variable X is determined by "the amount of events that can occur in a certain interval of space or time", this implies that this variable X is going to be distributed with a distribution of the parameter
7. The probability that an event occurs in a certain time interval will be the same for different intervals of the same length.
8. What happens or does not happen in one interval is independent of what happens in any other interval, that is, the occurrences are independent.
9. At the same time two events cannot occur simultaneously.
10. The variable can only adopt integer and positive values, for example: X = [0, 1,2, 3,4,...] Since this parameter is a proportionality factor that expresses the probability that a certain event occurs in an infinitesimal interval, this parameter is designated as the intensity parameter and corresponds to the mean of the events expected to occur in a unit interval and is also able to match the variance of the distribution.

On the other hand, the field of variation of the variable because it is a discrete model will be part of the set of natural numbers including zero: x [0, 1, 2, 3,...]

51.2 Amount function

If we start from the hypotheses of the process, we can get to obtain a differential equation capable of defining it and that can also be easily integrated, in order to obtain the quantity function of our variable "number of events capable of occurring in a unit interval of space or time ", it can be expressed as follows:

```
F(x) = P(X = x) = (e^(-)*^x)/x!
```

Where:

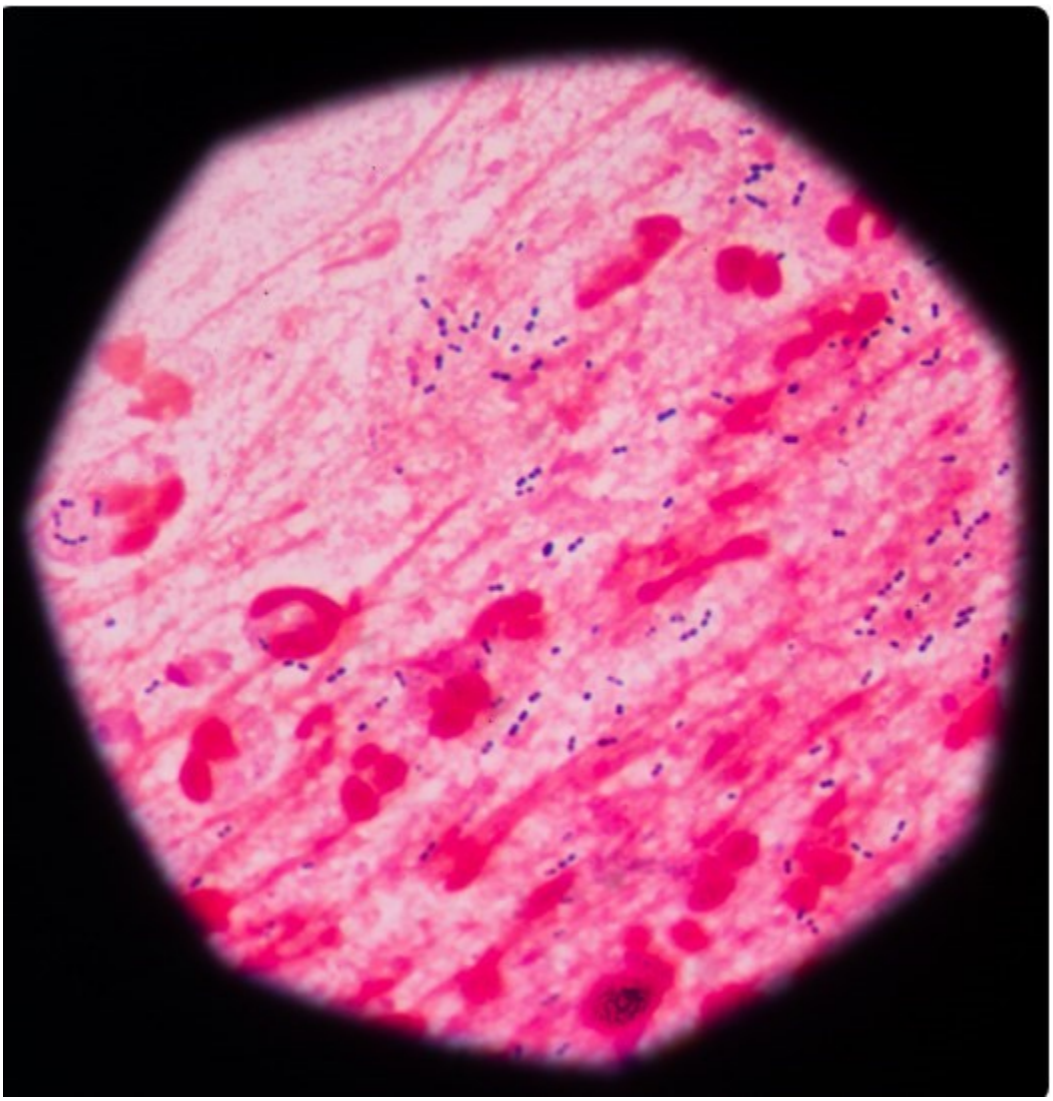
= To the measure of the expected value that an event occurs e = Is the base of the natural or natural logarithm = 2.71828

Let's go with some examples where the Poisson distribution can be used for a certain type of interval:

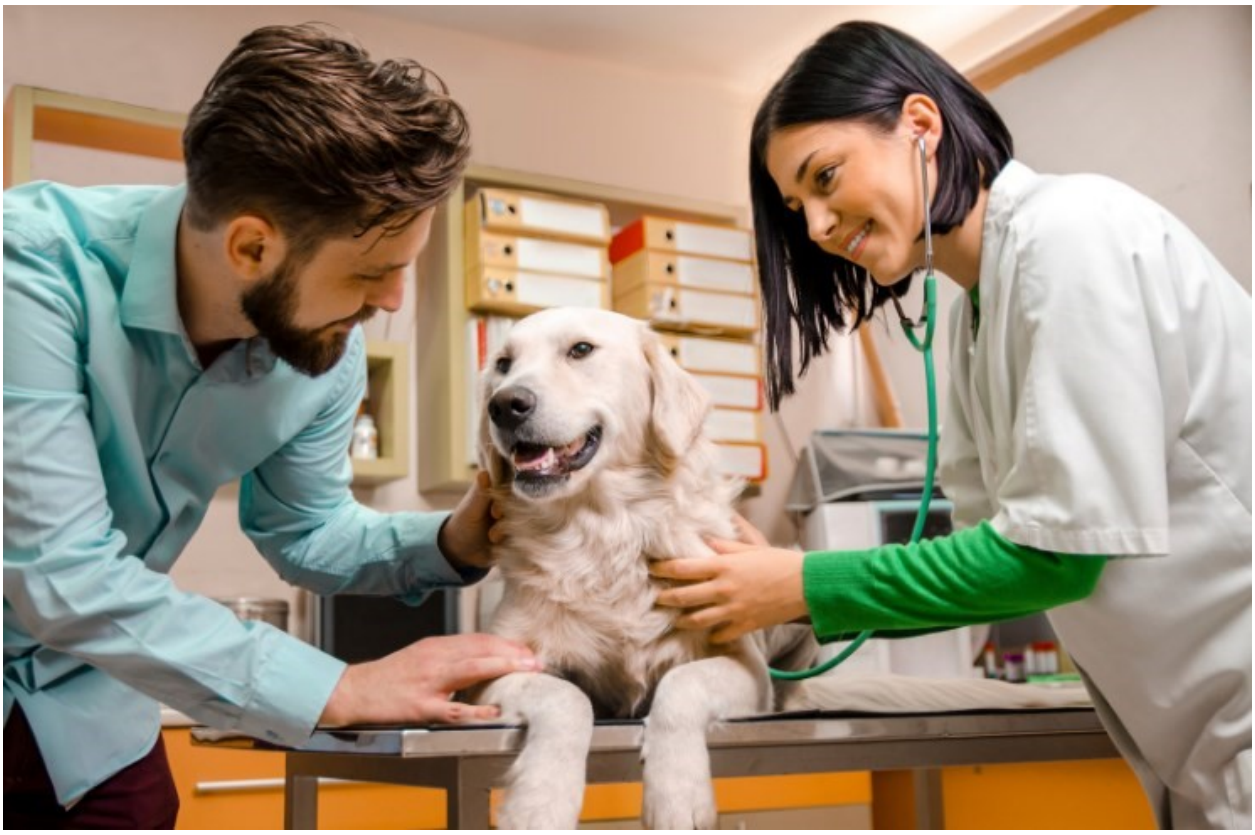
1. X = The number of people who come to a dentist's office in a time interval of one day.



2. X = Number of cars that show up at a gas station in a period of eight hours.
3. X = The number of bacteria found in a liter of water.



Let's go with the first example of Poisson distribution: Jorge is a veterinarian and receives an average of four pets a day. If we know in advance that the number of pets Jorge receives in one day at his veterinary clinic follows a Poisson distribution. Is it required to know what probability Jorge has of receiving 3 pets in one day?



X = No. of pets Jorge receives at his veterinary clinic in one day X ~ Poisson () = 4 P (X = 3) =? F(x) = P(X = x) = (e^(-)*^x)/x! F(3) = P(X = 3) = (e^(-4)*4^3)/3! = 0,1954

If we want to establish it in percentages, we multiply the result by 100:

```
F (3) = 19.54%
```

Poisson Distribution Example 2: suppose a rate of 0.4 customers per minute enters a bank, we want to know the probability that there is no customer entering the bank in one minute. X = No. customers who enter the bank in one minute = 0.4 If we want to evaluate the probability that no customer enters the bank, then the value of x = 0 by instituting the data of the Poisson formula we have:

```
P( x = 0) = (e^(-0,4)*0,4^0)/0! = 0,67
```

If we want it in percentage 0.67x 100 = 67% But now we are going to calculate the probability that 2 clients enter the bank in one minute




```
P(x = 2) = (0,4*0,4^2)/2! = 0,053
```

When multiplying by 100 we have that the probability that two clients will enter the bank in one minute is 5.3%.

Suppose we now want to know the probability that at least 2 customers enter the bank in the space of one minute. To do this, it will be necessary to calculate the probability of 2, 3, 4, 5,..., ∞. As we know, this would not only be a daunting task if not impossible, but there is a property in the probabilities that for this type of case can be of great help and that is that the sum of all the probabilities must be equal to unity. So from the unit (1) we subtract the probability of x = 0 and x = 1, we will obtain the probabilities from 2 to infinity, which is precisely the answer we are looking for.

```
P (X 2) = 1 - P (X  1) = 1 - [P (x = 0) + P (x = 1)]
```

In the first part of this exercise we already calculated the probability when x = 0, we will have to carry out the rest of the calculations:

```
P(X 2) = 1 - [0,67 + (e^(-0,4)*0,4^1)/1! ] = 1- [0,67 + 0,27] = 0,0618
```

We can conclude then that the probability that at least 2 clients enter in one minute is 6.18%.

It is also required to know the probability that at least two clients will enter in a period of 10 minutes.

The interval that concerns us is now 10 minutes, this implies that I must modify the Poisson equation and redefine the random variable

X = The number of customers that enter the bank in a period of 10 minutes

It will also be necessary to modify the average, since previously the rate was 0.4 in one minute, with a simple rule of three we can calculate the average and in this case it will then be a rate of 4 clients in 10 minutes = 4

Substituting the values in the Poisson distribution formula and applying the probability property again where it indicates that the sum of all probabilities is equal to 1. We can subtract the probabilities of x = (0,1) from unity to obtain the probability from 2 to infinity and therefore we have:

We can conclude then that the probability that at least 2 clients enter in one minute is 6.18%. It is also required to know the probability that at least two clients will enter in a period of 10 minutes. The interval that concerns us is now 10 minutes, this implies that I must modify the Poisson equation and redefine the random variable

X = The number of customers that enter the bank in a period of 10 minutes It will also be necessary to modify the average, since previously the rate was 0.4 in one minute, with a simple rule of three we can calculate the average and in this case it will then be a rate of 4 clients in 10 minutes

= 4

Substituting the values in the Poisson distribution formula and applying the probability property again where it indicates that the sum of all probabilities is equal to 1. We can subtract the probabilities of x = (0,1) from unity to obtain the probability from 2 to infinity and therefore we have:

```
P (X 2) = 1 - P(X  1) = 1 - [P(x=0) + P(x=1)] = 1 - [(e^(-4)*4^0)/0!+ (e^(-4)*4^1)/1!] =
0,9084
```

When expressing the probability as a percentage, we are left with 90.84%

As you can see, the probabilities are quite high, since we have considerably increased the time interval.

51.3 Benford's law

One day in the year 1881, Simon Newcomb, an astronomer and mathematician, was using a book of logarithms and he noticed that the initial pages were more used and older than the last pages of the book. It is important to take into account that at that time computers did not exist and at that time, tables of logarithms were widely used for multiplication between large numbers. It is as if today the wear of the number (1) key on calculators is examined. The question of why the logarithm pages beginning with 1 had been consulted many more times than those logarithm pages that began with higher numbers arose immediately.

At that time Newcomb deduced that the initial numbers are not equiprobable since the number 1 appears more frequently than the rest of the successive digits, until it reaches the number 9 which is the least frequent. That is why Newcomb enunciated a logarithmic law: "the occurrence of numbers in the probability law is such that the mantissas of their logarithms are equiprobable."

This probability law was forgotten until in 1938 a physicist from the General Electric company named Frank Benford was able to observe the same pattern and devoted himself to studying 20,229 numbers that came from 20 samples of physical magnitudes and all kinds of constants such as: statistics of baseball, river lengths, figures taken from magazine covers, people's addresses, etc. Based on these data extracted from the real world, Benford came to verify that the probability of a number from a series of data that begins with the digit d is going to be given by: P (d) = log (1 + 1 / d) and this postulation was called "Benford's law of anomalous numbers." In this probability law, it was found that the possibility that the first digit of a series is number 1 will be 30%, while the first digit is number 2 will have a probability of 17.6 % and 3 have a probability of 12.5%, as one advances in the digits closest to 9, the probability decreases. Although it is true that Benford's analysis provided some evidence for the existence of the law, the physicist was not able to explicitly explain the reason for this pattern.

The first person who stepped forward to try to explain this relationship was a New Jersey mathematician named Roger Pinkham in 1961. The reasoning that mathematician used was as follows: Let's assume that there really is a law regarding the digit frequency, if so, this law should be universally enforced. So if we measure a certain length in meters or inches, if we calculate prices in dollars or euros, the ratios with respect to the frequency of the digits should be equal.

In other words, Pinkham argued that the frequencies of the digits should not change in the face of scale changes. He later showed that when a digit frequency law did not vary with respect to scale, then it could be Benford's law, that is, the test provided confirmation of the existence of Benford's law.

While it is true that this law is quite obvious with just a few small checks (as long as the data set was valid), it was not until 1996 that Ted Hill a mathematician achieved a fairly satisfactory demonstration of this pattern and this The proof comes from certain central limit theorems and their relation to multiplication of random values and the behavior of mantissas.

Benford's Law is a relevant and very interesting result, but Dallas-based accounting professor Mark Nigrini proposed in 1994 to use digit frequency analysis to be able to detect irregularities and fraud situations. He started by applying it in the investigation of tax data and lately he generated a program to detect to what extent certain supplied data meshes with Benford's law. The manipulation of results and variables to generate fraud can exist in all areas of knowledge: plagiarism in investigations, tax, electronic, banking, electoral fraud, in medicine, among others. Any dishonest practice deprives others of their rights with the intention of causing harm.

In 2015 Kroll presented a report based on several surveys made to senior executives from companies and referring to fraud. To carry out this report, 768 executives were interviewed and the conclusion was that fraud tends to increase, the executives expressed that 75% of the companies they represent have been victims of fraud during 2014 and this implies an increase of 14 % with respect to the figures reported just three years before that year.

On the other hand, the Association of Certified Fraud Examiners in 2016 carried out another study on fraud where 2410 cases were investigated between January 2014 and October 2015 with respect to labor fraud. They found $ 6.3 trillion in losses and were able to conclude that in 23% of the cases, they had suffered more than $ 1 million in losses for the fraud victim company.



Hernández, Llanes & Rodríguez presented a research work in 2007 that was based on improper statements in the communication and production of scientific results, which occurred during the period from 2004 to 2006. This research work discusses important falsifications and fabrications of data, plagiarism and other less severe frauds than the previous ones such as duplicate publication, unjustified authorship and publication biases. Examples of scientific fraud that occurred between 1974 and 2006 are also discussed.

To reach these conclusions in each of these investigations, Benford's law was used.

51.4 Benford's Law Enforcement

It is important to take into account that to apply this law it is necessary to find experimentally the probability that the first digit (not null) in a series of numbers from the real world, if not manipulated, is presented as a logarithmic probability. That number other than zero must be taken as the first digit and it was shown that this first digit is much more likely to be odd with a probability of 61%, while if it is an even number, the probability is 39%.

The first significant digit is the nonzero that appears to the left of the decimal expression. Suppose we have the number 0.00574, the first significant digit would be the number 5 and if we are observing the value of the number the first digit to take into account would be 3. Also Benford's law concludes that the probability of the first two Base 10 significant digits are able to satisfy the following relationships:

We will call the first significant digit as d1 and the second as d2:

`P(d1) = log_10(1+ 1/d1)`

`P(d2) = log_10[1/((d1+d2))]`

Benford's law determines that the probability that the 1st digit is a set digit "n" is:

`P(n) = log_(10 )(1+ 1/n) = log_(10 )(n+1)- log_10n , where n = 1, 2, 3,...,  9`

The general formula for any set of the first "n" digits is as follows:

`P(n_1 n_2...n_n) = log_10[1+ 1/((n_1 n_2...n_n ) )]`

Each digit determines a probability of occurrence based on its position, that is, we can calculate the probability of the first digit (1) as:

`P(1) = log(1+1/1) = 0,301`

If we want to express it in percentages, we must multiply the probability by 100 = `0.30 * 100 = 30.1%`

Let's suppose that we want to calculate the probability that the first two digits are the number 37, when applying the formula we have:

`P(37)= log_10[1+ (1/37)]= 0,0116`

The probability that the first two digits are 37 is 1.16%

We are now going to calculate the probability that the first three digits are the number 280:

`P(280) = log_10(1+ 1/280) = 0,0015`

The probability that the first three digits are 280 is 0.15%

Requirements that must be met for Benford law to apply:

1. It is important that those data that have a geometric sequence contain neither a maximum nor a minimum.
2. The set of data or observations must be made up of magnitudes of the same phenomenon that are measurable.
3. This law is independent of the scale in which it is measured
4. The advisable thing to do to apply the study of the first three digits is to have at least 10,000 data.
5. This law is not applicable for a series of random numbers, since in this case, all the values have the same probability of occurrence.

Here is an illustrative example that can clarify Benford's law: suppose that in a certain city a new street is created that begins to fill with houses from one of its ends, over time the municipality begins to assign numbers to these houses that for reasons obvious ones will start with: 1, 2, 3, etc. As we can see, the lowest figure has a greater probability of leaving since they are used first, however, when the portal number 9 is listed, the probability is balanced and when building house 10, again the digit 1 takes advantage again.

In the same way, once the street has reached 19 houses, each of the digits will have come out twice minus the digit number 1 that will have been used 12 times, this happens frequently and is never compensated.



With regard to fraud, if anyone tries to falsify their tax return in any way, they will most likely make up the data and most people use numbers that start with the digits 5, 6 and 7 are those that occupy the middle Very few of the scale use the digit 1. So statistically speaking, when Benford's law is not fulfilled, one begins to suspect fraud.

This law is used to evaluate results obtained either by analytical means, through simulation or through mathematical models whose data verify a logarithmic distribution such as: the income tax declaration, the results of presidential elections and certain data prosecutors. In this way, irregularities and fault situations can be detected.

Benford's law has been very useful as an analytical tool for audits, the area of finance, geographical dimensions, constants of chemical and physical quantities, in the decay of radioactive particles, social quantities, populations, and to detect electoral fraud, among others.



However, there are data in which Benford's law is not satisfied, these data where the law cannot be applied are the following:

1. Data on the ages of the people, in this case it is not applicable because they follow a normal distribution.
2. Those data that come from uniform distributions, for example, lotteries.
3. The telephone numbers and neither the identity data, because the first numbers have been assigned depending on the area.
4. Those numbers that come from the evaluation of quadratic functions, those that come from the evaluation of roots, among others.

Main frauds detected with Benford's law:

1. Several mathematicians determined that the 2009 elections in Iran were manipulated because they did not comply with this law.
2. The data that Greece presented to the European Union to form part of the eurozone, were also fraudulently manipulated.
3. One of the most notorious cases was that of the energy giant Enron, this company was listed on the United States stock exchange and was also audited by one of the five most important auditors in the world at that time, which was the Arthur Andersen company. Enron's financial status was found to be out of compliance with Benford's law and in light of this, it was decided to dig a little deeper. In this way, it was found that this company paid just over 1 million dollars a week to its auditor to be its accomplice in the fraud. Thanks to Benford's law, neither Enron nor the auditing company exists anymore.
4. Benford's law was used to analyze the Covid cases presented by each of the countries according to their report presented last year and the experts realized that the number of positive Covid cases exposed by the countries Russia and Iran did not comply with this law and therefore the figures given had been manipulated.



To verify some type of fraud either in elections or in finances, it is enough to take all the data of the population of each of the municipalities and extract the first digit. To know what the first digit of any number n is, what we must do is divide the number n by 10^(k-1), k being the number of digits that n has and then, find out in which of the intervals this result falls, that is, [1,2, 3,4,. . . , 9]. The data sets that follow Benford's law are those whose log_10x is uniformly distributed.

After knowing what the first digit is, we calculate its frequency of appearance number by number and we obtain the percentages of that frequency. If the percentages roughly follow the following table extracted from Benford's law, we can assume that there is no type of fraud, otherwise, we must begin to suspect that there was some type of manipulation in this data.

The following table was calculated for each of the digits from 1 to 9:

We are not going to do a complete exercise, why we should handle a very large amount of data, but the calculation itself is very easy to perform.

We are now going to deal with those probability distributions also for discrete variables, but this time, whose domain is infinite

1. The Pascal or negative binomial distribution: this distribution is capable of describing the number of Bernoulli trials that are necessary and independent to achieve an amount n of correct answers, when they give us an equal probability p of constant success.
2. The geometric distribution: this distribution describes the number of attempts that are necessary to get to the first hit.
3. The extended negative binomial distribution
4. The negative binomial beta distribution: this distribution is capable of determining the number of experiments that are of the "yes or no" type that are necessary to achieve n number of hits, but when the probability of success that occurs in each one of those attempts, has a beta distribution.
5. The Boltzmann distribution: This type of distribution is very important within statistical mechanics and is capable of describing within a thermal equilibrium the levels that energy occupies, within this distribution we can list several special cases such as:

- The Gibbs distribution.
- The Maxwell Boltzmann distribution.

6. The parabolic fractal distribution: This is a type of probability distribution in which the logarithm of the size or frequency of the individuals in a population comes from a quadratic polynomial and this notably improves the adjustment by means of a simple power law relationship.
7. The asymmetric elliptical distribution.
8. The extended hypergeometric distribution.
9. The logarithmic distribution: This type of probability distribution is derived from the Maclaurin series expansion
10. The generalized logarithmic distribution.
11. The distribution of Polya Eggenberger.
12. The Yule Simon distribution.
13. The Poisson distribution with its various variants such as: the hyper-Poisson distribution, the Conway Maxwell Poisson, the displaced Poisson, and the Poisson binomial, among others.
14. The zeta distribution: This type of distribution uses Riemman's zeta function in order to assign a probability for each natural number.
15. The Skellam distribution: it is a type of distribution capable of describing the difference that exists between two random variables, which are also independent but with Poisson distributions and whose expected values are different.
16. Zipfs law: this law is used to determine the frequency with which the words of a certain language are used.
17. Zipf Mandelbrot's law: this version of the previous law is much more precise.

51.5 About the Author

Graduated in Mechanical Engineering, and a master's degree in teaching component, I gave classes in several institutes of mathematics and physics, but I also dedicated several years of my life as a television producer, I did the scripts for mikes, the camera direction, editing of video and even the location. Later I was dedicated to SEO writing for a couple of years. I like poetry, chess and dominoes.

CHAPTER

FIFTYTWO

PROBABILITIES

The man usually faces certain situations where he does not have a total control of his certainty and on many occasions we ask ourselves the probability that an event has if it is capable of happening or not, since we do not have absolute certainty that it can happen in some circumstance.

That is why knowing probabilities that can help us measure certainty is so important. Although it is true that statistics is a powerful tool for the knowledge of data, from the way of collecting, presenting and interpreting them in order to generate statistical inferences that help us in making decisions. Probability, on the other hand, is no less important and both are very valuable instruments within the different fields of research, risk markets, productive, administrative and in the health area.

We use the term probability on a daily basis and without the need to become mathematicians. For example, to try to forecast the weather, probability is used, since it deals with both uncertainty and chance. As you will realize later there are three different approaches to probability, but in addition, there are dependent events that tell us to calculate what we call conditional probabilities and what is commonly known as Bayes' Theorem. But we will also study the development of combinations and permutations.

Many consider that probability is the basis of statistics and even mention that when working with a known population, one can have a better certainty or probability of obtaining a particular sample from that population. That is, the probability is based on a series of rules or patterns where you can have a better idea of what may happen. However, probability has three defined approaches: subjective probability, relative frequency probability and classical probability.

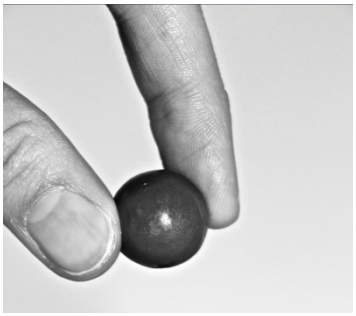
The classical probability is also known as the a priori probability and consists of a sample space where there are results that are mutually exclusive, therefore, it can be said that two or more events cannot occur at the same time, that is, that all situations have the same probability of occurring (equiprobable). When we say that an event A can occur in m ways, we can then say that the probability of A is going to be equal to the number of favorable cases divided by the total number of cases (n).

For example: we are going to suppose that in a box there are 15 white and 8 black marbles. What would be the probability at the time of extracting a marble and that it is black?

Therefore the total number of marbles is n = 23 and that they are black m = 8

$$P(B) = 8/23 P(B) = 0.3478$$

The probability that we have to extract a black marble will be 34.78%.



On the other hand, when we talk about relative frequency probability, it is also commonly called a posteriori and as you know it means “after”. This implies that if in a study an event that we call A occurs m number of times, having repeated the event n times, the relative frequency of A would be fr = m / n

When n tends to infinity, since the experiment is repeated several times, the relative frequency will be equal to the probability, in this case A

$$(lim)(n\text{ß})fr(A) = P(A)$$

Let’s go with another example: Let’s suppose that in a racetrack we have observed that horse number 12 has won 9 races out of 10, given the case that you want to bet on this horse of course you want to know the probability that it wins, for this concern:

m = 9 n = 10

Developing:

$$(lim)(n\text{ß}9)fr(A) = P(A)P(A) = 9/10P(A) = 0.9$$



Answer:

As you will see, the probability that you have of winning when betting on horse number 12 is going to be 90% and what we call subjective probability is determined by the probability that any person assigns to a situation, but based on in your experience.

When any of us forecast the possibility that it rains or does not rain, according to how the sky sees and of course, we are aware that it is not necessarily an absolute pattern, because many times what we predict does not happen, it is a clear example of probability subjective.

From another point of view, it is worth mentioning that many probabilities are calculated axiomatically, understanding that the axioms in probability are those minimum conditions that must be verified, so that a certain function that is defined on a set of events, establishes the consistently your odds.

Now, this relationship that exists between the relative frequency with respect to an event and its probability, through the number of times it is repeated in a large experiment, is attributed to Kolmogorov, who developed the axiomatic theory and relied on 5 theorems and 3 axioms.

Theorems: 1) P (Ø) = 0 2) P ($\bar{A}$) = 1 - P (A) 3) Being A and B events where AB, then P (A) P (B) 4) Since A and B are events we can ensure that P($\bar{A}$B)=P(B)-P(AB) 5) Being A and B any two events, P(AB) = P(A) + P(B) - P(AB)

Axioms:

1. P(S) = 1
2. Being A any event, P (A) 0
3. Being A AND B events that are mutually exclusive, then AB= the probability that either A or B will occur will be P(AB) = P(A)+ P(B). Generalizing we can say that if we have several events A1, A2, A3, … An and these events are mutually exclusive, then the intersection of all these events will result in an empty set, while the union will be equal to _(i=1)^nP (Ai)

52.1 Events

When we make calculations to reach conclusions in some applied science, we generally resort to mathematical models that in turn make up sets of unitary, binary and trinary relations, to satisfy the propositions that are derived from the axioms that are explained with advance.

There are two types of models, the deterministic one in which uncertainty plays no role and the non-deterministic one, which is of the random probabilistic type.

Mathematical calculations are usually applied to solve some type of observable phenomenon of our reality, but also quantifiable and reproducible. Experimentation is the process used to reproduce events and to be able to expect tangible results, with repeatable reproduction being the most important property for this process.

When we talk about deterministic experiments, we can say that they are those in which the conditions of the experiment, manage to allow the results obtained to always be the same. For example, when we put water to heat, we will realize that it always manages to boil or boil at 100 ° C.

While when we talk about non-deterministic experiments, they are those in which the conditions under which the experiment is carried out, are those that determine the probability that the expected results will occur or not, that is, they are those experiments where probability intervenes. For example, when we toss a coin, we cannot predict the expected result with certainty and that is why we must study all the possible results that we will obtain from tossing the coin several times and this is what is called the sample space. The sample space is usually represented by the letter "S" and between braces { } that indicate a set.

Let's take an example, if we determine the sample space when we flip a coin, as we all know, the coin has two probable sides when it comes to landing. Now, one side of the coin is the head and the other is a tails, for this specific example we will use the nomenclature "C" for heads and "T" for tails, then:

S = {C, T}

But what happens if we flip the coin twice? Our probabilities will be as follows:

S = {CC, CT, TC, TT}



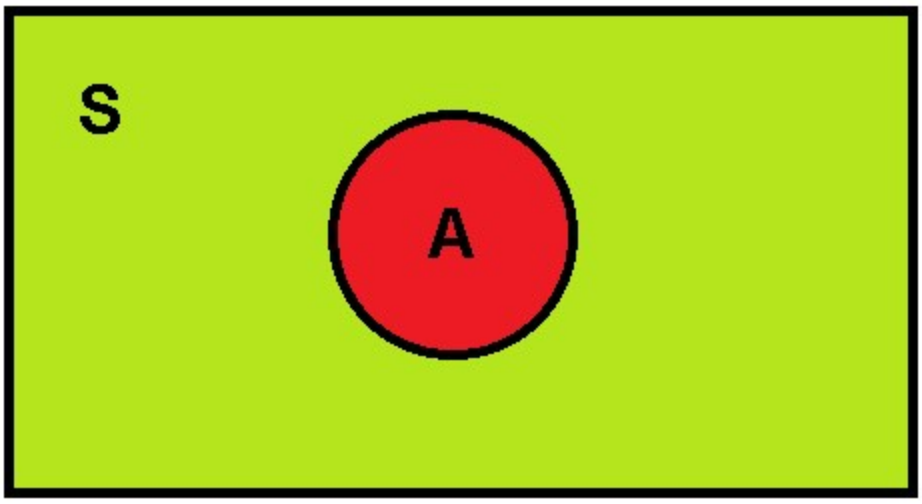
Being “S” the sample space made up of all the possible results of our experiment and can be decomposed into events or events. Both the event and the event are subsets of the sample space and are represented by any letter of the alphabet that is capitalized and with the exception of “S” (to avoid confusion with the symbol of the sample space).

For example, if S = {KKK, KKL, KLK, KLL, LKK, LLL, LKL, LLK} and we intend an “S” event that we will call A in which three K occur, the answer would be A = {KKK} , but if we try an event that we will call B where it is taken into account that it has at least one K, then: B = {KKK, KKL, KLK, KLL, LKK, LKL, LLK}.

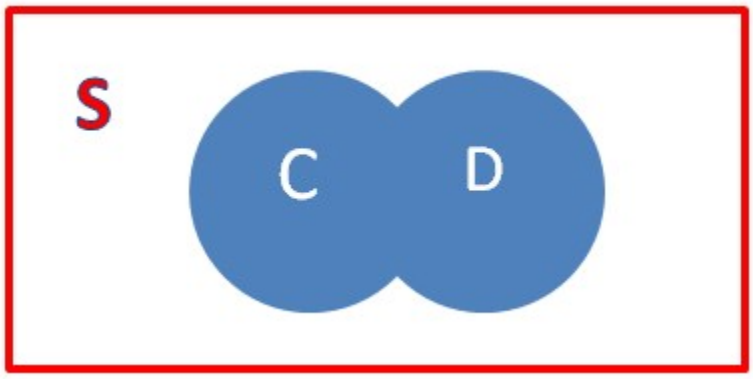
In many cases the simplest thing is to try to represent the sample space through Venn diagrams, since in this way those events that can generate other events can be better appreciated.

Venn diagrams are the schematic representation of set theory and are used in logic, mathematics, and diagrammatic reasoning. In Venn diagrams, sets of elements are shown by closed lines.

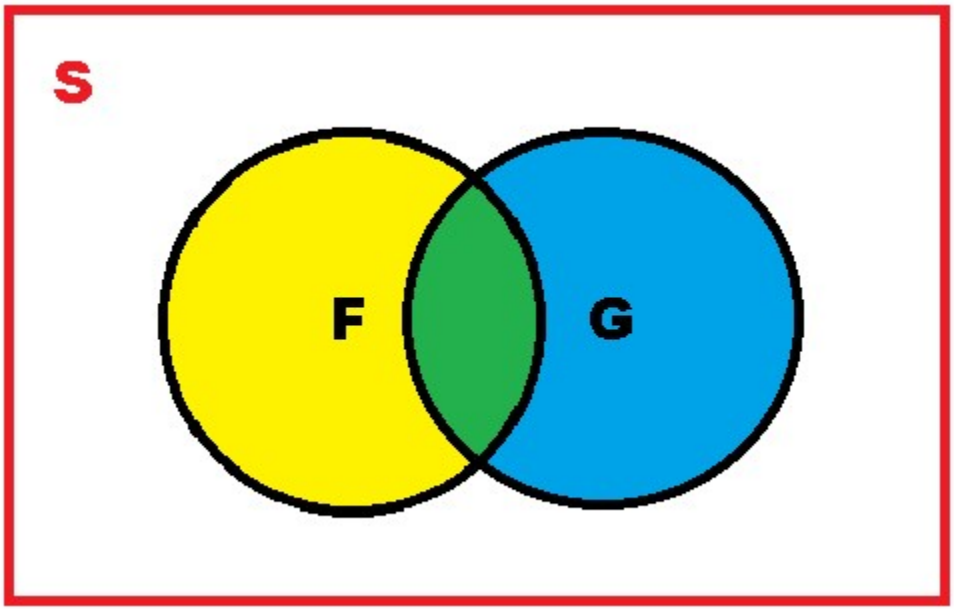
These diagrams were devised by John Venn around 1880 and they try to represent what the sample space “S” is and how we can observe, this space is the one that is part of the rectangle but is not part of the circle, that is, the Venn diagram represents all the points that make up the sample space, but are not included in A.



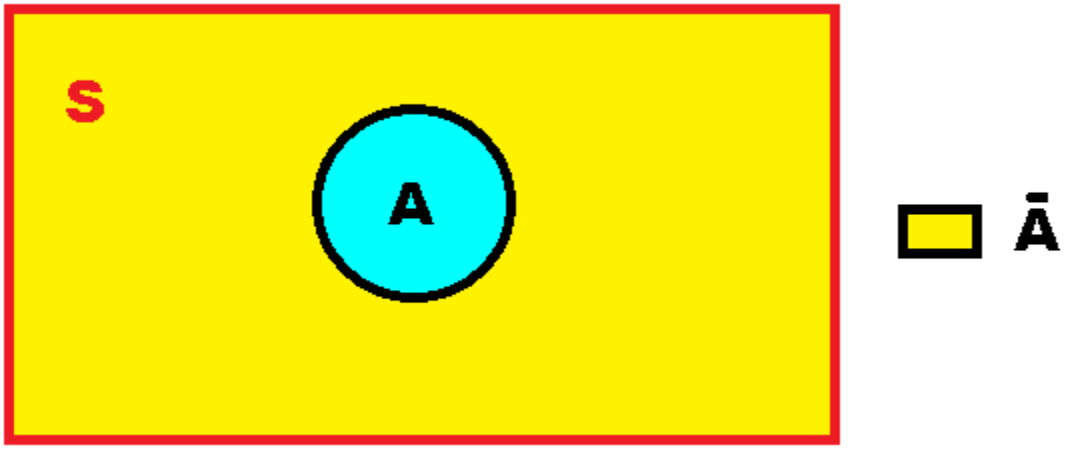
Now, when we join two events such as C and D, we can define the union of the two events, as the set that includes all the points that are in both events and is represented mathematically with the symbol U, therefore it would be CD and looks like this:



Now, the intersection that exists between two events F and G is represented by those points in the sample that are common to both events and are represented in the following figure by the green area and are mathematically represented as follows FG, by both the area that is shaded in green will be:



The complement of A, are those points that belong to S but are not in A and is represented by the symbol $\bar{A}$.



Let's go with an illustrative example, the sample space for the toss of a die is S= {1, 2, 3, 4, 5, 6}, If we determine three events such that A = {1, 3, 5], in addition B = {4, 5} and C = {1}, we can conclude that:

1. The complement of A will be: $\bar{A}$ = {2, 4, 6}.
2. If we require A U B, we need to join all the points of both A and B: A U B = {1, 3, 4, 5}
3. If what we need is to find, we must find the common points of both events and therefore: AC = {1}

52.2 Conditional probability

Before understanding what conditional probability is, we must know that there are independent events and dependent events. When a certain event does not exert any type of effect with respect to the probability that another event occurs, it is what we define as an independent event. For example, when it comes to rolling a die, the result that we obtain when we make the first roll, we know that it does not affect in any way the probability that is obtained from a second roll.

Being the events A and B independent, we can express them as follows:

$$P(AB) = P(A)P(B)P(B|A) = P(B)P(A|B) = P(A)$$

On the other hand, dependent events indicate that one event happens or does not happen with respect to another and it is precisely in this type of event that we use conditional probability, which is the one where situations that are similar and in which it is required to find the probability of event A, but yes, when we already know what happened in another event B.

Now, since A and B are two specific events within a sample space and the condition that P(B) > 0 is obtained, this implies that the probability of A with respect to B is:

$$P(AB) = P(AB)/P(B)$$

An example can clarify the above much more, if we want to calculate the probability when tossing a coin 2 times and also that the result of the second toss when falling to the ground turns out to be heads, when the result of the first toss is a tails. . We must first specify the nomenclature to use and we will use the same that we established in the example mentioned before: C = Heads T = Tails

In this case the sample space is: S = {CC, CT, TC, TT}

To know the conditional probability, we must express the following: P (C T) = P (C T) / P (T)

It is important to take into account only the sample space in those results where the first toss is a stamp or a cross (T) T = {TC, TT}

When we express the event C T we will need to limit the sample space, but this time when the second toss has yielded as a result. C = {CC, TC}

When it comes to intersecting C with T, we have one element in common: C T = {TC}

As we can see, in the original formula there is a division that is carried out precisely with the results that we have just obtained and also we only have 1/4 in the numerator, since we have one element of the 4 that are part of the sample space (in this case TC) of the intersection that exists between T and C. On the other hand, we obtain two elements such as TC and TT from the limited sample space of T, therefore that account gives us 2/4, since they are two elements of the 4 that make up the sample space, therefore:

$$P(C|T) = ((1/4))/((2/4)) = 1/2$$

Answer: according to the calculations when we toss a coin twice, the probability that we will get heads on the second toss is 50%, yes, when we get tails or tails on the first toss.

What probabilities do we have when two events intersect?

When we have an event A and another B, given the case that the intersection between the two generates a new event, where all the points of the sample are common to both A and B. It is important to take into account that when we talk about the intersection of both events, we refer to the event composed of those common elements of two or more events when they intersect and therefore, the probability will only be equal to the probability that the common elements have. According to the property that the intersection of sets has, we can say that: A S = A A = A $\bar{A}$ = With B A we can then say A B = B

Let's now go with an example, suppose that a dice is thrown into the air and we want to analyze two events, the first event is that an odd number is returned and the second is that the number is less than 4 Let's first define the nomenclature: I = odd number A = less than 4 We then have that: I = {1, 3, 5} A = {1, 2, 3}

Answer: As we already know, this problem takes us directly to an intersection of probabilities, we must then find the elements in common of I and A, if we observe we can realize that they are the numbers 1 and 3, this implies that we obtain 2 of the 6 points that make up our sample space, therefore: P (I A) = 2/6 P (I A) = 0.3333

Answer: The probability that we have when we throw a dice into the air and that a number that is odd will fall and is also less than 4 is 33.33%.



52.3 Bayes theorem

As we saw in a previous article, Bayes' theorem allows us to calculate the probability of an event A, but from what happens in an event B. This theorem is generally used in areas such as quality control In this way, we can know how likely we are to find a defective item or, on the contrary, that it is perfectly manufactured.

According to Bayes' formula, we can assume that we have a sample space "S" which in turn is made up of "n" events, but in addition, each of the events are mutually exclusive. Of course, the union of all the events will make up our sample space "S".

On the other hand, we can suppose that H is any event that is in "S", where P(H) > 0, so that the conditional probability that H generates on other events such as: G1, G2, G3, ..., Gn can be expressed through the Bayes formula:

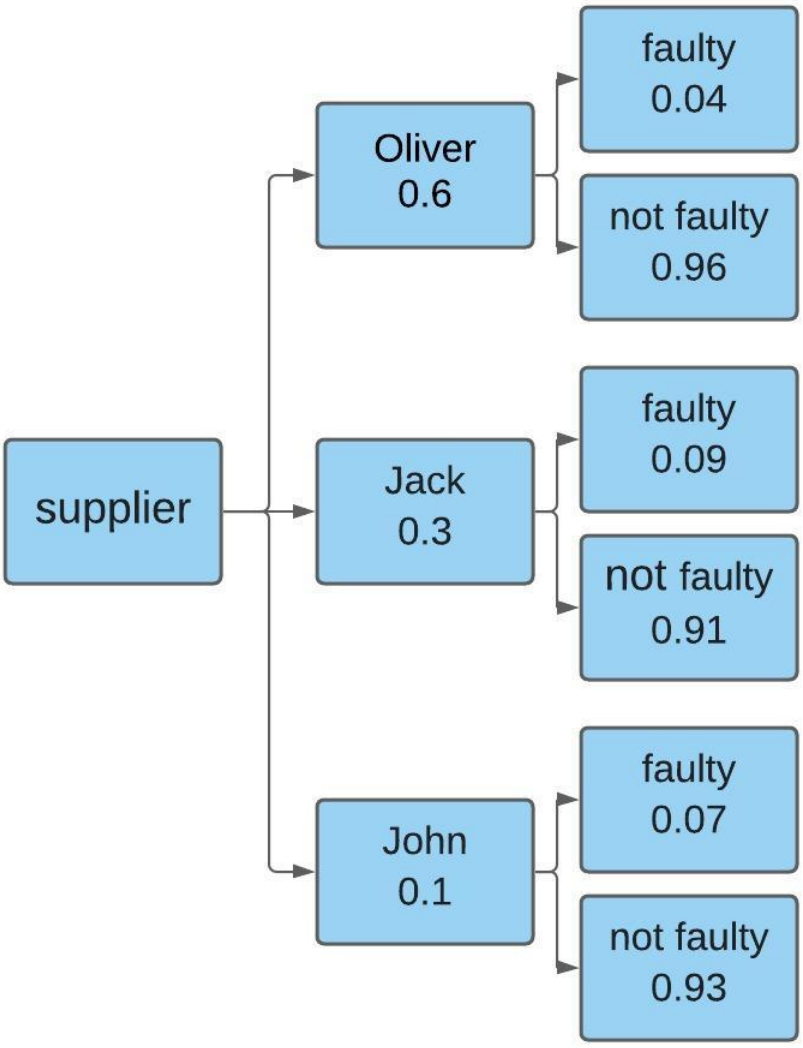
$$P(G1H) = P(G1)P(HG1)/(P(G1)P(HG1) + P(G2)P(HG2) + ... + P(Fn)P(HGn))$$

In order to better visualize the Bayes formula. It is advisable to rely on what we call a probability tree, which is nothing more than a graphical representation where we can visualize the groupings of the elements that influence the formula.

For example: A small company dedicated to the manufacture of clothing, depends in turn on other companies that send the prefabricated pieces, in this sense, the small company has three suppliers that are: Mr. Oliver who provides 60% of the clothing, while Mr. Jack supplies 30% and the rest is produced by Mr. John.

According to his experience, the president of the company assumes that the probability of obtaining a defective pants from Mr. Oliver is 4%, in the same way, he believes that the probability corresponding to Mr. Jack is 9% and the John's is 7%. All suppliers deliver their ready-made garments the same day and at that moment they find defective pants from which supplier is the defective pants most likely to come from?

First, a probability tree is made so that the probability paths can be illustrated:



Once the probability tree has been visualized, the path of each provider is followed, in this case the name of each of the providers and then multiplied by the data of interest, for this specific case it will be the defective path of that supplier and finally, that result is divided between all the branches of the defective cases, that is, the sum of all the suppliers.

Let's suppose that we want to know the probability that the defective pants were manufactured by Mr. Oliver:

$$P(G1H) = (0.60)(0.04)/(((0.60)(0.04) + (0.30)(0.09) + (0.10)(0.07)))P(G1H) = 0.024/0.058P(G1H) = 0.4137$$

According to the formulas we can conclude that Mr. Oliver has a 41.37% probability at the time of having manufactured the defective pants.

Now, if we want to know the probability that the defective pants come from Mr. Jack, we must carry out the same procedure:

$$P(G2H) = (0.30)(0.09)/(((0.60)(0.04) + (0.30)(0.09) + (0.10)(0.07)))P(G2H) = 0.027/0.058P(G2H) = 0.4655$$

As we can see, Mr. Jack has a 46.55% probability of having made the defective pants. Finally, we need to know the probability that Mr. John has of having manufactured the defective part.

$$P(G3H) = (0.10)(0.07)/(((0.60)(0.04) + (0.30)(0.09) + (0.10)(0.07)))P(G3H) = 0.027/0.058P(G3H) = 0.1206$$

This calculation indicates that Mr. John has a 12.06% probability of having made the defective pants.

Answer: As we can see, it is most likely that the defective pants come from the manufacturer named Jack, since this supplier has a probability of 46.55% and therefore, this number is higher than that of the other two manufacturers.

52.4 Counting techniques

When we calculate a probability, it can become tedious or complicated to count the elements that make up the set, that is why it is advisable to apply techniques that favor us when carrying out a count and also that allow us to solve and know some problems in as far as probabilities are concerned.

We are then going to delve into the combinatorial analysis, which will allow us to know each of the subsets or selections that can be formed with the elements that make up the set.

Combinations: Unlike permutation, in a combination it does not matter the order that the "r" objects may have without repetition, which as we already know have been selected from the "n" objects taken from r to r. The commonly used nomenclature is nCr. The number of possible combinations that can be obtained from the "n" objects is given by:

$$nCr = n!/r!(n-r)!$$

As always, we are going to clarify your doubts with an example: A company is made up of 20 workers and among them they must cover a guard every Saturday of the weekend, so that a group of 4 workers will be formed to carry out the work. How many different groups made up of 4 members can be constituted?

Answer: It should be taken into account that for this specific example, the order of the workers who will make up the guard group is not important at all, since it is not necessary to establish how they intend to choose the members of each group, any possible combination does not alter the final result.

$$20C4 = 20!/4!(20-4)!20C4 = 20.19.18.17.16!/4.3.2.1.16!20C4 = 116280/2420C4 = 4845$$

Although the answer is self-explanatory, 4,845 different groups of 4 workers out of the 20 who work in the company can be formed to carry out the Saturday shifts.



Permutations: In the case that we are interested in the order of our "r" non-repeated objects, which in turn have been selected within the "n" objects that we have in totality, we must use what we call a permutation and its nomenclature it is denoted as nPr.

Now, we can determine the number of possible permutations that exist of our "n" objects, but taken from r to r and for this it will be necessary to apply the following formula:

$$nPr = n(n-1)(n-2)\ldots(n-r+1)$$

But when we have a large number of elements, it is best to express the same formula but in factorial terms, so we will state it as follows:

$$nPr = n!/(n-r)!$$

For example: Let's suppose that you want to carry out a market study to find out the preferences of consumers with respect to the brand of a certain soft drink. For this, the respondent must choose 4 reasons from the six possible items, why they may be interested in consuming the soft drink in question. But in this market study the preferences must be ordered from highest to lowest, that is, with number 1 being the preference of greatest interest and in the same order of ideas, 4 will be the ratio of least interest among its four choices. The question is, in how many possible ways will the respondent be able to answer the questionnaire?



Answer:

$$6P4 = 6!/(6-4)!6P4 = 6.5.4.3.2.1!/2.1!6P4 = 6.5.4.36P4 = 360$$

As we can see, the calculations indicate that the respondent has 360 different ways of answering the questionnaire.

CHAPTER

FIFTYTHREE

SAMPLING METHODS

Researchers in their studies often use different sampling methods, so as not to have to investigate an entire population in order to collect analyzable perceptions. In this article we will learn to know the characteristics of these sampling methods, to be able to decide which is the best when carrying out a research project and in the most successful way.

What is sampling?

It is the technique to select individual members or a subset of the population, in order to make statistical inferences in only a part of it, without having to study the entire population. The sampling method is the fundamental basis of any research design and also saves not only time but also costs. On the other hand, survey software with appropriate sampling techniques can be used to obtain optimal research.



Let's suppose that a drug manufacturer wants to investigate the unfavorable side effects of a certain drug on the entire population of a country and for obvious reasons, it is practically impossible to carry out research in which all citizens of that country participate. That is why the researcher must choose a sample of people for each demographic group, in order to obtain feedback regarding the behavior of the drug and its side effects in the population.



53.1 Sampling methods

There are two types of sampling methods that are: Probabilistic and non-probability sampling.

Probability sampling: This is a sampling technique where the researcher determines a classification with few criteria and randomly chooses individuals or a sample from a population. It is important to emphasize that all individuals will have the same opportunity to make up the sample through this selection parameter.

Non-probabilistic sampling: In this sampling technique, the researcher simply randomly chooses the individuals in the research, in this case there is no predefined selection process and that is why it is more difficult for individuals to have the same probabilities of be part of the show.

53.2 Examples of sampling methods

We are going to know the different types of sampling, both probabilistic and non-probabilistic, that can be applied in a research study.

In probability sampling technique, researchers choose samples from the largest population and use probability theory. In this sampling method, all individuals in the population are considered and the samples based on a fixed process are formed.

Suppose we have a population of 2000 members, each individual will have a probability of 1/2000 of being chosen to be part of a sample. In probability sampling, bias is eliminated in a population and all individuals are given a fair chance when it comes to being included in the sample.

In probability sampling, four different types of techniques can be named:

1.- The simple random sampling technique: This is one of the best techniques as far as probability sampling is concerned

and also a lot of time and resources can be saved with this method. On the other hand, it is a reliable method to obtain information and each one of the individuals of a population is chosen completely at random. This implies that each individual has the same probability of being chosen, when forming part of a sample.

For example, suppose we have a company with 500 employees and that its human resources department requires teaming up for a certain activity. For this, human resources members prefer to choose the individuals whose names are in a bowl and that is why each of the employees will have the same opportunity to be chosen.

2.- Cluster sampling technique: This method is also called cluster sampling and is a technique in which researchers divide the population into clusters or sections and which in turn represent the population. A sample is included in each of the groups based on demographic parameters such as location, gender, age, etc. In this way, it is easier for the researcher to create a survey to obtain an effective inference, based on the feedback.



For example, suppose the United States government requires an assessment of the number of immigrants living within its country. One proposal will be to divide them in terms of the number of immigrants by states, let's say those from Florida, California, Texas, Hawaii, etc. This is how a more effective survey is carried out, since the results will be organized by state and in this way, the immigration data will be obtained in an objective way.



3.- Systematic sampling technique: Systematic sampling is a method used by researchers to choose individuals from a certain population at regular intervals.

To apply the method it will be necessary to choose a starting point for the selection of the sample and a size that can be repeated at regular intervals. This type of method has a defined scope and that is why this technique is the one that can be performed in a shorter period of time.

For example, suppose that a certain researcher wants to systematically collect a sample of 500 people and a population of 5000 people. For this, it is necessary to list each individual in the population between the numbers 1 and 5000, but only one individual in 10 will be chosen to make up the sample, that is, the total size of the population must be divided by the size of the sample. = 5000/500 = 10.

4.- Stratified sampling technique: In this stratified random sampling technique, the researcher must divide the population into smaller subgroups, but that yes, they do not overlap but rather represent the entire population. During sampling, the groups should be organized and then a sample is drawn from each of them separately.

For example, suppose that a researcher wants to analyze people according to their annual income and to do this, he will create groups or strata according to their annual family income. A first stratum can be less than $ 20,000, to later generate a second stratum that ranges between $ 21,000 and $ 30,000, a third stratum that ranges from $ 31,000 to $ 40,000 and another group that ranges from $ 41,000 to $ 50,000, etc.

In this way, the researcher includes the characteristics of individuals belonging to different income groups. This is how traders can study which income group to target and, on the other hand, which of these groups does not suit them when it comes to obtaining their desired results.

53.3 Different utilities of probability sampling

1. Sample bias is reduced: Through probability sampling methods, the bias derived from the population sample is nonexistent or negligible. Probability sampling allows us to gather data that have a higher quality, since the sample represents the population in an adequate way.

2. Diverse population: When the population is diverse and extensive, it is necessary to have an appropriate representation so that the data does not derive from a single demographic group.
3. Generate an accurate sample: Probability sampling is very useful for researchers, as it helps them plan and create an accurate sample and in this way, be able to obtain well-defined data.

53.4 Different types of non-probability sampling

The non-probabilistic method is based on a collection of information that in turn is based on the selection of samples by an investigator and not precisely, on a fixed selection process.

In a large part of the cases, the result of a survey that is carried out through a non-probabilistic sample generates biased results and this ultimately does not help in the objective representation of the population. But there are circumstances such as the preliminary stages of a study or perhaps certain cost limitations when conducting the research, where non-probability sampling will be a more useful response than using another type of sampling.

53.5 Non-probability sampling types

1.- Convenience sampling: This technique will depend on the easy access that individuals have, such as a survey conducted with customers in a certain shopping center or perhaps passers-by who are on the road of a certain street. crowded.

It is called convenience sampling, thanks to the ease with which the researcher can carry it out and his ability to get in touch with individuals. In this case, the researcher does not have sufficient authority to be able to select the elements of the sample and the survey is carried out based on proximity and not precisely on representativeness.

In general, this type of method is used when there are cost or time limitations in collecting the information. There are circumstances in which there are limitations with respect to resources, such as in the initial stages of an investigation and that is where convenience sampling is used.

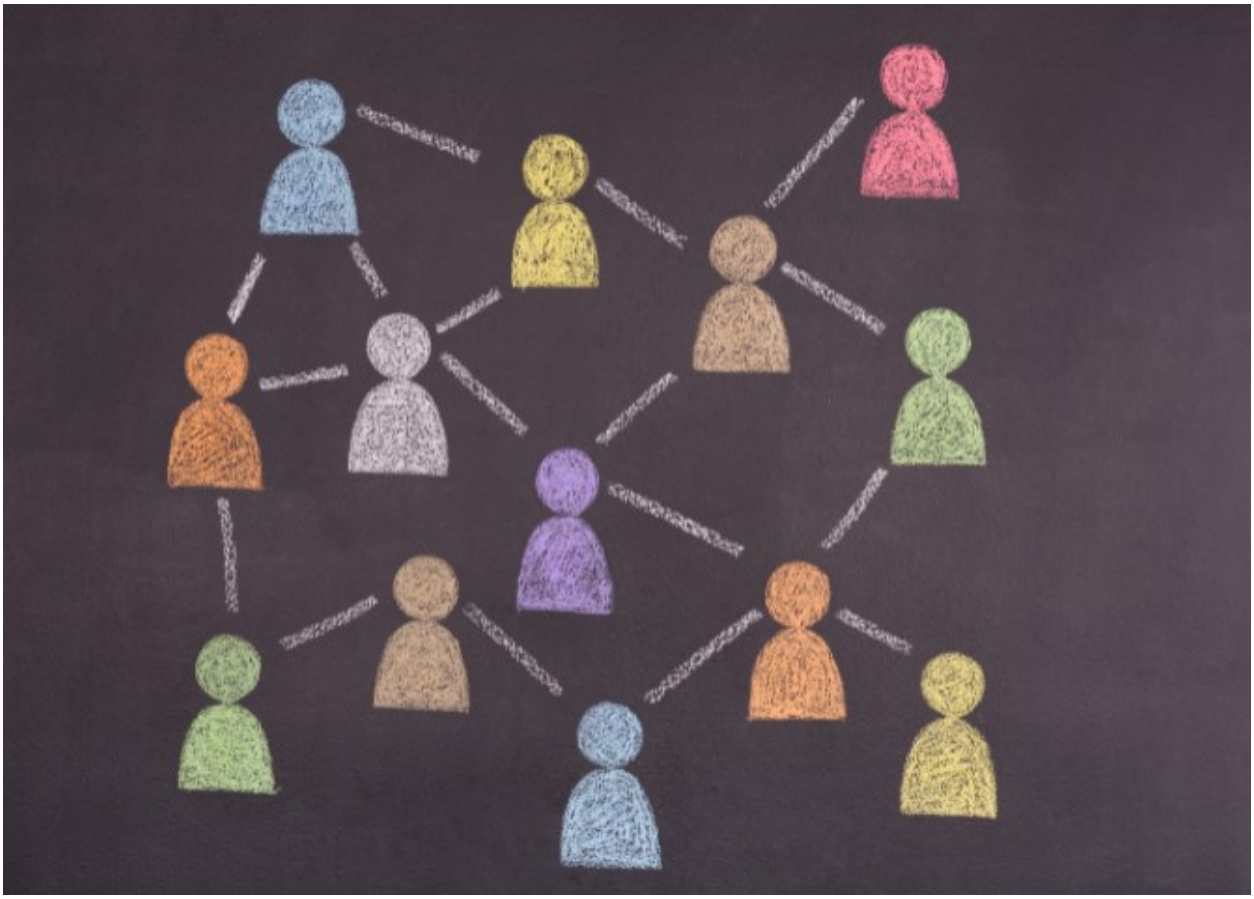
For example, Non-Governmental Organizations generally use convenience sampling a lot in shopping malls to distribute flyers for upcoming events or promote some cause, and to that end, they distribute their flyers at random.

The researcher chooses the individuals in the sample solely because of their proximity and not precisely because they are part of a representative sample of the entire population.

This type of sampling is used when it is not necessary to consider that a person is part of the sample, that is, each individual can participate and is eligible as part of the sample. For example, many times we find situations in a school where the teacher chooses the first two rows to participate in a competition, this is the typical example in terms of proximity.

This technique is widely used by companies to collect information on some critical problems that must be faced almost immediately or perhaps, when a brand is gathering information regarding a product that has just been launched on the market. It is also widely used by researchers in the early stages of a study, as it is a very easy and fast method when it comes to obtaining results.

An example of convenience sampling is when a marketing student must complete a task to obtain feedback regarding the scope of marketing in the year 2018. The student will most likely plan an online survey and send it to all of their contacts by phone or through their social networks, in addition to asking their closest colleagues to help them answer the survey, since it requires it to complete their task.



2.- Deliberate, judgmental or critical sampling technique: The deliberate sampling method is at the discretion of the researcher, since only the purpose of the study and the objective understanding of the public are considered.

For example, suppose that a researcher needs to understand the thought process of those who are interested in studying for a master's degree. The selection criteria will be: Would you be interested in studying your master's degree in . . . ? And those people who answer "No" will be excluded from the sample.

When we refer to the selection process through deliberate sampling or by judgment, this implies that the researcher carefully selects each individual when forming part of the sample. In the sampling process, the knowledge of the researcher is essential, since the members that make up the sample are not chosen at random.

When is deliberate, judgmental or critical sampling conducive?

This sampling model is much more efficient, in those circumstances in which there are only a limited number of people who possess certain qualities that the researcher expects from the population. It is usually used when the researcher prefers to apply deliberate sampling, because he feels that other sampling techniques may consume more time and also trusts his prior knowledge when selecting a sample in order to carry out the research.

This kind of sampling is generally used in situations such as that the population of interest is made up of individuals with a high degree of intellectuality, who, as we know, cannot be chosen using some type of sampling, whether it is probabilistic or non-probabilistic. It can also be used in those circumstances where the sample needs to be filtered or approved by other sampling methods.



Suppose that a researcher first performs a convenience sampling, to collect feedback data from the professors of a certain university, but finds that there are high probabilities that the results will be biased, that is when the researchers prefer to use sampling deliberate, judgmental or critical, to specifically select those professors capable of providing 100% feedback regarding the University.

Properly selecting each individual that will make up the sample is a challenge for the researcher. On the other hand, it is a very tedious task to manually select the individuals from a sample, to then ensure that there are no biases in it.

In the selection process, the intervening authority does not have to be an expert in the matter, but it must meet certain characteristics expected from an authority in this type of sampling. The authorities in charge of this process do not necessarily need to have any work experience or training in this regard.

This type of sampling is usually used when there are time limitations when creating the sample and also, the authorities in the process prefer to rely on their knowledge and not precisely on other sampling techniques.

However, it must be taken into account that the researcher may or may not be competent in carrying out an efficient sampling process. So each researcher must take responsibility for using experts when creating the sample or be very confident of their skills and understanding of the topic.

3.- Snowball sampling method: This method is the most used by researchers when individuals are difficult to track.

For example, suppose a researcher wants to survey illegal immigrants or people without shelter. In these cases, re-

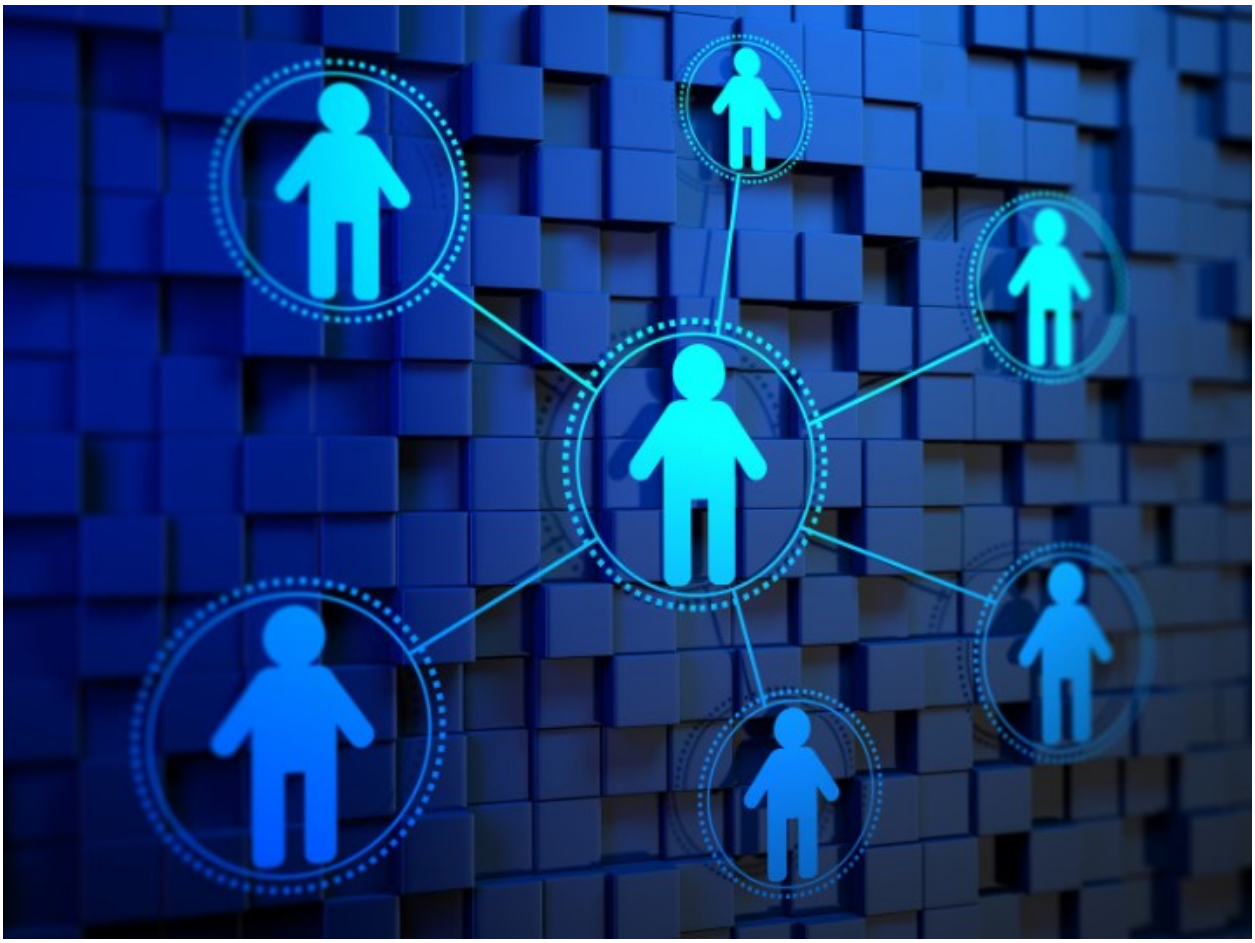
searchers use snowball theory to track down a few categories and thus be able to interview their individuals of interest to obtain results.

This sampling method is also applied in those circumstances where the subject is quite sensitive and many people do not like to discuss it openly, for example, when it is necessary to collect information on AIDS and HIV. Many victims will not answer the required questions so easily. However, the investigator can make contact with those people who know people with this disease or perhaps some volunteers related to the cause, in order to find the victims and be able to gather information.

To perform a snowball sampling you must perform two steps:

1.- The first is to identify the potential subjects that the population has and, in general, only one or a couple of individuals can be found initially.

2.- A good strategy may consist of asking those few individuals to recruit or get other people. But yes, it must be made very clear to the participants that they do not have to provide a name, if they do not want to. In short, this type of sampling method is based on the references of the initially found subjects and in this way, additional subjects are generated, it is precisely from this fact that the name "snowball" is derived. A chain referral is the way to recruit group members and this step is repeated until the required sample size is obtained. For ethical reasons, research participants should not be asked to identify other potential participants. But they can encourage others to participate.



When can snowball sampling technique be useful?

Some individuals may not want to be found, suppose a researcher were doing a study regarding shoplifting, drug use, cheating on exams or any other socially unacceptable behavior, this directly implies that potential participants should be cautious when answering any survey. But it is likely that some research participant knows other people who are in the same situation as them and can help inform their acquaintances about the benefits of the research, in addition to

ensuring absolute confidentiality.



4.- Quota sampling technique: In this sampling technique, in order to select individuals, a pre-established rule is needed. Given that the sample is generated on some specific attributes, the generated sample will have the same qualities as the general population and it is a very fast method to collect them.

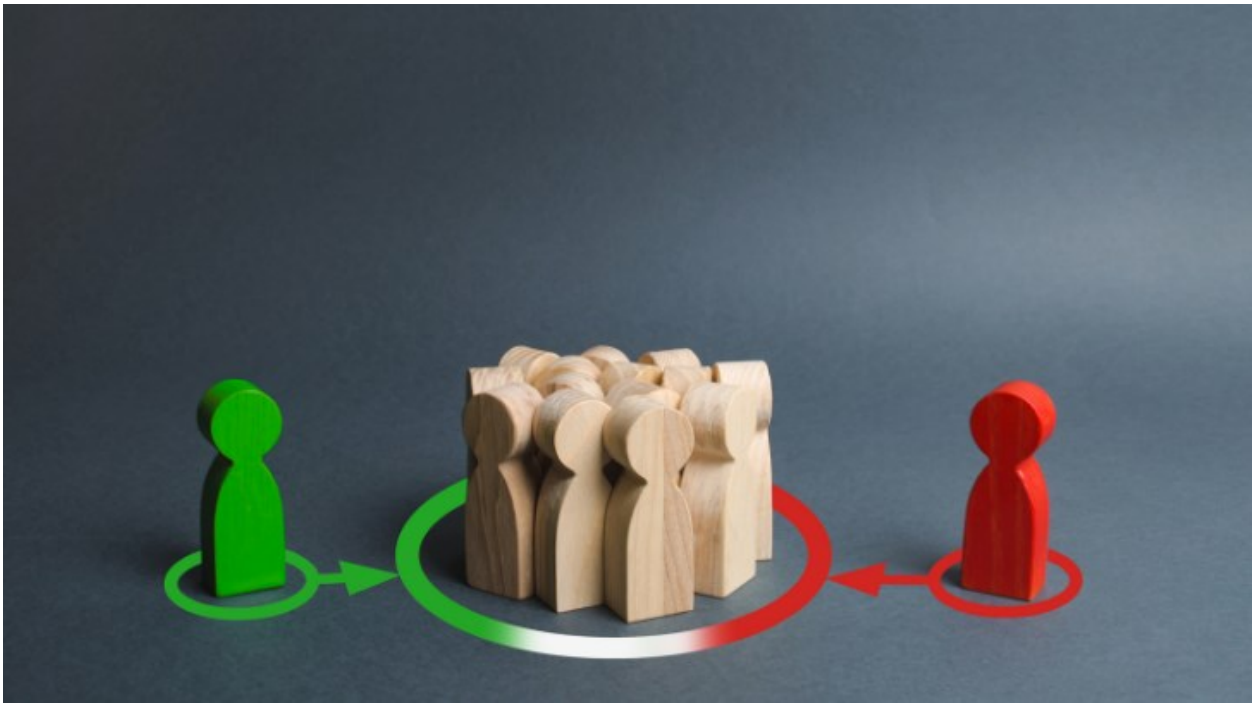
The researcher makes up a sample made up of individuals who are chosen for their traits or qualities and who represent the entire population. The trait can be defined to make the selection of the subset of the entire sample and that thus the data collection is really effective, in addition to being able to generalize to the population.

For the creation of precise strata, the researcher must take into account two main points:

1.- Understand all elements of the population

2.- A true intention to investigate

For example, suppose that a certain researcher performs a quota sampling and to do this he divides the population by sex, age, state, etc. It is essential to take into account the strata or proportions of each group. If the population has 60% men and 40% women, the quota sampling must also include this same proportion, to avoid biasing the results obtained.



Steps to carry out quota sampling:

1.- The population must be divided into subgroups where the characteristics of each subgroup must be part of this subgroup only. Suppose a researcher wants to study the market for a variant of Bluetooth hearing aids, the best thing to do is to target a niche based on age and evaluate the proportion that exists in the population of each of the subgroups, in order to maintain the same percentage in the selected sample.



Suppose that 58% of the individuals interested in buying their headphones have an age ranging between 25 and 35 years, the subgroups must have the same percentages with respect to age, which they have in the total population. It is also necessary to maintain the proportion of the population, that is, if the population has 500 people, the researcher

can choose a sample of 50 individuals.

A sample chosen following the steps above should represent the population of interest.

53.6 Uses and utilities of sampling or non-probability

1.- Create a hypothesis: Researchers usually use non-probabilistic sampling methods, in order to create a hypothesis at times when they do not have prior information. This method not only builds a whole base for future research, but it also returns the data immediately.

2.- Exploratory research: This sampling technique is widely used by researchers in those cases where qualitative studies, exploratory research or pilot studies are carried out.

3.- Time and budget limitations: These techniques are usually used when there is some kind of limitation in the budget or time and it is then necessary to collect some preliminary data. Since the survey design is not exactly rigid, it becomes much easier to pick respondents at random and take the questionnaire.

What sampling method should be used?

In order to meet the objectives of the investigation, it is completely necessary to choose the best sampling method for that specific case and the efficiency of the sampling will depend on several factors, below we will present the steps that expert researchers usually use to decide the suitable sampling method.

1.- It is important to specify the objectives of the research, but also the required accuracy combined with the cost of the study must be taken into account.

2.- It must be identified which sampling techniques are potentially effective to achieve the proposed objectives.

3.- Put sampling techniques to the test and evaluate whether they can achieve the objective of the investigation.

4.- Once the previous steps are carried out, the best method for the investigation can be selected.

53.7 Sampling errors to avoid

Surveys to research customers and obtain knowledge about the market must be designed with great precision in order to collect data and preferences from the audience in a reliable way. That is why it is absolutely necessary to avoid sampling errors so that the data collected is of quality and offers a true analysis, in this way you can obtain the necessary knowledge to grow the business.

According to the quality of the information, the success or failure of a product can be determined, it is also necessary to have knowledge regarding market research. Suppose that the selected sample does not coincide with the research criteria, this implies that when analyzing the survey, inaccurate results can be reached and the decisions that are to be made around these results may affect in a way negative the success and growth of any business.

53.8 The main risks of making a sampling error

When taking a research sample, the following errors may be incurred:

1.- Do not take into account an important audience: It is important to take into account that the audience is not only made up of people who buy products, they are also those who make donations to some cause, enroll in schools or institutes, etc. It is essential to identify the interested party, in order to achieve the business goals.

By losing the key audience, useful responses provided by surveys can be wasted, which in turn can have a great impact to increase sales. On the other hand, the appropriate audience is likely to be a subset of a larger group.

2.- The most relevant audience is often not prioritized: The audience of an organization is considered as employees, shareholders, clients, business partners, etc. But, many times they are not equally important at all times, so it is relevant to avoid this sampling error since they cannot be counted on for all the products of an investigation. There is a risk that

when you consider everyone, you end up not bringing a real benefit to anyone. So by ignoring what is important or accurate to the target audience the product is targeting, organizations may not be able to tailor their products or design marketing strategies to the existing needs of their audience.

3.- Survey bias: Each research study carries certain biases in its surveys. A researcher may make a sampling error and come to think that they have succeeded in creating an online survey, with the aim of attracting people of all ethnic origins. However, there is a possibility that the survey questions favor a certain ethnic group and instead offend the other groups. That is why the style of the survey must be designed to be acceptable to all audiences from which the information is intended to be obtained. Otherwise, the answers collected will be completely biased and therefore, the objective of the investigation will not be achieved.

4.- The survey lacks a response from the respondents: The subject of market research is closely related to the way in which the survey is provided to the population and for this it is necessary to address the specific population, this therefore it can become a problem. Since it is possible to design a survey whose respondents do not want to answer and that is ultimately a sampling error, it is also wasted a lot of time trying to find out why respondents hesitate to participate and it takes too much effort or alternative incentives, to achieve attract respondents. Reasons why designing an ideal survey eliminates the risk in the absence of a response.

5.- Limited time: When time is lacking, it is practically impossible to carry out a survey without the use of a sample. Thus, the design of an accurate survey is completely necessary, as this allows researchers to reach conclusions with greater precision and in a much shorter time.

It is no secret to anyone that time is of the essence for market research and decision making. As the market changes in a customary way, sampling must be done with great precision, otherwise the researcher will require much more time to collect and select the responses of his respondents.

Let us suppose that the researcher spends too much time collecting the information, to later collect it again after rectifying the sample, while all this is happening, market conditions may change and the decision may be taken too late, thus losing no only time, but money.

5.- Budget: The design of a survey from its inception to decision-making generates a certain investment expense and this will depend only on the size and type of the research activity.

Some researchers decide that it is best to purchase samples from some vendors, but it is also important to choose the correct sample for the first attempt, as this avoids conducting a second investigation and having to spend more money.

6.- Precision in the data: The precision of the data is possibly one of the most important factors to carry out any investigation and thus avoid the possible risks in terms of sampling error. This can happen when the wrong people are asked to respond to the survey and this can directly lead to a wrong analysis. While it is true that a bad question can stand out a bit, this circumstance is not as obvious as when a bad sample is obtained.

53.9 Recommendations to obtain a good sample within the investigation

1.- It is important to define the sample from the beginning, that is, to specify the people with whom they want to speak and why.

2.- Guidelines should also be defined and designed with respect to the people who should be included in the audience.

3.- Make the decision if the sample should be divided into smaller groups, since this helps a greater analysis and the subgroups can be compared cross-wise.

4.- The required quality of the sample must be determined, since many times it is not questioned whether the surveys are professional or not.

53.10 Errors mostly made with respect to the accuracy of the answers

1.- Measurement errors: This error is quite common within research and occurs, for example, when the intention of the question is modified in the wording and also when the respondent understands something different from what is being asked, in addition to not receiving instructions in a clear way when answering the survey.

2.- Error that arises when a question is not answered: There are specific questions that usually address sensitive issues for the interviewee, such as personal inquiries or that the respondent may consider that he is at risk if he answers the question, this implies an incomplete survey .

On other occasions, respondents who work within a company may have problems answering when these individuals are part of an organization where there are different levels of authority. It is much more feasible for any employee to answer a survey when they have the authority to do so or if they have the necessary knowledge to answer the survey on behalf of the entire company they represent, it may also be favorable for the employee to have work or personal reasons for provide the requested information.

It is important to take into account that there are different types of errors that can be incurred and thus affect the project. The idea is to try to minimize the number of errors by performing good practices from the beginning, such as choosing the research design and establishing the necessary precision. It is also necessary to know the margin of error that is available when measuring or estimating, so that to avoid bad decisions that can lead to major errors, you must be attentive and at the same time be aware that a good or bad decision can obstruct the success of any goal.

CHAPTER

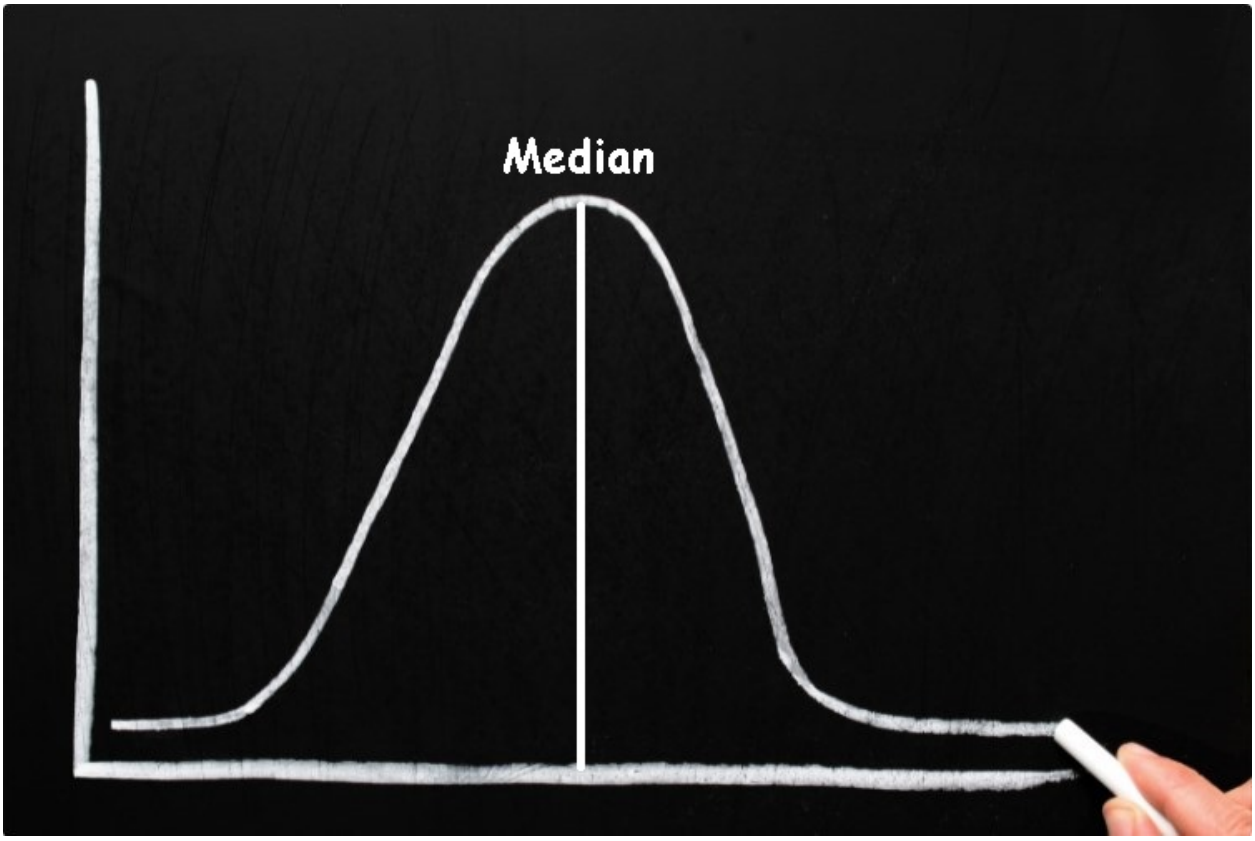
FIFTYFOUR

STANDARD DEVIATION

When we speak in statistics of the standard deviation or the standard deviation, it is represented by the Greek letter Sigma (in lowercase), as well as by the Latin letter (s) or by its acronym in English SD (Standard Deviation) and is a measure A that quantifies the spread or variation of a data set.

When we have a decreased standard deviation, this implies that most of our data from the sample are grouped very close to the “expected value”, that is, its mean. If, on the other hand, we have a high standard deviation, this tells us that our data is extended over a more extended range of values.

It is important to note that the median is calculated by adding all the data we have and dividing it by the number of data.



54.1 General considerations

When we refer to the standard deviation of some statistical population, random variable, probability distribution or data set, we can find it with the square root of its variance.

$$= var$$

But what if we ask ourselves what is the variance? Variance is the measure of dispersion that exists between a random variable, but with respect to its mean value. It must be understood that this is nothing more than the mathematical expectation and to find it we must first square the difference between the variable and what is expected of it.

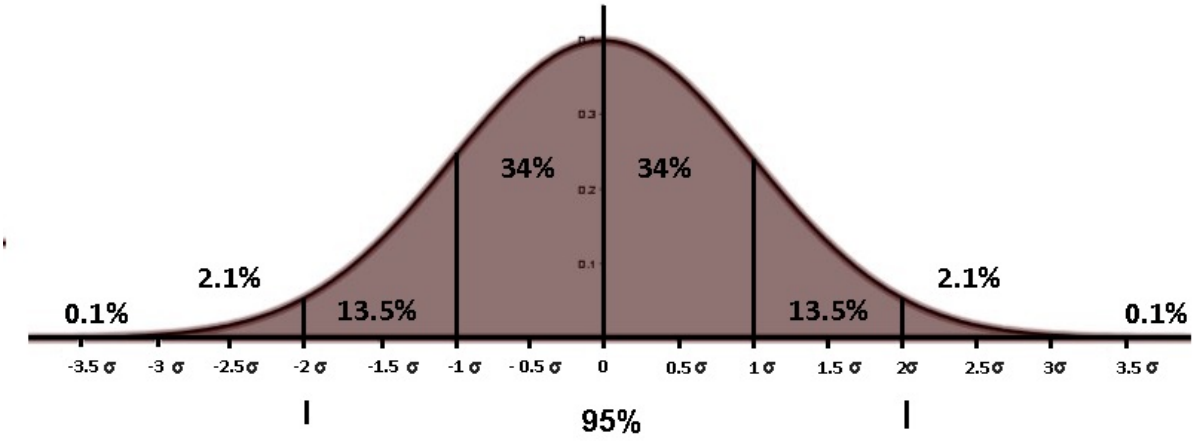
While it is true that this is algebraically much simpler, in practice the standard deviation can be considered to be less robust than the mean deviation. However, a standard deviation has a very useful property and that is that it can be expressed in the same units as the data from which that standard deviation came and also expresses the variability that a population has.

On the other hand, the standard deviation is also used to measure the reliability of our statistical conclusions. For example, when we refer to opinion polls, we can calculate the margin of error that our data has, through the standard deviation of the results, of course, to achieve this, the survey must be repeated several times.

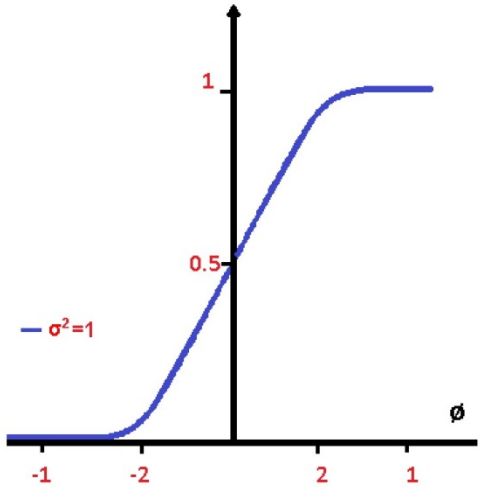
This type of interpretation of the standard deviation is what is called "the standard error" of the estimate and when it refers to a statistical median, it is called "the standard error of the mean". So we can calculate all the means of a population from which we can extract an infinite number of samples, to later calculate the mean for each of those samples and then obtain our standard deviation through the formula.

You should be aware that the standard deviation obtained from a population and its standard error (such as the mean) are very different, but are related by a factor, which is the inverse of the root of the number of data taken from the sample. . Now, the margin of error that any survey has, can be calculated by means of the standard error that its mean has. But you can also calculate the margin of error, such as the product that exists between the standard deviation that the population has, by the inverse of the square root of the amount of data that is represented in the sample (it is the same).

Generally, if we take a 95% confidence interval, half its width will be approximately equal to twice the standard deviation.



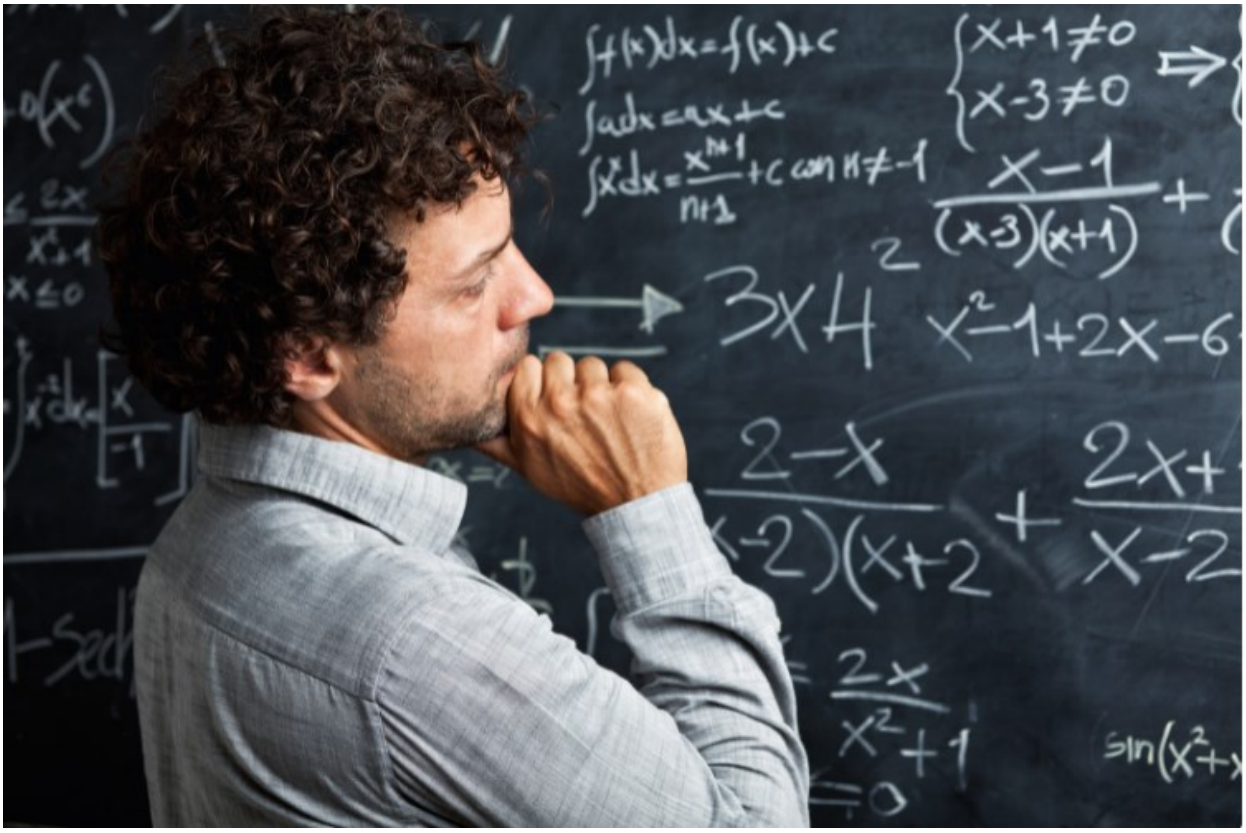
Many scientific researchers consider the standard deviation from experimental data, and only those effects that are twice the standard deviation away from what they consider to be "expected" are what researchers can consider statistically significant. This is how they distinguish common variation in measurements, or normal random error, from truly genuine and significant effects.



When it comes to finance, the standard deviation is also an important indicator, since the rate of return on any investment uses this deviation to give you an idea of its volatility. Suppose we have at our disposal a sample of data from some population of our interest, the sample standard deviation or standard deviation of the sample, can refer to twice what is known as the standard deviation applied to these data or it can also be a amount to which an adjustment is made to serve as an unbiased estimate of the much-referred standard deviation applied to the entire population.

Let's go with an example to clarify the above:

A math teacher after an exam obtained the following results:



04, 17, 09, 10, 12, 05, 15, 14, 11, 10

1. The teacher considers that the range of the points obtained in his last test is very large. What would the range be?
2. You have indicated that if the mean deviation of the test is greater than 4, you will repeat the test. Will the students take the test again?
3. The class teacher has pointed out that if he obtains a variance of 7, the results would be favorable. What would the variance be?
4. You also decide that depending on twice the standard deviation, you will repeat the test. Given the case that 2 > 6 will propose to carry out another exam, will this be the case?

The first thing I have to do is order my data from smallest to largest:

04, 05, 09, 10, 10, 11, 12, 14, 15, 17

$Answer1) The range is the greatest distance that exists between the proposed data and can be calculated by subtracting the maximum$

$Answer2) To calculate the mean deviation, it will first be necessary to know what the population median (m) is, so we must add all the$

$Answer3) To calculate the variance we must use the following formula: Var = (Xi - m)/N, where i will vary from 1 to n [(04 - 1$

As we know, the variance measures the dispersion of the data representing the variable, but with respect to the arithmetic mean, so the greater the variance, the greater the difference between the data and the mean, that is, the greater the variability. If the teacher assumes that a variance of 7 is favorable, we can deduce that a variance of 15.21 will be unfavorable.

$Answer4) Standard deviation (as we mentioned earlier) is a measure of dispersion used in statistics and is calculated as := 15.21 =$

54.2 About the Author

Graduated in Mechanical Engineering, and a master's degree in teaching component, I gave classes in several institutes of mathematics and physics, but I also dedicated several years of my life as a television producer, I did the scripts for mikes, the camera direction, editing of video and even the location. Later I was dedicated to SEO writing for a couple of years. I like poetry, chess and dominoes.

CHAPTER

FIFTYFIVE

STATISTICAL ESTIMATION

Predicting something that is happening or something that has already happened, is ultimately the basis of statistics and is deeply rooted in our daily lives. We can also make estimates around a range of possibilities. When for example we say "I think I can finish this task in about six or seven days", we are already defining a time interval to complete it.

When it comes to data analysis, we apply certain technical nuances and this article is intended for the specific concept of estimation. We will start with the point estimation, later we will deal with the estimation model, but focusing on intervals.

55.1 The point estimate

Estimating in statistics means inferring and it is a process by which we can establish what value a parameter has according to what we can deduce from statistical data. That is, estimating is nothing more than establishing certain conclusions, with respect to the population characteristics and according to the results of the sample.

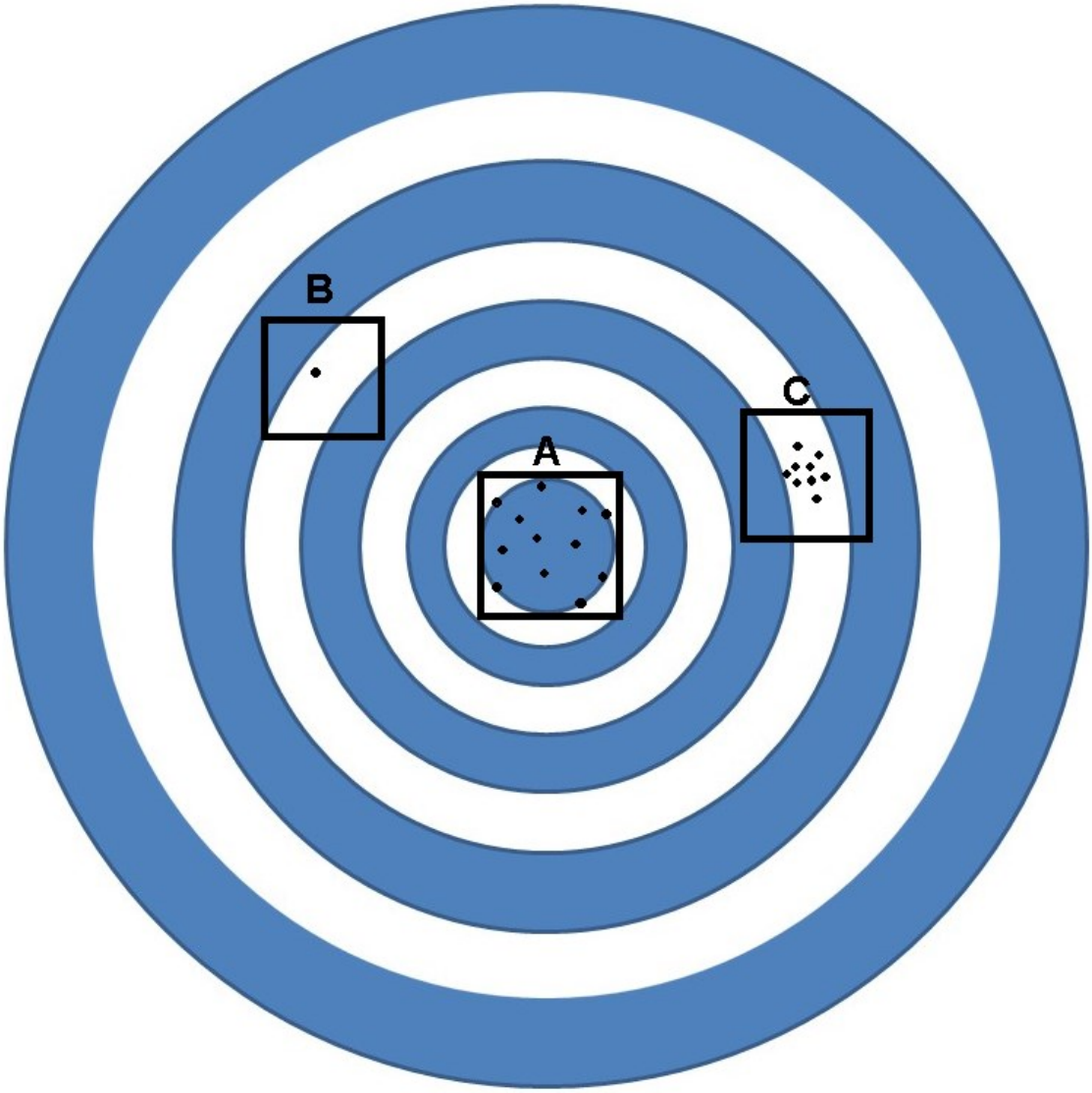
When we establish a specific value, what we call a point estimate (that is, a point) but with respect to the parameter. In other words, the value that we choose as a parameter is placed on the "X" axis and it is precisely the one that provides us with a specific statistical data and is usually called an estimator. For example, if we use the arithmetic mean of a certain sample, in this case, the arithmetic mean will be the estimating parameter.

It is important not to erroneously conclude that every parameter that is inferred from statistical data ends up being the same function or formula but calculated in the sample. Suppose we want to estimate the population mean, for this we must assign the value of the proportion specifically in the sample, in the same way if we want to estimate the population variance. But we must be very careful since this rule has its exceptions, so it is best not to think that way as a rule or pattern.

On the other hand, we will call a constant trend bias. Let's go to an illustrative example, if we affirm that the shotguns found at fairs are specially designed to deviate or miss. We can come to the conclusion that if this deviation is fixed and constant, we can then speak of bias, but if it is not fixed, in this case we will speak of a random variation.

Let's look at the figure, if the objective is precisely to hit the center of the target, we can speak of a random variation when we refer to the shooting area "A". But this area cannot be classified as bias thinking of missing, since the shots are precisely around the target.

While in area "B" we can speak of a clear bias, since all the shots are around the same point, but as we can see, that point is not near the center of the target. When we refer to area "C" it is an example of a mixture of both situations, since although it is true that there is a bias, there is also a random variation. This is because the shots are in an area that has some random spread, but all the shots are concentrated around a point that is offset from the center of the target.



In general, the estimators provide a random dispersion, but it is important to take into account that the set that contains all the samples that come from the same population always provide different values. This implies that there is random variation that we have to deal with, as it is unavoidable.

But the situation may be even worse, since it is possible that the chosen estimate has a bias, therefore, not only will it be varying around a point, but also that point around which it varies is not precisely the real population value in the one we are interested in. However, this can be avoided by using estimators that are not biased. For this we will use a resource that is "the expected value", to achieve this we will use the arithmetic mean, but from our sample distribution of the estimator. The expected value is nothing more than the value (as your phrase implies) that we hope to obtain. It is important then, to choose an estimator so that the expected value specifically matches the parameter. For this, it will be necessary to use the arithmetic mean of the sample, but in this case, we will handle it as an estimator of the population arithmetic mean.

For example, we are interested in knowing how many people will vote for the WW party in the next elections or perhaps, how many cigarettes are consumed in this population for the month of May.



To answer these questions we will use a previous estimate that can come from a proportion or an arithmetic mean. Suppose that the voting population is made up of 1 million inhabitants and we are going to work with a sample of 300 inhabitants, of which 132 of them profess that they will vote for the WW party, this implies that:

$$132/300x100 = 44We can say that a specific estimate indicates that 44\% of the population will vote for the WW party and as there ar$$

We will then be talking about 440.000 people.

On the other hand, we are going to suppose that an average of 50 cigarettes are smoked per month, taking this as the arithmetic mean of our sample, therefore, the point estimate will indicate that 50 cigarettes will be smoked per person during the month of May. However, we know that there are 1 million inhabitants, so the average will be 50 million cigarettes per month. Therefore, for the estimation of the totals, we do not go down an alternative path, we simply extend the previous estimate of a mean or a proportion.



It is important to emphasize that point estimates when established in the center of the objective are not exactly a good option. Although it is true that they solve certain procedural problems, when the parameter has exactly the legitimized value, it is actually a very difficult coincidence to find.

Let's go to another specific example, this time we want to know the average time that exists between one breath and another while sleeping. As we all know, we cannot sample all adults over 18 years of age and Europeans, which is the population that interests us, there are too many millions on the continent. So we are going to select a random sample of 350 adults over the age of 18.

After measuring the mean time of our sample, we obtain an average of 5 seconds. If we make a point estimate, we can conclude that the mean time between one breath and another is of course 5 seconds. Suppose for a moment that we can know the precise value that concerns us in that population and that the value is 5.2 seconds, of course we ask ourselves if we have been correct or not, when the difference is 0.2 seconds.

For the majority, they will surely gladly accept either of the two approaches, since the difference is too small to deny the conclusions obtained in the study and in this way, we are not making a point estimate, but thinking about an interval close to 5 which marks an acceptable deviation.

In short, if we fix a point (as we must do for the point estimate) we cannot then use a reasonable interval and continue saying that it is a point estimate, since 5 seconds is not exactly the exact value of the parameter, which as we already know which is 5.2. While it is true that some will not attach importance to them, the estimate is not the true value. That is why point estimates, in the strict sense, tend to err.

In general, what we do in practice are estimates by interval and we use an acceptable range such as "plus or minus", so the best way to express our result is that a sleeping person takes about 5 seconds between one breath and other. But in statistics that of "more or less" is very imprecise and incomplete, so that we must establish a specific range of what we consider to be our "more or less" to get to be pleased with the result. For example, we can set plus or minus 0.3 seconds and then our conclusion will be an interval of $5 \pm 0.3 = \{4.7; 5.3\}$ and this is our first example of what an interval estimate is. The set range is what we call "precision error".

Now, what should we take into account to establish this precision error? When we estimate the mean of a population over an interval, calculating the precision error requires us to have a value, such as the standard deviation of that population. But that is not our objective, we just have no other option to limit it in some way, in order to continue with the process that concerns us.

It is then necessary to make a point estimate, which will consist of establishing a standard deviation of the sample. Suppose you make a bet with a friend that the next person to walk past you is 30 years old. Being your friend, I would accept the bet without hesitation, since if the person passing by is 30 years, 5 months and 2 days old, in the strict sense of the bet, it is not 30 years. So to avoid such inaccuracies, it is always best to use a range.

We are going to establish two different intervals, interval A: a person whose age ranges between 28 and 33 years. An interval B, where the person is between 15 and 50 years old. Of course, if we choose interval B, a person whose age is between 15 and 50 will be much more likely to pass. This denotes that the wider the interval, the more possible results will be integrated and the more likely it is to get it right. This implies that there is a factor within an estimate and that is, security, so the greater the security in an estimate, the more likely I am to be wrong.

Summarizing, we can have three perfectly defined elements in an interval estimation: The initial element, which is of course the estimator, to later establish the precision error that will lead me to be more or less certain.

The sample determines the value of the estimator and it is not something in which we have much interference, but the security, we know, is a function of the choice of our precision error. Therefore, we must choose one of these two remaining options and calculate the value that the other must have. Both elements are related and are inversely proportional, so as security increases, precision decreases and vice versa. Although it is true that achieving this balance is something complex to explain, we can tell you that it also depends on other factors such as habit, tradition and the fear of explaining.

The most logical recommendation in an interval estimation is to start by deciding the security to be reached and depending on it, the precision error value is calculated, to later build the interval.

The advisable process is:

1. Choosing the ideal safety and precision values, of course, excessively ambitious values will undoubtedly generate very demanding circumstances.
2. The size of the sample that leads us to achieve these priority objectives of precision and safety must be calculated.
3. Obtain the sample.
4. Obtain the statistical value that is going to be used as an estimator and which, therefore, is the one that provides the central point of your interval.
5. Subsequently, it is calculated in precision error, according to the information provided by the sample and taking into account the desired safety.
6. The interval is constructed

As we already know, there is no absolute security and the more security we want to obtain, there will always be a price to pay, many times that price will lower the precision or perhaps we will have to take a sample so large that it becomes impossible or very difficult to handle, either because of the cost of time, money, etc.

The best thing then will be to take a fairly reasonable security and it should be closely linked to the consequences of the error that we are willing to assume. For example, if I am depending on the probabilities that a parachute opens or not, the consequences can be fatal, so if my life depends on it, I will demand the maximum possible security.



However, if you sell expensive last generation motorcycles, you may accept the job when the security will be 10%, therefore you will sell one out of every 10 motorcycles. But note that the probabilities in both cases are very different, since the consequences when making a mistake are very different and that is when it will be necessary to place oneself in the specific circumstance when making decisions regarding a value for the safety.



However, this lacks a procedure that manages to limit a specific probabilistic value, they are only general principles. But Ronald Fisher made progress in this regard, it occurred to him that a certain elderly lady was able to differentiate whether the milk or tea had been poured first into a cup of tea with milk, being able to decide just by tasting a small amount of mix.



Fisher decided to limit the amount of successes with which one could come to believe in the lady, of course, we must accept any error on her part. Let's suppose that we give him 10 cups, the fact that he guesses all of them can happen 1 time out of every 1000 times that we submit anyone to this test, yes, the person in this case is going to get it right by chance and not like the lady, who has some knowledge about it.

Now, if anyone gets it right all but one time, when it comes to determining the order in which the milk tea mixture was composed, it is something that can happen in 1 out of every 100 tests. The fact that two fail will happen 1 out of every 25 times, that is, 4%. That is why Fisher thought of varying the study, where there will be 8 cups, of which half will be served one way and the other half, in the reverse order. It was then that he asked the lady to distinguish them by separating the possibilities into two groups, where he came to the conclusion that when it comes to safety, 95% was a good level. This implies that the lady had a probability with a maximum of 5% of hitting it by chance.

Of that, a little less than 100 years have passed and that value proposed by Fisher, still prevails. In fact, if any researcher decides to use 94%, they should be prepared to answer Why? Since 95% has been assumed as the standard value, but if someone requires greater security, then they resort to 99%, apart from these two values, it is very difficult to find a research work with another security value.

55.2 The precision error

The first thing to calculate is the value of the estimator that, as is usually the mean, we will call it (m), the following is ultimately the value of our precision error (ep) and for this we must first establish the security, to which we will call (ø) which will also depend on the particularities of our sample. Once we get to this point, the only thing left is to construct the interval and in this case, it will be necessary to subtract and add to the estimator, our precision value:

$$: m - ep, m + ep$$

There is a parameter to be defined and it is dispersion. One of the examples we mentioned earlier is the number of cigarettes consumed in a town during the month of May. But in this population, everyone smokes the same amount and there is no need to set an interval around a value that does not vary. If all the people smoke exactly 3 cigarettes, then that will be the mean and its variance is zero. So when we have 50 people and each one of them smokes 3 cigarettes per month without exception, the precision value will be zero, this implies that it is not necessary to establish an interval and it is not only a point estimate, but also with a 100% security.

But suppose that we find a population with a completely different situation. In other words, in that population there are many people who smoke an immense amount of cigarettes, while other people smoke absolutely nothing and the rest smoke dissimilar amounts. Now, if we take a sample of 50 people from this new population, we will of course have very different amounts for the number of cigarettes smoked in this population during a month.

This will lead us to the fact that in order to maintain acceptable security, the precision error must be very high, so that the interval is wide enough to include so much variability. In this case, the mean that we have chosen to establish the variation of this characteristic is the standard deviation, but as such characteristic belongs to a variation within the population, then we speak of a standard deviation of the population and we will call it ().

So we can say that the precision error will depend on three elements. The first of course is the security level, so the lower the security, the greater the precision error and the larger the interval. The resource to be used to represent safety will be a standardized distance value, which we will call Zsec. But the sample size is missing and we will call it (n), so the larger the sample size, the estimated value will be much closer to the parameter, therefore, the distance between the parameter of the estimated value will be smaller. This is more or less obvious, since the more individuals make up our sample, the more precision we will have when drawing conclusions. Taking into account all the elements, the formula that defines our precision error is:

$$ep = Zseg/(n)$$

It is important to take into account that this formula is applied in random samples of very large populations, otherwise, if the population is rather small, the expression of the formula will be different. However, it is very common to use this formula, even with other sampling models.

In statistics this fraction: /(n) It is what is known as the standard error.

55.3 About the Author

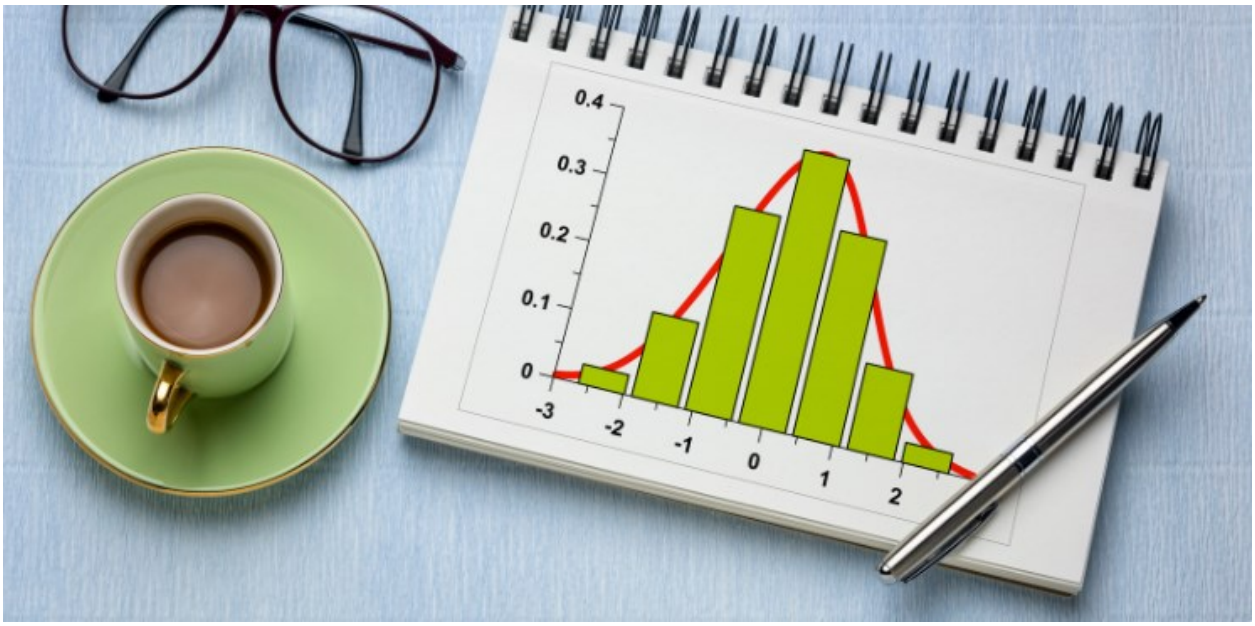
Graduated in Mechanical Engineering, and a master's degree in teaching component, I gave classes in several institutes of mathematics and physics, but I also dedicated several years of my life as a television producer, I did the scripts for mikes, the camera direction, editing of video and even the location. Later I was dedicated to SEO writing for a couple of years. I like poetry, chess and dominoes.

CHAPTER

FIFTYSIX

TESTS TO SEE IF THE DATA MEET A NORMAL DISTRIBUTION

Parametric hypothesis tests have as a condition compliance with normality and for this it will be necessary to test this assumption. There are several tests to check the normal distribution, some more powerful than others and in this article we will name the main and best tests when it comes to checking normality. Through a simulation process, the power of each of the tests can be estimated using samples that come from known distributions, but yes, we can measure in each of these samples how far they are from normality.



Experience leads us to think that a moderate deviation from normality is not exactly of great importance in the tests of parametric hypotheses and that they can be carried out without major problems. But there are circumstances in which it is not possible to avoid such non-compliance and for these cases, there are two types of alternatives. The first is to use non-parametric statistics and the second is to use equivalent methods, in these cases no assumptions are required regarding the distribution of the data. But if the assumption of normality is fulfilled even in an approximate way, the use of parametric methods is much more recommended, since they are much more powerful than non-parametric methods.

Many times some mathematical function is used that is capable of transforming the data in such a way that the new values can fulfill the required assumption. After the data is transformed, the new values are checked again to see if they meet the normality assumption.

The Shapiro Wilk test for many is one of the best options, since its power is very high, with the exception that it is used only for those non-normal distributions that are large enough and with strong distances. For small sample distributions and weak deviations, almost none of the usual tests appear to be good enough. Tests based on equivalence approaches can also be used and most likely, they may be somewhat better than the tests mentioned above.

Most of the techniques used in statistical inference such as hypothesis testing, regression analysis, forecasting models,

etc. They are based on parametric models and, as we know, these models are subject to the assumption of normality. We can find in the literature several hypothesis tests proposed in order to verify whether or not the data come from a normal distribution, there are approximately 40 tests developed for this purpose and in the face of this wide range of options, the rigorous question with which we finds the researcher, is which of these tests is the best alternative to check the assumption of normal distribution in his data.

Multiple investigations have been developed in order to establish some criteria for comparison, which allows the researcher to objectively determine which is the most appropriate test. The comparison criterion most used by researchers is based on estimating through a simulation process the power that the different normality tests have, in order to recognize those tests whose power is the highest for their investigation. To estimate the power of 33 tests with different sample sizes such as n = 25, 50, 100 whose significance levels are = 0.05 and 0.1, different symmetric non-normal distributions were used such as: Cauchy, Beta, Laplace, Student's t, Logistics and also other asymmetric ones such as Gamma, Chi square, Weibull, Log Normal, and Gumbelt) and others with modified normality such as mixed normal, contaminated normal, truncated normal and normal with atypicals to ensure the condition of non-normality . The power in all these cases does not change too much, regardless of whether they have different levels of significance. However, no specific test could be determined as the most powerful, as there are many different options based on the non-normal environment.

Another study that was even more detailed than the one previously mentioned, Shapiro Wilk together with Jarque Bera, was also carried out, in which the same distributions that simulated non-normal samples were used and were determined for the case of symmetric samples, being the most powerful tests. For these symmetric samples, Shapiro Wilk and Anderson Darling were used, which in this case were the best option.

In another investigation, sample sizes with n = 20, 30, 40, 50 were used and it was possible to determine that the samples generated from a Beta distribution, the most powerful test ultimately turned out to be that of Anderson Darling and in the case of samples generated by a Log Normal or a Gamma, the most powerful test ended up being that of Jarque Bera.

In all these studies, in order to estimate power, samples were sought such as the probability distribution that, being not normal, most of them tend to normal in some way and that is why they can affect the results found. On the other hand, in a real analysis, the available data should not necessarily conform to some previously known non-normal distribution, such as those we present in previous studies, since in some cases its distribution will be totally unknown.

Although it is true that generating unknown samples is as important as those samples that come from known distributions, however, they have not been presented in the aforementioned investigations. Therefore, the following study is proposed in which, through a stochastic simulation process, the power of 7 normality tests is estimated, using the Fleishman system to generate samples of unknown distribution, but which in turn is known to They are found in the real data and with different levels of contamination and away from normal.

Taking into account previous research and the most common tests of normality established in statistical software, in most of the literature that covers the subject, it is proposed to study the power of the following tests capable of contrasting the following hypotheses:

Ho: The data come from a normal distribution

H1: The data do not come from a normal distribution

56.1 Shapiro Wilk test

This test is used to contrast normality in the case that the sample size is less than 50 observations. The idea is to order the sample from smallest to largest and calculate both the mean and the sample variance. If the Shapiro Wilk statistic is less than the critical value obtained in tables, then the null hypothesis is rejected. It is important to take into account that the table is entered with the values of the level of significance and the size of the sample.

In this normality test, it is considered that the normal probability that comes from the adjustment of the sample data for the normal distribution is similar to a linear regression and that is why the diagonal line of the graph fits perfectly, with the difference that this line is similar to the residuals of a regression.

The test statistic to use is:

W = $\frac{b^{2}}{\sum_{i = 1}^{n}{(xi - \overline{x})}^{2}}$

Being the term b = $\sum_{i = 1}^{k}{ai\ \left\lbrack x_{(n - i + 1)} - \ x_{i} \right\rbrack}$ where ai is a coefficient that is tabulated for each sample size, being the position "i" of each observation. On the other hand, the term $\left\lbrack x_{(n - i + 1)} - \ x_{i} \right\rbrack$ is equivalent to the differences obtained when the first from the last value is subtracted, successively from the second from the penultimate value, the third from the penultimate value and so on until the last value is subtracted from the first value. We are going to suppose that we have seven values, then we can conclude that the sequence of differences is going to be the following:

The acceptance zone for the null hypothesis is made up of the values of the test statistic W, which are less than the expected value or the value that is tabulated $W_{(1 - \alpha;\ n)}$

Acceptance zone = W calculated $\ W_{(1 - \alpha;\ n)}$

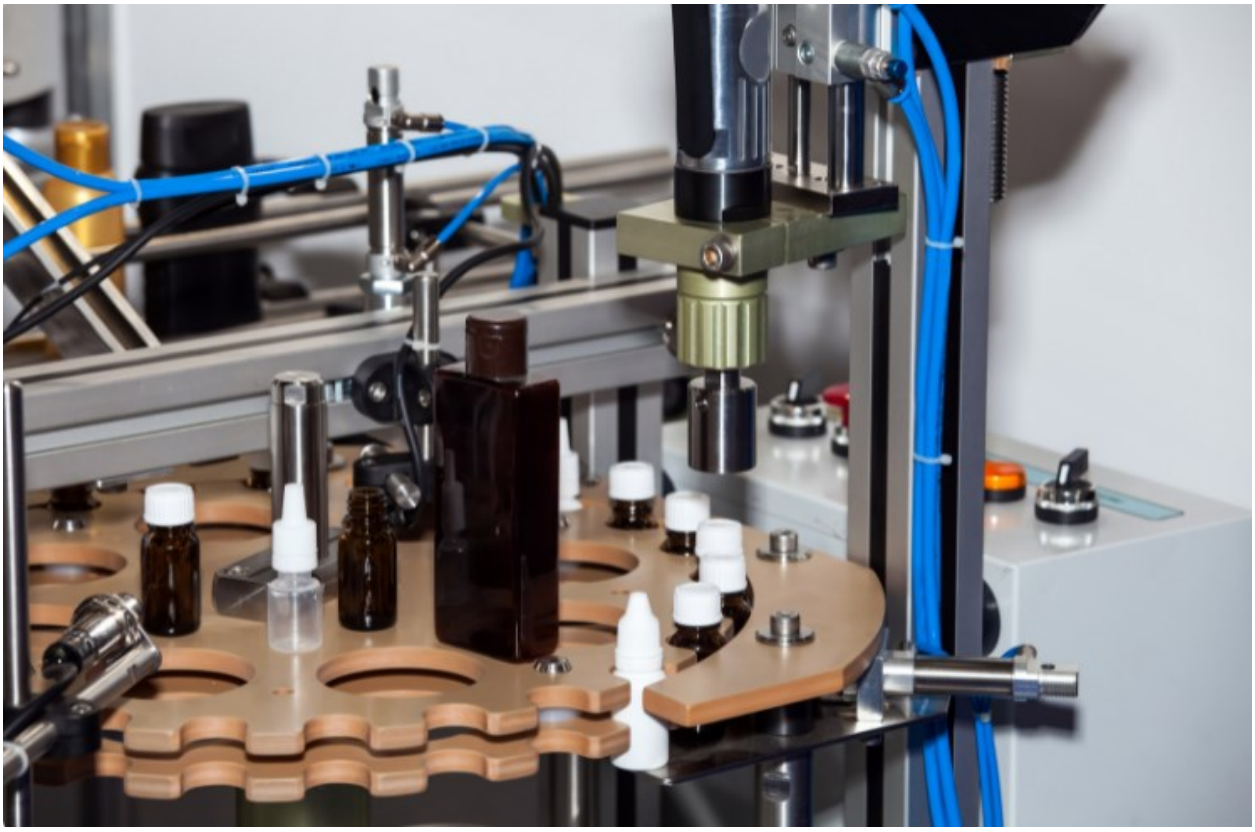
Let's go with the first example: Suppose that a factory has an automatic dispenser that is used to fill containers of a medicine whose volume is 16 ml, eight bottles were selected through random sampling and their packaging volume is measured, where the following results are obtained:

16 ml; 15.9 ml; 15.97 ml; 16.04 ml; 16.05 ml; 15.98 ml; 15.96 ml and 16.02 ml

We want to know if the variable of the volume served follows a normal distribution, for this the normality test of Shapiro Wilks is used and the following hypotheses are raised:

Ho = The random variable that represents the volume served does not have a normal distribution

Ha = The random variable represents the volume served has a normal distribution



The steps to follow in the Shapiro Wilks normality test are as follows:

1.- A table made up of the following columns is built:

a. 1st column: All those values that make up the variable studied are listed (i = 1, 2, 3,. . . , n)

b. 2nd column: The values of the variable are ordered in ascending order (Xi)

c. 3rd column: The values of the variable are ordered in descending order $X_{(n - i + 1)}$

d. 4th column: the values of the 3rd column are subtracted minus those of the 2nd column

e. 5th column: The values of ai that are tabulated are searched for a sample of size n = 8

f. 6th column: It is made up of the product $ai\ \left\lbrack X_{(n - i + 1)} - \ X_{i} \right\rbrack$, that is, the values of the 5th column are multiplied by the 6th column

g. 7th column: ${(Xi - \overline{X})}^{2}$ is calculated

The test statistic is obtained by dividing the square of the sum of the values in the 5th column $b^{2}\ $= $\left(\sum_{i = 1}^{k}{ai\ \left\lbrack x_{(n - i + 1)} - \ x_{i} \right\rbrack} \right)^{2}\ $ between the sum of the 6th column $\sum_{i = 1}^{n}{(Xi - \overline{X})}^{2}$

W = $\frac{b^{2}}{\sum_{i = 1}^{n}{(Xi - \overline{X})}^{2}}$ = $\frac{{(0,0159)}^{2}}{0,0166}$ = 0,9553

The acceptance zone for the null hypothesis is obtained by contrasting the value of W (0.95; 8) with the critical value obtained in the tables. To obtain the value in the tables, it must be entered with the level of significance and the number of observations:

As we can see with a significance level of = 0.05 and n = 8, we obtain a critical value of 0.818. The decision rule to know if we are within the acceptance zone is to compare both values and if the Wcal Wcritical, the null hypothesis must be rejected. In this case, it is indeed what happens, since:

0.9553 0.818

So we can conclude that the null hypothesis is rejected with a confidence level of 95% and therefore, the alternative hypothesis is accepted. This implies that the variable representing the volume served is normally distributed.

We now go with a brief introduction to the Kolmogorov Smirnov normality test. It cannot be compared to the Shapiro Wilks test, since for Kolmogorov Smirnov both the mean and the variance must be known and it cannot be estimated solely from the data, on the other hand the Shapiro Wilks test can be used in samples whose mean and variance are not specified.

The Kolmogorov Smirnov test makes it possible to compare whether the sample score follows a normal distribution or not. This test is part of a group of so-called goodness-of-fit tests, the main characteristics of which are that they pose a hypothesis regarding fit or independence, the mean of the variables is low (ordinal), they do not have excessive restrictions, they are robust and applicable to small samples.

The Kolmogorov Smirnov test is a test that belongs to statistics and that aims to extract information regarding populations. It is used to corroborate whether the scores obtained from a sample follow a normal distribution. Thus, it allows to measure the level of agreement that exists between the theoretical distribution and the distribution of the data set. The objective of this test is to indicate if the data come from a population whose theoretical distribution is specified, therefore, it reasonably tests whether the observations could come from this distribution. The rigorous question is: Do the observations come from some sample with a hypothetical distribution?

The idea of the proposal of the null hypothesis and the alternative hypothesis is to demonstrate that the empirical sampling distribution agrees with the population distribution, for this it is established that the hypotheses are:

Ho = establishes that the empirical distribution is similar to the theoretical one

Ha = states that the observed frequency distribution is not similar to the theoretical distribution.

In short, in this case there is no attempt to reject the null hypothesis and it is convenient that it has a good fit and, therefore, that it is similar. On the contrary, the alternative hypothesis as opposed to the null one determines a bad fit and therefore, that the distribution of the data is not similar to the empirical one.

Conditions for using this test: The way to apply the test correctly is by assuming a series of assumptions. The first thing is that the parameters of the distribution have been previously specified and these parameters are estimated from the

sample. It is also necessary to assume that the standard deviation and the mean are parameters of a normal distribution. On the other hand, the maximum and minimum values of the sample determine the range of a uniform distribution.

When determining deviations from a hypothetical distribution, the capacity of this test can be greatly diminished. Thus, to achieve its contrast with a normal distribution of estimated parameters, it will be necessary to consider the possibility of complementing the Kolmogorov Smirnov test with the Lilliefors test.

56.2 Advantages of Kolmogórov Smirnov

1.- It is more powerful than other goodness-of-fit tests such as Chi square.

2.- It does not require data grouping, so it is easier to use and calculate.

3.- The statistic of this test only depends on the size of the sample, since it is not dependent on the frequency distribution.

56.3 Example of the test kolmogorov Smirnov

We are going to apply the steps to follow for this test with a specific example, for subsequent observations simply follow the same steps that are exposed below:

A researcher measured the height of 100 children with an age of five years and wants to know if these observations come from a normal distribution.



The null and alternative hypotheses are established:

Ho = There are minimal differences between the theoretical values and the observed values of the normal distribution

Ha = The values of the theoretical frequencies whose distribution is normal and the observed values are very different.

For probability values that are less than or equal to 0.05, the null hypothesis is rejected and the alternative hypothesis is accepted.

For all probability values greater than 0.05, the alternative hypothesis is rejected and the null hypothesis is accepted.

After the corresponding measurements, the following results were obtained:

Where the total average of the sample gives a value of $\overline{X\ }$= 99.2 and its standard deviation is = 2.85

The first step is to calculate the expected theoretical values to obtain a normal distribution. For this, it will be necessary to determine the value of Z with the limits of each interval, for example: in the first interval, Z must be calculated for both the lower and upper limits, that is, a Z for 90 and another for 93, but In subsequent intervals, Z should be calculated only for the upper limits, in this case they are: 97, 101, 105 and 109.

To calculate the Z values, you need to use the following formula:

Z_{90}= $\frac{X1 - \ \overline{X}}{\sigma}$ = $\frac{90 - 99,2}{2,85}$ = -3,23

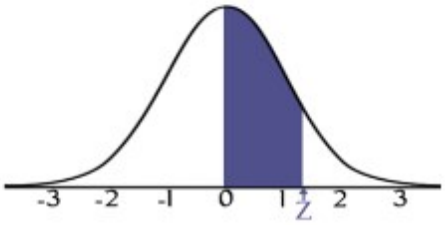
Z_{93}= $\frac{X2 - \ \overline{X}}{\sigma}$ = $\frac{93 - 99,2}{2,85}$ = -2,18

Z_{97}= $\frac{97 - 92,2}{2,85}$ = -0,77

In this way we continue to calculate each of the Z values corresponding to the subsequent upper limits and place them in a table:

56.4 Interval limits Z values of interval limits

Once all the Z values have been obtained, we must locate the area under the normal curve that is typified in the table. To reach the required value, we must place the whole number with its first decimal place in the left column, and we place the second decimal place in the upper columns and find the value that intersects both numbers. For example, for the first value of Z we have:

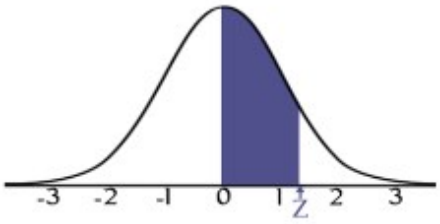


STANDARD NORMAL TABLE (Z)

Entries in the table give the area under the curve between the mean and *z* standard deviations above the mean. For example, for *z* = 1.25 the area under the curve between the mean (0) and *z* is 0.3944.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0190	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2969	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3513	0.3554	0.3577	0.3529	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998

As we can see, we obtain a value of 0.4994 in the table for Z = 3.23, but since it is negative (-3.23) we must also take the value obtained in the table as negative. We carry out the same procedure for the rest of the Z values and obtain the following results that we will place in the third column:



STANDARD NORMAL TABLE (Z)

Entries in the table give the area under the curve between the mean and *z* standard deviations above the mean. For example, for *z* = 1.25 the area under the curve between the mean (0) and *z* is 0.3944.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0190	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2969	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3513	0.3554	0.3577	0.3529	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998

The fourth column is made up of the difference of the standardized values below the area of the curve obtained in the table, for example if we subtract the first two values we have: -0.4854 - (-0.4994) = 0.014. In the same way, the following values are subtracted, with the value of the previous interval, thus filling in the 4th column.

The 5th column is made up of multiplying the differences in areas found in the 4th column by the size of the sample, which in this case is n = 100. For example: 0.014 x 100 = 1.4 we repeat this procedure to the rest of the values, while

the 6th column will be made up of the accumulated frequency (fa), that is, the value of the 5th column is added the next value and so on.

In the following table we will show the theoretical frequencies and the observed frequencies that are adapted as follows in the corresponding intervals and then, it is when the Kolmogorov Smirnov method is applied.

56.5 Calculation of the D statistic of the Kolmogorov Smirnov test

As we can see, the maximum difference in D is 0.049 and this is going to be the value that we are going to compare with the critical value D obtained in the table. The problem is that when we go to the table the maximum value of the number of samples observed in the table is N = 40 in this case N = 100, so we must use the formula for a set of observations greater than 40.

Anexo 3. Valores Críticos para la Prueba Kolmogorov-Smirnov

http://www.udc.es/dep/mate/estadistica2/documentos-pdf/dmtablas.pdf

n/α	0.200	0.100	0.050	0.020	0.010
1	0.900	0.950	0.975	0.990	0.995
2	0.684	0.776	0.842	0.900	0.929
3	0.565	0.636	0.780	0.785	0.829
4	0.493	0.565	0.624	0.689	0.734
5	0.447	0.509	0.563	0.627	0.669
6	0.410	0.468	0.519	0.577	0.617
7	0.381	0.436	0.483	0.538	0.576
8	0.358	0.410	0.454	0.507	0.542
9	0.339	0.387	0.430	0.480	0.513
10	0.323	0.369	0.409	0.457	0.489
11	0.308	0.352	0.391	0.437	0.468
12	0.296	0.338	0.375	0.419	0.449
13	0.285	0.325	0.361	0.404	0.432
14	0.275	0.314	0.349	0.390	0.418
15	0.266	0.304	0.338	0.377	0.404
16	0.258	0.295	0.327	0.366	0.392
17	0.250	0.286	0.318	0.355	0.381
18	0.244	0.279	0.309	0.346	0.371
19	0.237	0.271	0.301	0.337	0.361
20	0.232	0.265	0.294	0.329	0.352
21	0.226	0.259	0.287	0.321	0.344
22	0.221	0.253	0.281	0.314	0.337
23	0.216	0.247	0.275	0.307	0.330
24	0.212	0.242	0.269	0.301	0.327
25	0.208	0.238	0.264	0.295	0.317
26	0.204	0.233	0.259	0.290	0.311
27	0.200	0.229	0.254	0.284	0.305
28	0.197	0.225	0.250	0.279	0.300
29	0.193	0.221	0.246	0.275	0.295
30	0.190	0.218	0.242	0.270	0.290
31	0.187	0.214	0.238	0.266	0.285
32	0.184	0.211	0.234	0.262	0.281
33	0.182	0.208	0.231	0.258	0.277
34	0.179	0.205	0.227	0.254	0.273
35	0.177	0.202	0.224	0.251	0.269
36	0.174	0.199	0.221	0.247	0.265
37	0.172	0.196	0.218	0.244	0.262
38	0.170	0.194	0.215	0.241	0.258
39	0.168	0.191	0.213	0.238	0.255
40	0.165	0.189	0.210	0.235	0.252
>40	$\frac{1.070}{\sqrt{n}}$	$\frac{1.220}{\sqrt{n}}$	$\frac{1.360}{\sqrt{n}}$	$\frac{1.520}{\sqrt{n}}$	$\frac{1.630}{\sqrt{n}}$

If we use a significance level of = 0.05, the corresponding formula for the critical value is = $\frac{1,36}{\sqrt{100}}$ = 0,136

Now we must apply the decision rule where the maximum difference of D calculated is compared with the critical value. Given the case of the maximum difference in D calculated is less than the critical value, the null hypothesis is accepted and the alternative hypothesis is rejected. In this case, the maximum difference in D actually calculated is

less than the critical value, since:

0.049 < 0.136

Therefore, the null hypothesis is accepted and it can be concluded that there are no significant differences between the calculated theoretical frequencies and the observed frequencies, this implies that the observations have a normal distribution.

56.6 Lilliefors test

The Lilliefors test is a correction of the Kolmogorov Smirnov test, which, as we know, is used when the parameters of its hypothetical distribution are known. The problem is that many times it is not so easy to know these values and that is when the Lilliefors test is used with estimates of the mean and standard deviation that are based on the sample data. However, the critical and statistic values will be the same as the Kolmogorov Smirnov test.

Let's go directly with an example to know how the Lilliefors test is used, suppose we have the following data: 6, 1, -4, 8, -2, 5, 0 and we want to know if they follow a normal distribution considering a significance of = 0.05 and we can see that the sample size is N = 7

The first step is to order the data from least to greatest: -4, -2, 0, 1, 5, 6, 8

Then we must establish the intervals that exist between these data:

X < -4

-4 X <-2

-2 X <0

0 X <1

1 X <5

5 X <6

6 X <8

8 X

The third step is to establish the probabilities, for example for the first interval the probability is zero, for the second interval it will be 1/7, for the third it will be 2/7 and thus we are increasing a number in the numerator and dividing it by the number of data, for each of the intervals

0 if X <-4

1/7 if -4 X <-2

2/7 if -2 X <0

3/7 if 0 X <1

4/7 if 1 X <5

5/7 if 5 X <6

6/7 if 6 X <8

7/7 if 8 X

The fourth step is to calculate the arithmetic mean of the observations in the sample:

$\overline{X}$ = $\frac{- 4 + (- 2) + 0 + 1 + 5 + 6 + 8}{7}$ = 2

In order to later calculate the standard deviation of the observations and for this, it will be necessary to square the subtraction of each of the observations minus the value of the arithmetic mean and that total is divided by the subtraction

of the number of observations minus one (N -1). The square root is extracted from the result of this calculation, the resulting number being the standard deviation:

= $\sqrt{\frac{(- 4 - 2)^{2} + {(- 2 - 2)}^{2} + {(0 - 2)}^{2} + {(1 - 2)}^{2} + {(5 - 2)}^{2} + {(6 - 2)}^{2} + {(8 - 2)}^{2}}{(7 - 1)}}$ = 4.43

Now I proceed to calculate each of the Z values with the formula:

Z= $\frac{(X - \overline{X})}{\sigma}$

Z1= $\frac{- 4 - 2}{4,43}$ = -1,35

Z2= $\frac{- 2 - 2}{4,43}$ = -0,9

Z3= $\frac{0 - 2}{4,43}$ = -0,45

Z4= $\frac{1 - 2}{4,43}$ = -0,22

Z5= $\frac{5 - 2}{4,43}$ = 0,67

Z6= $\frac{6 - 2}{4,43}$ = 0,90

Z7= $\frac{8 - 2}{4,43}$ = 1,35

Later I look in the tables of cumulative probability of the standard function in the same way as we did for the previous example, that is, the units of the first decimal in the left column and the second decimal in the columns that are found on top. For example, if Z = -1.35 we will search for -1.3 in the left column and 0.05 between the columns above and the intersection will be the value of interest of the cumulative probability, which in this case will be of: 0.0885. In this way, we are looking for the corresponding values in the table for each value of Z and we can place them in the following table:

As we can see, the first $X_{i}\ $ is made up of the data ordered from least to greatest.

The second column that we call φ_{7}(X_{i}) is made up of the probabilities that we previously established how to calculate them, only that we add the result of the division of the numerator by the denominator.

The third column φ_{7}(X_{i}) are the values obtained in the tables for each value of Z, while the fourth column is the calculation of the absolute value of the subtraction of the values obtained in the second column minus the third column $\left| {S_{7}\ \left(X_{i} \right) - \varphi}{7}(X{i}) \right|$.

The last column we obtain the first value always subtracting from zero (0) the first value of the column φ_{7}(X_{i}), but the subsequent values are obtained from the absolute value of the subtraction between the value obtained in the previous column of S_{7} (X) minus the value of the next row of the 3rd column φ_{7}(X_{i}) and so on.

The next step is to determine the test statistic to be able to contrast the hypothesis and for this the maximum value of the last column must be chosen, which in this case is:

Do = max $\left| {S_{7}\ \left(X_{i - 1} \right) - \varphi}{7}(X{i}) \right|$ = 0.1772

Now we go to the Lilliefors Test Table and we must enter with the values n = 7 for a significance of = 0.05:

We obtain the value of tables which we will call Dt = 0.3 and it is then that we proceed to contrast the value of the test statistic with that obtained in the table. In case the test statistic (Do) is less than the one obtained in the table (Dt), the null hypothesis is accepted and otherwise, it will be rejected (Ho). We can realize that the test statistic is less than the one obtained in the table, since:

0.1772 <0.3

Therefore, the null hypothesis is accepted and it can be concluded that the data have a standard normal distribution.

CHAPTER

FIFTYSEVEN

THE MONTE CARLO METHOD

The Monte Carlo method is used to approximate certain mathematical expressions that are extremely complex or simply very difficult to evaluate accurately. Its name comes as a reference to the Monte Carlo casino in Monaco that specializes in gambling. Roulette is a random number generator and that is how the Monte Carlo method works.

The creator of the Monte Carlo method was Stanislaw Marcin Ulam when during an illness he dedicated himself to playing "solitaire" and realized that it was much easier to obtain a general result of the game, performing multiple tests and counting the proportions obtained from the results, in instead of having to calculate all the probabilities.

This great idea was implemented in his work that was "The Manhattan Project" developed by the United States government with the collaboration of Canada and the United Kingdom, during World War II. The objective of this project was nothing more and nothing less than developing the first atomic bomb Although it is true that this method was not used in the development of the first atomic bombs, once the war was over, it was applied in quantum physics and nuclear physics research.

Ulam was working with John von Neumann and convinced him of great potential that this new method had, so both mathematicians worked together to develop it. Although the greatest contribution, in addition to Ulam, was made by Nicholas Constantine Metropolis (Greek mathematician and physicist who also worked on the Manhattan project) and Enrico Fermi (Italian-born physicist with excellent contributions in nuclear, quantum and particle physics).

The first formal publication of the Monte Carlo method was made in 1949 in an article where Ulam and Metropolis participated, where the latter led the reins of a team, which achieved the first simulation carried out with this method on the first "ENIAC" computer in the University of Pennsylvania (1948). The Monte Carlo method is considered one of the top 10 most important algorithms of the 20th century.

The simulation of probabilities in hydrodynamics with respect to the diffusion of neutrons in fission, has a completely random behavior and that is where the Monte Carlo method has its place. Today this method is fundamental in the algorithms that generate 3D images, in addition to providing solutions to a large number of mathematical problems that lead to experiments with random number samples on the computer.

The Monte Carlo method can solve problems such as complex volume calculation, cost minimization, optimization, etc. the idea is to try to generate random samples that are capable of corresponding to a specific probability function.

Let's suppose that we are studying the probability function of a given that, as we know, has six heads and each of these faces has the same probability of coming out.

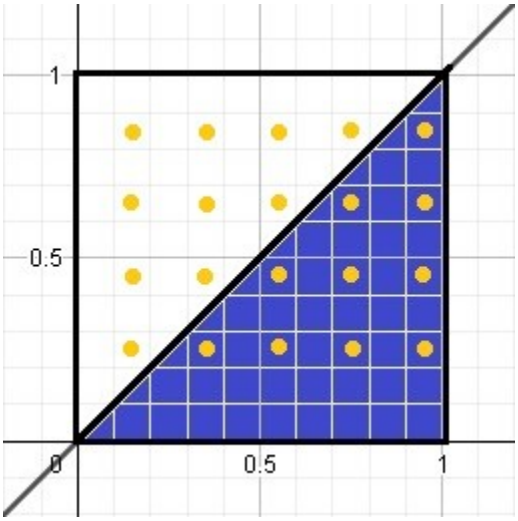
In this case, the probability function is 1/6 for each face and we realize that if we add each of the probabilities, the result is unity (1). In this example, the function is discrete when it only takes whole numbers and they can be counted. But we can also have continuous functions, such as the weight of each individual in a population, in this case, to calculate the probability area of this continuous function we must use integrals, although the result will always also be one (1).

When calculating integrals of continuous functions or other integrals of highly complex probability distributions, such as calculating the expected value, we find that these integrals are often very difficult to calculate analytically and that is when numerical methods of sampling to be able to approximate the result of this type of integrals. This is when it is advisable to use the Monte Carlo method, which is capable of generating random samples that are not only independent, but are also homogeneously distributed for a better approximation of the calculations.

The result of an integral is the area under the curve of a function between points a and b, to model it, we simply used a summation of successive rectangles and triangles where an area that we do not know can be found, with the sum of areas that we do know , as are the area of the rectangle and the triangle.

Then the Monte Carlo method appears, which allows solving mathematical and physical problems through the simulation of random variables.

Let's go to an example to illustrate the difference between both methods, suppose we want to find the area of the following figure:



Of course, this area is half of a square with side (1), therefore the area of a square is: 1 ^ 2 and its half will be: 1 ^ 2/2 = 1 ^ 2/2 = 0.5

Now, what the Monte Carlo method does is generate points within that frame, that is, it generates random values for me and distributes them evenly. If we count the total number of points generated and the number of points that are below the line, we realize that there are 20 points in total and below the line I have 10 points, when dividing the points under the line by the total points, it gives me 10/20 = 0.5.

Steps to use the Monte Carlo method

The first thing we must do is generate the points uniformly distributed between points 0 and 1 both on the "x" axis and on the "y" axis.

I draw the line y = x which in this case is my function

Then I count the total number of iterations or points, which in this case is 20

Later we must count the number of points that remained below the line and we realize that there are 10

Find the percentage represented by the points that are below the line, with respect to the total number of iterations, so that 10 represents 50% of 20, that is: 10/20 = 0.5

If we multiply the total area by the previous fraction, that is, the division of the points under the function by the total of scattered points, we will obtain the approximate area under the curve

l2 (0.5)= (1)2 (0.5)=0.5

On the other hand, if we calculate:

$$\int_0^1 x\,dx = \frac{x^2}{2}$$

If we evaluate it between 0 and 1:

$$\frac{1^2}{2} - \frac{0^2}{2} = 0.5$$

We can conclude that through the Monte Carlo method we approach the value of the integral and we say approximate, because as the points are random, we may find 9 or perhaps 11 points below the line.

We are now going to find the area under the curve of a function, but this time generating the random numbers and generally using the Excel tool.

The idea is to find the area under the curve of the function y = x between the values x = 0 and x = 4, using the Monte Carlo method.

As we can see, we are only interested in the section of the curve when "x" goes from 0 to 4, so to find the random numbers that are within that section of the curve we must limit them as follows:

x = lower value + (upper value - lower value) x random number

In this case: the lower value = 0 and the upper value = 4, so:

x = 0 + (4 - 0) x Random = (4) * Random

y = lower value + (upper value - lower value) x random number

y = 0 + (2 - 0) *Random* = *2* Random

The other thing that we must define is when the random number is below the curve and for this we must establish that if y <x definitely the number will be below the function

The first thing we have to do in Excel is a column that tells us the number of iterations, to get an idea of how far we should drag the calculations we are making.

Once we have column "A" capable of counting our data, which in this case we are going to establish 1000 points evenly distributed within the rectangle, whose base is defined by "x" and its height by "y", in this case the base measures x = 4 and height y = 2, so the total area of our simulation square is: area = 4 x 2 = 8

Now, column "B" in Excel will be made up of the random points on the "x" axis generated by the program and for this it will be necessary to set the formula for that column as follows: = RANDOM ()

A	B	C	D	E	F	G
Accountant	Random x	Random y	x = 4Random	y = 2Random	Sqr (x)	If the values fall under the curve
1	0,5355583	0,2983301	2,142233295	0,59666021	1,463637	1
2	0,5270545	0,3874883	2,108217905	0,77497668	1,4519704	1
3	0,2074682	0,2783912	0,829872788	0,55678237	0,9109735	1
4	0,7957604	0,0191659	3,183041748	0,03833185	1,7841081	1
5	0,38637	0,4372833	1,545479865	0,87456658	1,2431733	1
6	0,9246923	0,2612012	3,698769338	0,52240238	1,9232185	1
7	0,124799	0,1145815	0,499195929	0,22916293	0,706538	1
8	0,1927062	0,9974046	0,770824869	1,99480914	0,8779663	0
9	0,3140076	0,6845187	1,256030599	1,36903736	1,1207277	0
10	0,9153385	0,0693342	3,661353883	0,13866844	1,9134665	1

Column "C" should also have this instruction, since we must generate random points for the "y" axis.

In column “D” we are going to find the random values of “x” bounded by the limits initially established for the study of our function, that is, x = 4 *Random. To find the values of this column, we must place the formula in cell D2: = B2* 4 and drag the result until the counter that is arranged in column “A” reaches the number 1000.

In the same way as the previous step, column “E” will be destined to obtain the values of “y” limited specifically for this function, as we defined previously y = 2 *Random, so in cell E2 we must include the formula: = C2* 2 and in the same way as in the previous step, we must drag the result until the counter reaches 1000.

On the other hand, column “F” will be composed of y = x, which will ultimately be the value that I will have to compare with the values of column “E”, in order to know if the points are below the curve of my function or not.

While column “G” is made up of a condition that tells us that: if the values in column “E” are less than the values found in column “F”, this implies that the random point is under the curve and therefore it should give me as a result the number 1, otherwise, if it is greater it should give me a zero as a result. To do this, the conditioner must be placed in cell G2 as follows:

= IF(The condition to check; the value if it is true; the value if it is false), in this case it will be as: = IF(E2 <F2; 1; 0)

To find out the number of random points that are below the curve, it is enough to add all the values that are in column “G”, since only those points that are actually below the value have the value one (1). function and those points that are above the function are represented by zeros, so they will not affect the sum in any way.

H1008 f_x

	A	B	C	D	E	F	G
998	997	0,7811338	0,0883509	3,124535071	0,1767018	1,7676354	1
999	998	0,965762	0,5714339	3,863047858	1,14286775	1,9654638	1
1000	999	0,8640094	0,051779	3,456037796	0,10355804	1,8590422	1
1001	1000	0,5215804	0,7864227	2,086321476	1,57284534	1,4444104	0
1002							666
1003							

We can realize that we have 666 points under the curve and as we know the total points or iterations are 1000, so that we can know the percentage of points under the curve if we divide both values:

(number of points under the function) / (number of points in total) = 666/1000 = 0.666

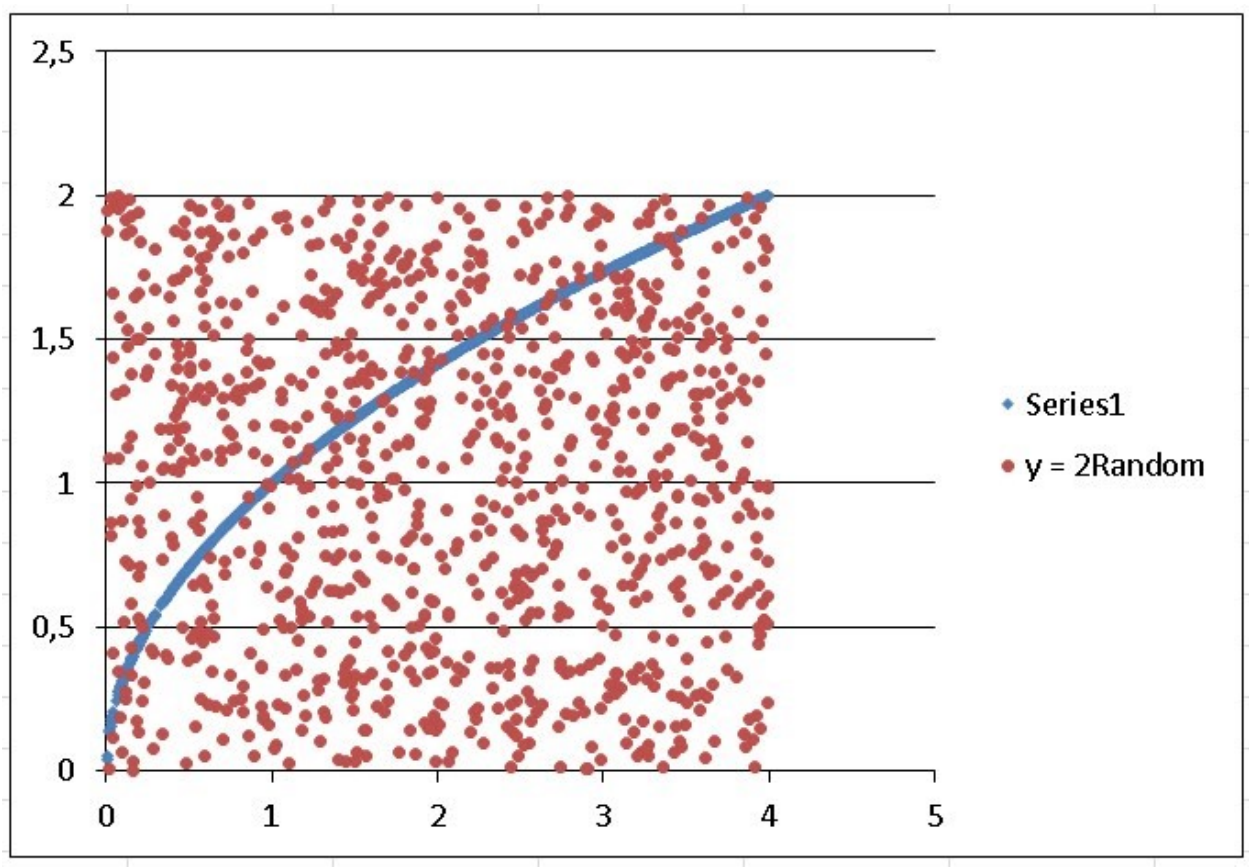
This calculation indicates that 66.60% of the points are below the function

y= x

Now, if we multiply this factor by the total area of the sample, we will have an approximate value of the area formed under this curve, that is:

0.666 x 8 = 5.328

If we choose columns D and F to graph them in Excel, we only have to choose the entire column D, but since they are not adjacent columns, to choose column F we must hold down the control button on our keyboard. Later, we are going to “Insert”, we look for the “Dispersion” diagram and we open the menu of possibilities, to choose the first one that appears in the display, from there we obtain the following image:



As the line of the function is a bit thick, we right click on it and a menu is displayed, we choose the last option which is “format data series”, a box opens and click on “options marker “, then we choose the type of marker as” integrated “and where” size “appears we position ourselves on the down arrow until we reach number 3, then we close and the line is somewhat thinner and more presentable.

On the other hand, if we theoretically calculate this function we are left with:

$$\int_0^4 \sqrt{x}\ dx = \int_0^4 x^{1/2}\, dx = \frac{2x^{3/2}}{3}$$

When evaluating “x” between limits 4 and 0 we have:

$$\int_0^4 \sqrt{x}\ dx = \frac{2(4)^{3/2}}{3} - 0 = \frac{16}{3} = 5.333$$

As we can see, the result we obtained when applying the Monte Carlo method is very close to the theoretical one. Exercise 2:

We are now going to simulate the area of intersection between two known functions between the interval of x = 0 and x = 1, these functions being:

y= x2 and y= x

As in the previous exercise, column A will be configured by random values of “x”, but this time we are not going to multiply these values by some number, since the interval that interests us goes from 0 to 1 and the values Random data

generated by Excel assume precisely numbers between 0 and 1, so the formula for the first column will be: = RANDOM ().

	A	B	C	D	E
1	x	y= SQR(x)	y= x^2	y = Random	If the values are within the intersection of both curves
2	0,620934641	0,7879941	0,3855598	0,1413313	0
3	0,530144777	0,7281104	0,2810535	0,8708114	0
4	0,582923155	0,763494	0,3397994	0,8898768	0
5	0,98809245	0,9940284	0,9763267	0,5186784	0
6	0,432561913	0,6576944	0,1871098	0,639526	1
7	0,116374471	0,341137	0,013543	0,5298072	0
8	0,810152001	0,9000844	0,6563463	0,6284163	0
9	0,727087958	0,8526945	0,5286569	0,8834698	0
10	0,057885638	0,2405943	0,0033507	0,92796	0
11	0,910018091	0,9539487	0,8281329	0,5650943	0
12	0,427304943	0,6536857	0,1825895	0,4639919	1
13	0,15344624	0,3917221	0,0235457	0,1609871	1
14	0,821512035	0,906373	0,674882	0,8154818	1
15	0,918802426	0,9585418	0,8441979	0,1111692	0

Column b representing the function y=x is made up of the square root of the random values found in column A.

In the same way, column B is made up of the values of column A squared in representation of the function y=x2, while column “D” are random values for “y”, which are the points green that are scattered throughout the total area box equal to (1) and are also precisely the points that we are going to buy with both functions to know if they are inside the intersection area or outside.

Column “E” is made up of two conditionals, which are to compare if the random values in column “D” are greater than y= x2 and less than y=x, if so, we will know that those points random are within the intersection between both functions.

Cell D2 so that instead of throwing me “true” or “false” they give me some (1) or zeros (0), which are ultimately easier to count, for Excel purposes, I must express it as:

= - -Y(D2>C2;D2<B2)

The important thing here are those two signs (- -) that are in front of the “Y”.

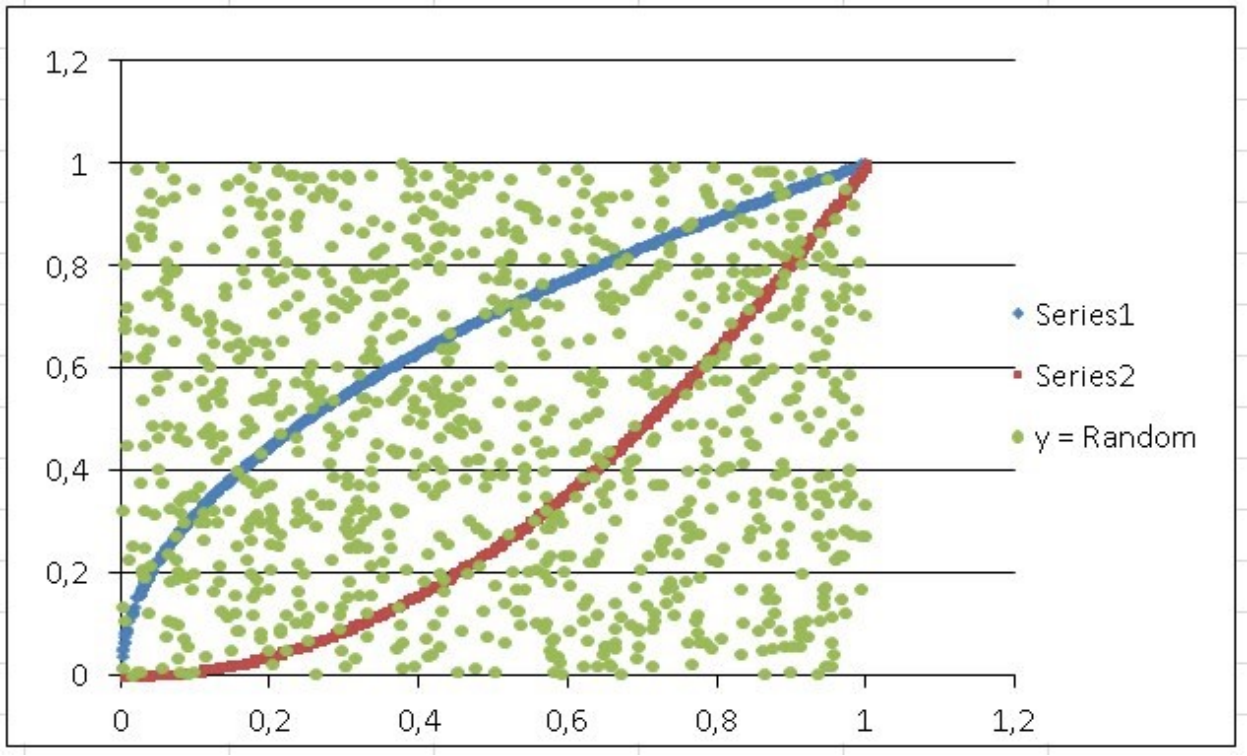
Once our comparative column is converted to ones (1) for those points that fall within the two curves, we simply have to add the elements of column D, to know the number of points of interest.

The last cell in column “D” represents that sum, so again we must divide that number by the total points or the number of iterations of our sample, which as we already know is 1000 (because we established it that way) and this time instead After placing a counter, we only drag the values up to row 1001, since the first row is occupied by the indicators (in letters), which give an idea at a glance what that column contains.

	A	B	C	D	E
995	0,122458604	0,3499409	0,0149961	0,6930881	0
996	0,263897941	0,51371	0,0696421	0,2924873	1
997	0,335081248	0,578862	0,1122794	0,6533705	0
998	0,179060454	0,4231554	0,0320626	0,653416	0
999	0,30234782	0,5498616	0,0914142	0,2906182	1
1000	0,051547526	0,2270408	0,0026571	0,5594842	0
1001	0,260522633	0,5104142	0,067872	0,9357664	0
1002					336

Let's then find the fraction that will indicate the percentage of points that remain within the intersection:

336/1000 = 0.336



To find the area between the two functions, we simply have to multiply this number by the total area of the sample, which in this case is one (1).

Intersection area = 0.336 x 1 = 0.336

It is important to take into account that every time we open Excel or manipulate any of the random columns, the values change, that is, it is almost certain that that value of 336 points that is at the intersection of the two functions, changes continuously, but always within a very acceptable range when calculating the area.

On the other hand, if we shade any of the columns with random values and press the F9 key, we can change those values at will.

The Monte Carlo method can be used to calculate the multiple integrals that are presented to us in probabilities and statistics, for example, the denominator of Bayes' theorem becomes an integral when our sample values are too many, to calculate them easily and also, that integral can become complicated to calculate by the traditional method.

But it is not the only case, in the universe of probabilities we find endless integrals that can be difficult to calculate.

Exercise 3:

We now go to other types of statistical examples, in which we can use the Monte Carlo method and not precisely to calculate integrals.

The table below shows the probability distribution of the number of consultations a dentist has per working day, we are going to calculate the average of daily consultations using the Monte Carlo method.

	A	B
1	**Nº dental consultations**	**Absolute frequency days**
2	0	10
3	1	20
4	2	40
5	3	60
6	4	40
7	5	30
8		200

This means that for a total of 200 days, 10 of them the dentist did not have anyone in his office, while 20 days of the total, he had only one patient and so on.

We are going to calculate the average by conventional methods:

Average = (0 x 10 + 1 x 20 + 2 x 40 + 3 x 60 + 4 x 40 + 5 x 30) / 200 = 2.95

Although this exercise can be calculated very easily in the traditional way, we want to illustrate how the Monte Carlo method is used in a simple exercise, to get a better idea of how to implement it for these types of problems.



The first two columns are data provided by the empirical count, but already in column “C” we will have to find the relative frequency of the days and for this, it will be necessary to divide the absolute frequency by the total number of days, which in this case is 200.

Now, in Excel I must freeze the data of the total of days, since it is common for all the relative frequencies. This is achieved by placing the “$” symbol between “B” that indicates the column where this data is located and the “7” that indicates the row. So cell C2 will be as follows: = B2 / B $ 8, in this way we can drag the formula, without changing the data for the total number of days found in cell “B8”.

The next column contains the cumulative relative frequency, so the first cell will be equal to the first cell in the previous column. However, D3 will already be equal to the initial relative frequency D2 added to the relative frequency C3 and it is then, when we can drag the result to the last cell, which will always be given by the unit (1).

Now we are going with the intervals, it is important to take into account that the last column of intervals “F” will exactly coincide with the column of the accumulated frequency “D”, so we equalize both columns.

While the initial column of the interval “E”, begins with zero (0) and the next lower limit of the interval will be given by the upper limit of the previous interval “D”, that is, C3 = D2 and I drag the result.

In the next column “G” we are going to generate the random values or iterations corresponding to the number of days for which we want to calculate the average, in this case we are going to establish the average for 500 days.

Now, the next column “H” is destined to find where the random value that we have in column “G” is located between the intervals that are in columns “E” and “F”, to give us as a result the value of the number of dental visits corresponding to that interval. To do this, it will be necessary to enter the command in cell H2: = LOOKUP (G2; E2: F7; A2: A7), which is achieved by writing: = LOOKUP (G2; here both column E and F are chosen or shaded; choose all column A)

It is important to note that each of the instructions given is separated by a semicolon (;) and also the “$” symbol must be placed between all the rows and columns of the command to freeze the common data, except the first G “ which corresponds to the random value, which of course must change cell by cell.

So cell H2 will end up looking like this: = LOOKUP (G2; E $ 2: F $ 7; A $ 2: A $ 7).

If we take any cell in column G and look between what interval is found in those established in columns E and F, we will realize that the result of the cell will be the number of dental consultations that is in that same row, but in column A.

For example, if column G gives us a number 0.7003354, we will realize that it is between the interval 0.65 - 0.85 and its number of corresponding queries is 4 and that is the value reflected in column H

	A	B	C	D	E	F	G	H
1	Nº dental consultations	Absolute frequency days	Relative frequency	Cumulative relative frequency	Intervals		Random	
2	0	10	0,05	0,05	0	0,05	0,7003354	4
3	1	20	0,1	0,15	0,05	0,15	0,8411371	4
4	2	40	0,2	0,35	0,15	0,35	0,0620423	1
5	3	60	0,3	0,65	0,35	0,65	0,9036836	5
6	4	40	0,2	0,85	0,65	0,85	0,4911913	3
7	5	30	0,15	1	0,85	1	0,5280963	3
8		200					0,6241854	3
9							0,3828871	3
10							0,5033034	3
11							0,3913412	3
12							0,8501203	5

Finally, to find the average, we place ourselves in the cell after the last cell of our column “H” and write the following: = AVERAGE (here we must choose the entire column H), in this way we will obtain a number that is equivalent to average of all queries, with our sample of 500 iterations.

J512 f_x

	B	C	D	E	F	G	H
496						0,5329048	3
497						0,9240363	5
498						0,6897246	4
499						0,1000757	1
500						0,8520388	5
501						0,4395874	3
502							2,952

In this case the result was 2,952, but in the same way as in the previous examples, when manipulating our Excel in some way, the random data will change and therefore our final result will also vary.

As we can see, this result is very close to the one calculated theoretically.

Exercise 4:

We now go to the fourth exercise applying the Monte Carlo method. Suppose that we roll 2 dice 1000 times, we want to know the probability that the sum of the points of both sides, give as a result each of its possibilities.



If I roll two dice, what are the chances that I can get by adding the points of both? The minimum result is 2, then 3, 4, 5, 6, 7, 8, 9,10,11 and 12 as the maximum result.

We also want to answer some questions such as:

1) What is the probability that we get the numbers 3 or 6?
2) What is the probability that we get an odd number?
3) What is the probability that we obtain a multiple of 3?
4) What is the probability that we obtain a number greater than 9?
5) What is the probability that we obtain a number divisible by 5?

Now, when we roll two dice and the first falls with the number 1, the second dice can fall with numbers from 1 to 6 and we are going to reflect that in the first cells of our Excel, that is, A2 = A3 = A4 = A5 = A6 = A7 = 1, while the cells that go from B2 to B7, will vary with the possibilities of the second die of obtaining as a result number from 1 to 6.

E	F
Possible results of the sum	how many times is it repeated
2	1
3	2
4	3
5	4
6	5
7	6
8	5
9	4
10	3
11	2
12	1

But from cell A8 the first die changes to the possibility of landing on its face 2, so in A8 the cell will be: = A2 + 1, while the numbers from 1 to 6 are repeated for the second die , that is: The instruction in cell B8 is: = B2, it is there when I can drag both formulas to the last of their possibilities, which is when both dice fall with face 6, therefore, there are 36 possibilities that give me the sum of the roll of two dice up to cell 37 (remember that we subtract the first row because it is intended for words that help us to recognize at first glance what that column is about).

Note that in column C (which represents the sum of both dice) there are numbers that are repeated, because the sum of the combinations of the dice can be equal, for example: (1 + 6) = (2 + 5) = (3 + 4) = (4 + 3) = (5 + 2) = (6 + 1) = 7, while there is only one possibility for numbers like 2 and 12.

To know how many times a possibility is repeated in the sum of the possible combinations of both dice, it is enough to place a column with all the possibilities from 2 to 12 and another column next to it where we will give the following instruction: = COUNTIF (we choose the entire column of sum “C”, we choose the cell to compare which in this case is E2).

In this way, the result will give me the number of times that each number is repeated, once I drag it to 12. As we deduced previously, the “7” is repeated 6 times and is the number with the highest number of repetitions, so when roll two dice, we have a greater probability that the sum of its two faces gives us “7” as a result.

We can calculate the probability of obtaining each result if we divide the number of possibilities by the total number, which as we know is 36, of course, when adding column G, we obtain as a result the unit (1), which represents 100%.

E	F	G	H
Possible results of the sum	**How many times is it repeated**	**Probabilities of each outcome**	**Probability percentage (%)**
2	1	0,027777778	3%
3	2	0,055555556	6%
4	3	0,083333333	8%
5	4	0,111111111	11%
6	5	0,138888889	14%
7	6	0,166666667	17%
8	5	0,138888889	14%
9	4	0,111111111	11%
10	3	0,083333333	8%
11	2	0,055555556	6%
12	1	0,027777778	3%
		1	100%

We are now going to simulate 1000 random throws, for them it will be necessary to limit the random value between 1 and 6 for both dice, so in Excel the instruction is: RANDBETWEEN(1; 6) that we will repeat for both column J and column column K.

Column L is the sum of the 1000 random values of die 1 and die 2, while in column M we will simply repeat the possible results of the sum of both dice. Now, column N is a counter that tells us the number of times a possibility between 2 and 12 is repeated, but this time using 1000 iterations. The command for column N will be: = COUNTERIF (I choose the 1000 data found in column N; the first value in column M) = COUNTIF (L $ 2: L $ 1001; M2).

It is important to take into account that we must freeze the values between the first and last cells of column L with the symbol of “$”, of course, the values of column M need to vary when I drag them until they reach their last value. of possibilities in M (I don’t put “$” there). This is how I get the number of times that one of my possibilities is repeated in 1000 iterations. If we realize it, when adding the number of times a value is repeated in the last column of M, we get the number 1000.

J	K	L	M	N
Dice 1	Dice 2	Sum	Possible results of the sum	How many times a possibility is repeated in 1000 iterations
1	5	6	2	20
2	2	4	3	57
3	1	4	4	85
3	6	9	5	98
2	6	8	6	133
2	5	7	7	173
3	4	7	8	152
5	3	8	9	108
2	6	8	10	76
3	4	7	11	66
6	5	11	12	32
2	2	4		1000
2	5	7		
5	6	11		

Again to find the probability that we have of obtaining a specific result, we must divide the number of times that it is repeated (which we have in column N) by the total number of iterations, which in this case is 1000, thus we obtain the values that They are in column O and if we pass it to percentages, we will have the values found in column P.

J	K	L	M	N	O	P
Dice 1	Dice 2	Sum	Possible results of the sum	How many times a possibility is repeated in 1000 iterations	Probabilities of each outcome	Probability percentage
3	1	4	2	24	0,024	2%
5	2	7	3	51	0,051	5%
3	1	4	4	84	0,084	8%
5	4	9	5	116	0,116	12%
1	3	4	6	135	0,135	14%
2	4	6	7	160	0,16	16%
5	1	6	8	131	0,131	13%
3	1	4	9	116	0,116	12%
4	6	10	10	105	0,105	11%
4	4	8	11	48	0,048	5%
5	2	7	12	30	0,03	3%
2	5	7		1000	1	100%
3	5	8				
1	2	3				

As we can see, the highest probability that a number will appear is, as we saw previously, the number "7" with a 16% probability, while the lowest probabilities are the numbers 2 with a 2% probability and 12 with a 3% probability. .

Of course, random numbers are sensitive every time we manipulate Excel and as we said, these results are going to constantly vary if we open, close or somehow touch the file in Excel.

Let's answer the rest of the questions:

1) To obtain the probability of obtaining the numbers 3 or 6, we are simply going to add the percentage cells corresponding to those numbers, that is: 5% + 14% = 19%

2) To obtain the probabilities of obtaining an odd number, we simply add each of the probability percentages of the numbers 3, 5, 7, 9 and 11 = 5% + 12% + 16% + 12% + 5% = 50 %

3) The multiples of three are: 3, 6, 9 and 12, we add the percentages of their probabilities: 5% + 14% + 12% + 3% = 34%

4) To obtain the probability of a number greater than 9, we add the percentages corresponding to the numbers 10,11 and 12 = 11% + 5% + 3% = 19%

5) The probability of obtaining a number divisible by 5 is obtained by adding the percentages corresponding to 5 and 10 = 12% + 11% = 23%

57.1 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

FIFTYEIGHT

TYPES OF PROBABILITY DISTRIBUTIONS

The primary objective of statistics is to access quantitative knowledge of a certain fraction of reality and that is why it is necessary to build a model of this plot of reality that we want to study. Of course, it is no secret to anyone that reality is always more complex than any model that tries to represent it. However, most of the model formulations that are acceptable to both institutions and users, make it possible to obviate the distance that exists between the model and reality or possible errors.

When a theoretical model is carried out that includes in its formulation, as in most cases, they are reduced to probability functions. As we well know, that probability comes from games of chance and that the impulse of the first investigations regarding the calculation of probabilities (16th century) started from there.



But it was not until the eighteenth century when probabilities were really implemented from a mathematical perspective, with what was called the "weak law of large numbers", which states that by increasing the amount of evidence it can be

concluded that the frequency of an event always tends to a fixed number, which is precisely what is called probability.

When we measure any characteristic that takes different values and whose probabilities are determined, it is what we call a random variable, that is, in every variable the theory has a probability distribution capable of describing its behavior.

In the case that the variable takes values within an interval that are isolated, we can say that the variable is discrete and that its probability distribution is capable of specifying all the possible values of the variable, in addition to the probability that each of them occurs. the values. Whereas when the variable can take on any type of value within an interval, we are dealing with a continuous variable whose probability distribution can determine the corresponding probabilities in the sub-intervals of values.

The density function is a way of describing the probability distribution in the case of continuous variables and in the case of discrete variables, it can be very useful to use the mass function and it is the distribution function that represents the cumulative probabilities.

Researchers are concerned with building probability distribution models that are capable of representing the theoretical behavior of those random phenomena that arise in the real world. For the empirical scientist, modeling probability distributions of what is observable is a basic need, since it is through these models or theoretical constructions that it can be experienced in circumstances where reality does not allow it. Models are extremely useful as long as they reflect the reality they are intended to represent or rather predict. The important thing is to exacerbate the most important properties of everything that surrounds us, even if it is through the simplification that every model brings with it.

Different types of probability distribution

The probability distributions will depend on the type of variable, so we will begin by explaining the different types of distribution for a discrete variable, that is, whose values are integers. But in turn, the different types of probabilistic distribution for a discrete variable are subdivided into: Variables defined in a finite domain or in an infinite domain.

Probability distributions for discrete variables in a finite domain:

1- The binomial distribution: it is that distribution that is capable of describing the number of hits in independent experiments whose possible results are binary, this implies that there are only two possibilities “yes” or “no”, where the probability of success we call it p and qa the probability of failure and both sum to the unit, therefore: q = 1 - p.

2- The Bernoulli distribution is the classical binomial distribution and takes values of 1 or zero (0).

3- The Rademacher distribution: In this distribution values of 1 and -1 are taken, where each of both values has a probability of ½.

4- The binomial beta distribution: This type of distribution describes the number of hits in independent experiments and whose results are yes or no, but in this case each probability of hit is defined by a beta variable.

5- The degenerate distribution in Xo: In this distribution X acquires the value of Xo and although it does not resemble a random variable, this distribution manages to satisfy each and every one of the requirements for it to be considered as such and the probability will be 1.

6- Discrete uniform distribution: This distribution is made up of a set of finite values where all have the same probability. For example, when we throw a coin or a dice into the air, also when we play in a casino roulette, the probability of obtaining each result is the same for each value, that is, they are balanced and without bias.

7- Hypergeometric distribution: This distribution is capable of measuring the probability of X amount of elements of a certain characteristic that is made up of d elements and that belong to a population that in turn is made up of N elements, where a sample of n number of elements.

8- The hypergeometric Wallenius distribution

9- Fisher’s hypergeometric distribution.

10- The Benford distribution: In this distribution you can see the frequency of the first digit of a set or group of numbers, which are found in decimal notation.

In later articles we will dedicate ourselves to the distributions for continuous variables, but now we will go on to explain in detail with a worked example, the main probability distributions that are used in discrete variables.

The Binomial distribution:

Many of the phenomena that occur in real life can be studied as a discrete random variable with binomial distribution, so that this study can be of good practical use.

We now go with a solved exercise of binomial distribution: A study carried out by the association of motorway drivers shows us that 60% of drivers wear seat belts.



To check if this statement is true, a sample made up of 10 drivers who circulate on the main highway is selected. But in addition, it is required to know the probability that exactly seven of these drivers wear a seat belt and it is necessary to know the probability that at least 7 of these drivers wear a seat belt.

We can realize that there are only two possible results, since the seat belt is worn or the drivers simply do not wear the seat belt. If the driver wears a seat belt this is a result that we will call “success”, otherwise we will call it “failure”.



According to the information provided by the association of motorway drivers, the probability of success is 60% and as we know the tests are independent, so that if the fifth driver is not wearing a seat belt, this does not mean that the sixth driver is not wearing a seat belt. is using you. Therefore, our random variable is "the number of drivers wearing seatbelts", that is, the number of successes where the number of drivers in the sample is n = 10 and the probability is p = 0, 6.

In order to calculate the probability of seven drivers wearing a seatbelt, use the following formula:

$$F(x) = \binom{n}{x} p^x * q^{(n-x)} = \binom{10}{7} 0{,}6^7 * 0{,}4^{(10-7)} = \frac{10!}{7!(10-7)!} * 0{,}6^7 * 0{,}4^3 = 0{,}215$$

Now we must calculate the probability of a maximum of seven drivers using the seat belt and this will be the distribution function for the sum of probabilities of xi = 7. But it is important to take into account that the distribution function has an expression that It can make the numerical calculations difficult for each of these terms from 1 to 7, so it is best to use another expression that facilitates the calculations and then we prefer to use:

P (x 7) = 1 - [P (x = 8) + P (x = 9) + P (x = 10)]

Where each of these terms is what we calculate with the formula we used in the previous item so that:

$$P(x \leq 7) = 1 - \binom{10}{8} 0{,}6^8 * 0{,}4^{(10-8)} - \binom{10}{9} 0{,}6^9 * 0{,}4^{(10-9)} - \binom{10}{10} 0{,}6^{10} * 0{,}4^{(10-10)}$$

$$P(x \leq 7) = 1 - \frac{10!}{10!(10-10)!} 0{,}6^{10} * 0{,}4^0 - \frac{10!}{10!(10-9)!} 0{,}6^9 * 0{,}4^1 - \frac{10!}{10!(10-8)!} 0{,}6^8 * 0{,}4^2$$

$$P(x \leq 7) = 1 - 0{,}006 - 0{,}04 - 0{,}121 = 0{,}833$$

Of course, we can always go the long way and calculate:

P (x 7) = P (x = 1) + P (x = 2) + P (x = 3) + P (x = 4) + P (x = 5) + P (x = 6) + P (x = 7)

But we know this way is much longer

58.1 Bernoulli's distribution

In the Bernoulli distribution we can define the random variable as follows:

The random variable X takes the value of 1 if we obtain a success, but if the trial ends in failure, the value of the random variable X will be equal to zero (0)

	Fracaso	Éxito
x	0	1
F(x)	q = 1-p	p

As we already know, the probability of success is denoted by p and the probability of failure by q, but we also know that q = 1 - p, so we can establish the probability function as follows:

$$F(x) = P(X = x) = \begin{cases} 1 - p; x = 0 \\ p; \quad x = 1 \end{cases}$$

Summarizing, we can calculate it as follows:

F(x) = P(X = x) = px (1-p)1-x

The notation to indicate that the variable (X) follows a Bernoulli distribution is:

X ~ Be (p)

Let's go as an example of the Bernoulli distribution: Suppose we want to play to roll a dice only once, the game is won if the number 3 is obtained on the dice, in which case another value is obtained, the game is lost. In this case X = the number of times a 3 is rolled and the probability distribution of this variable X must be determined.



We will consider a success when rolling the grade is obtained a 3 and a failure if any other result is obtained. Since we determine that X is the number of times a 3 is rolled, we know that it can take two values:

- X = 0 when rolling the die does not get a 3
- X = 1 If we roll the dice and we get a 3 We are now going to assign the probabilities of obtaining a 3:

$$p = \frac{nº\ favorable\ cases}{Total\ possible\ cases} = \frac{1}{6}$$

The probabilities of failure will be:

$$q = 1 - p = 1 - \left(\frac{1}{6}\right) = \frac{5}{6}$$

The probability function is expressed by:

$$F(x) = P(X = x) = \begin{cases} \frac{5}{6}; & x = 0 \\ \frac{1}{6}; & x = 1 \end{cases}$$

We can also express it as:

$$F(x) = P(X = x) = \frac{1}{6}^{x} \left(\frac{5}{6}\right)^{1-x};\ x = 0;1$$

As we can see, we are in the presence of a Bernoulli probability function and we have a probability of success where p = 1/6, that is, the random variable X has a Bernoulli distribution, whose probability of success is 1 / 6:

X ~ Be (1/6)

58.2 Discrete Uniform Distribution

This probability distribution has the characteristic of being equiprobable, this means that in those situations with n different results, all the possibilities have the same probability of occurring. For example, when we roll a die, the probability that each of its faces will come out is 1/6 and they all have the same probability. But if two dice are rolled, the sum of their values is no longer uniform since not all sums have the same probability.



Since X is a discrete random variable made up of {x1, x2,. . . , xn} and has a uniform discrete distribution, the nomenclature to use will be:

X ~ Uniform (x1, x2,. . . , xn)

Where the probability function will be defined by:

P (X = x) = 1 / n

For x = x1, x2,. . . , xn

If we are in the presence of X ~ Uniform (x1, x2, . . . , xn) then we can say that the random variable satisfies certain properties such as:

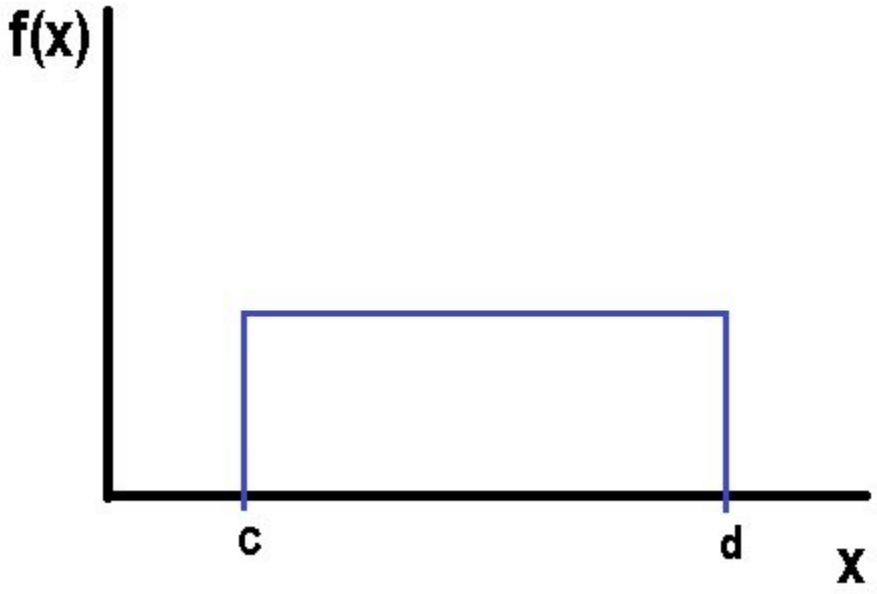
The measure of the variable in this case will be equal to:

$$E(x) = \frac{1}{n} \sum_{i=1}^{n} xi$$

On the other hand, the variance of the random variable in this case would be equal to:

$$\text{Var(x)} = \frac{1}{n}\sum_{i=1}^{n}[xi - E(x)]^2$$

If we make a graph of the uniform distribution we can visualize:



$$\text{Where f(x)} = \frac{1}{d-c}$$

Being the mean:

$$\mu = \frac{(c+d)}{2}$$

And the variance:

$$\sigma^2 = \frac{(d-c)^2}{12}$$

The parameter in this type of discrete uniform probability distribution will be given by the inverse of the number of values that the random variable can take. On the other hand, the mean of this type of uniform discrete random variable will always coincide with some of the values observed in the investigation and finally, the variance of this uniform discrete random variable will not depend on the number of values that can get to take the variable.

The probability density function between two points c and d is given by:

$$F(x) = \begin{cases} \frac{1}{d-c}; & a \leq x \leq b \\ 0; & x \neq \end{cases}$$

$$\int_{-\infty}^{+\infty} F(X)dx$$

The distribution function in the uniform case between c and d is:

$$\int_y^x F(X)dx = \frac{1}{d-c} * x \Big|_y^x = \frac{1}{d-c} (x - y)$$

Let's go with an example: Suppose that a certain pollutant is distributed in a range of 0 to 10 parts per million in a uniform way and this pollutant is considered to be toxic, when it has a concentration of eight or more parts per million. With this information we ask ourselves several questions:



1- What is the probability of taking a sample and that it has a toxic concentration?

2- Calculate the concentration of the mean and its variance

3- What is the probability that the concentration has an exact value of 10 parts per million?

Being X a discrete random variable whose distribution is uniform then:

X ~ Uniform (0, 20) it is true that:

$$F(X) = \frac{1}{(20-0)} = \frac{1}{20}$$

Answer to question 1:

$$P(x \geq 8) = \int_8^{20} \frac{1}{20}\, dx = \frac{1}{20}\, x \Big|_8^{20} = \frac{1}{20}(20 - 8) = \frac{12}{20} = 0{,}6$$

Answer to question 2:

The mean concentration is given by:

$$\mu = \frac{(20+0)}{2} = 10$$

The variance is:

$$\text{Var}(x) = \sigma^2 = \frac{(20-0)^2}{12} = \frac{400}{12} = 33{,}33$$

Answer to question 3:

The probability that the concentration is exactly equal to 10 is:

$$P(X = 10) = \int_{10}^{10} \frac{1}{20}\, dx = \frac{1}{20}(10 - 10) = 0$$

Hypergeometric distribution

Until now we have analyzed those distributions that model situations where the tests respond to a dichotomy, so that the probability in each experience was to obtain one of two possible outcomes. When an element is extracted in the process, this implied its replacement or the consideration of a sufficiently large population. But for small populations, in the case of an extraction that is not replaced, this immediately implies that the probability does not remain constant and in this case, the previous distributions do not help us to model the situation and that is when it comes to play an important role. the hypergeometric distribution, since it can cover this need when modeling Bernoulli distributions whose probabilities are not constant and without replacement.

This type of hypergeometric distribution is very useful in those cases where samples are extracted without the subsequent return of the extracted element or specifically, when the initial experimental situation is not returned. In fact, it is capable of modeling that situation in which a dichotomous test is repeated a certain number of times and that with each successive result, we do not see altered the probability of being able to obtain one or the other result in the next test.

This type of distribution ends up being fundamental when we study small samples of populations, but also when we calculate probabilities of random games. Even the hypergeometric distribution has great applications in those experimental processes where it is not possible to return to the initial situation. This type of distribution can be derived from a Bernoulli process, when it meets the following characteristics:

1- When the process consists of n tests that can be separable or separated from a set of N possible tests.

2- Each of these tests can give only two results that are mutually exclusive.

3- The probabilities in the first test are: P (A) = p or P (A) = q; where q = 1 - p and the probabilities of obtaining one or the other result vary in subsequent tests.

4- What is derived from the distribution: If we obtain a number of results "A" that come from n tests, the distribution of the random variable X will be a hypergeometric one whose parameters will be N, n, p and therefore:

X ~ H (N, n, p)

A very typical case of the application of this model will be the following: We are going to suppose that we randomly extract n samples from a set that is made up of N elements, of which there are Np that are of type A and also other Nq that are of type A where q = 1 - p. Suppose also that we carry out the extractions without replacing the extracted elements and we call "x" the amount of elements of type A that are within those n extractions, this implies that "x" will follow a hypergeometric distribution whose parameters are N, n and p.

Quantity function: In a hypergeometric distribution the quantity function will match the probability of the event with the value of each variable x = 0, 1, 2, …, n to obtain x amount of results of type A and also results of the type that they are not A, that is, (nx) in the n tests performed that are among the N possibilities.

Let's establish this mathematically:

There is a total of $\binom{Np}{x}\binom{Nq}{n-x}$ Different ways to get x amount of results of type A and also (nx) results of type A , When we start from a population that is made up of Np amount of elements of type A together with Nq quantity of elements of type A .

On the other hand, when we carry out n quantity of extractions or tests there are a total of $\binom{N}{n}$ groups of n elements of possible samples and if we apply Laplace's rule we will have:

$$P(x) = \frac{favorable\ cases}{possible\ cases}$$

Explaining this in a mathematical way we can say that:

$$P(x) = \frac{\binom{Np}{x}\binom{Nq}{n-x}}{\binom{N}{n}}$$

This is true for the values of "x" that are included within the set of integers 0, 1, 2, …, n and this will be the quantity function for a hypergeometric distribution whose parameters are N, n and p.

The mean and variance

When we consider a hypergeometric variable whose parameters are N, n and p, we can also consider that it was generated by a repetitive n dichotomous process, where these n dichotomies are not independent. Furthermore, a hypergeometric variable can be considered to be nothing more than the sum of the n non-independent dichotomous variables.

As we know from previous articles, the mean of the sum of our random variables, which can be both independent and dependent, is nothing more than the sum of the means and that is why the mean in any hypergeometric distribution as well as in the binomial distribution, it will be: = np. On the contrary, when the variables are not independent we cannot say that the variance of the variable will be the sum of the variances. In this case, the variance of a hypergeometric distribution whose parameters are N, n and p will be given by:

$$\sigma^2 = npq\left(\frac{N-n}{N-1}\right)$$

We can see that this way ends up being the variance of a binomial distribution (n, p) but that it is affected by a correction coefficient that is: $\left(\frac{N-n}{N-1}\right)$ This coefficient is called exhaustiveness, also known as the correction factor for finite populations and comes from the effect produced by the non-replacement of the sample elements that were extracted.

This coefficient becomes smaller as the sample size is larger and it can be seen that it tends to 1 while the population size N is large enough. This implies how irrelevant replenishment can be in those experiments where successive extractions are made but on a fairly large population, that is, in a very large population regardless of the size of n, thanks to the correction factor that is capable of to convert a hypergeometric distribution to a binomial distribution.

When we calculate the limit of a hypergeometric distribution in the case that N tends to infinity, we can say that just as we have seen that the mean of this type of hypergeometric distribution takes the same value as the mean calculated in a binomial distribution. We can also say that if the parameter N approaches infinity, the so-called exhaustiveness coefficient tends to 1 and that is why the hypergeometric variance approaches the binomial. In the same way, it can be proved that the quantum function in this case ($N \to \infty$) of the hypergeometric distribution also tends to approximate the quantum function of the binomial distribution.

The mode of a hypergeometric distribution

In the same way as the mode is obtained in a binomial distribution, we can obtain the mode for a hypergeometric distribution. So the values or the integer value that is verified for the following expression Xo will give us the expected calculation:

$$\frac{N(pn-q)+n-1}{N+2} \leq Xo \leq \frac{N(pn+p)+n+1}{N+2}$$

Let's do the first hypergeometric distribution exercise: A certain dealer has had 10 refrigerators returned because they make a high-pitched, oscillating noise while the refrigerator is running. We know in advance that of these 10 refrigerators 4 have faulty compressors, while the rest have milder problems. Suppose that of these 10 refrigerators 5 of them are examined at random and the random variable X is determined to be = "The number of refrigerators among the 5 examined that has a defective compressor." It is required to know:



1- Determine the distribution of this random variable X

2- What is the probability that not all refrigerators have minor failures?

3- What is the probability that at most 4 refrigerators have compressor failures?

Answer to question 1:

How can we figure out the population size N = 10 and if we set the faulty compressors as successes and those compressors as milder problems as failures, then: M = 4. On the other hand, the sample size n = 5. It can be said that the variable x that we remember is the number of refrigerators of the 5 analyzed that have defective compressors, it is a hypergeometric distribution:

X ~ H (N = 10, M = 4, n = 5)

Answer to question 2:

For convenience we can express the variable X as: “not all the refrigerators have minor failures”, this implies that if this occurs, it is because at least some of the refrigerators have a defective compressor which, as we know, is a serious failure and by expressing this mathematically we obtain that: X 1

$$P(X \geq 1) = 1 - P(X=0) = 1 - \frac{\binom{Np}{x}\binom{Nq}{n-x}}{\binom{N}{n}} = 1 - \frac{\binom{4}{0}\binom{6}{5}}{\binom{10}{5}} = 0{,}9762$$

Answer to question 3

When we think that at most four refrigerators have compressor failures, it is the same as asserting "At most four refrigerators have compressor failures" and we can express it mathematically as: X 4. We are aware then that the path of the variable is

R (X) = {0,1, 2, 3, 4} We can then say that:

P (X 4) = 1

Hypergeometric distribution exercise 2: Suppose that a group of friends from the University are planning to meet at Mary's house to make a grill. We know that in this group there are 6 men and 8 women, of the women 5 of them study letters and the other exact sciences. We also know that only one of the men studies letters and the other exact sciences.

We want to know:

1- If the first to arrive at the house are three women, what is the probability that they will study the same thing?



2- If among all the students who go to Mary's house, only three of them cook the grill, what probability is there that among these three they all study the same thing?

To better understand this problem, we are going to make a scheme that determines the composition of the group with respect to studies and gender:

$$14 \text{ estudiantes} \begin{cases} 6\ males \begin{cases} 1\ Letters \\ 5\ Sciences \end{cases} \\ 8\ Female \begin{cases} 5\ Letters \\ 3\ Sciences \end{cases} \end{cases}$$

The first students to arrive are three girls and of course Mary is at her house, so we know that there are 4 women, the 3 who arrive and Mary. On the other hand, the only way is for them to study letters, because the condition is that they study the same thing and there are not four women in the group who study science. This implies that Mary studies letters.

Answer to question 1:

Of the eight girls, 7 of them are the ones who can get to Mary's house, we know that 4 study letters and 3 exact sciences. If we consider these 7 women as the population, from which we randomly extract 3 individuals. Then N = 7, M (which are the ones that study letters) = 4 and from the sample n = 3 we also know that these 3 study letters X = 3.

We are going to define the variable with hypergeometric distribution:

X It is the number of women who study letters of the first 3 who arrive at Mary's house (they are chosen among the 7 women in total)

XH (N = 7, M = 4, n = 3)

To answer question 1 we must calculate the probability that X = 3

$$P(X = 3) = \frac{\binom{4}{3}\binom{3}{0}}{\binom{7}{3}} = 0{,}11429$$

Answer to question 2:

In this answer we are not interested in the gender of each one of them, but rather what they study and for this, we are going to specify it in the following composition:

$$14 \text{ amigos} \begin{cases} 6\ Letters \\ 8\ Sciences \end{cases}$$

We can also define the number of letters students of three friends chosen randomly from the total of 14 students. The hypergeometric distribution values will be: N = 14, M = 6 and n = 3

Given the case that Y = 3 this would imply that the three friends study letters, however, in the case that Y = 0 this would not indicate that the three friends study science.

The required probability is:

P (study the same) = P (Y = 3) + P (Y = 0) 0.05495 + 0.15385 0.2088

58.3 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

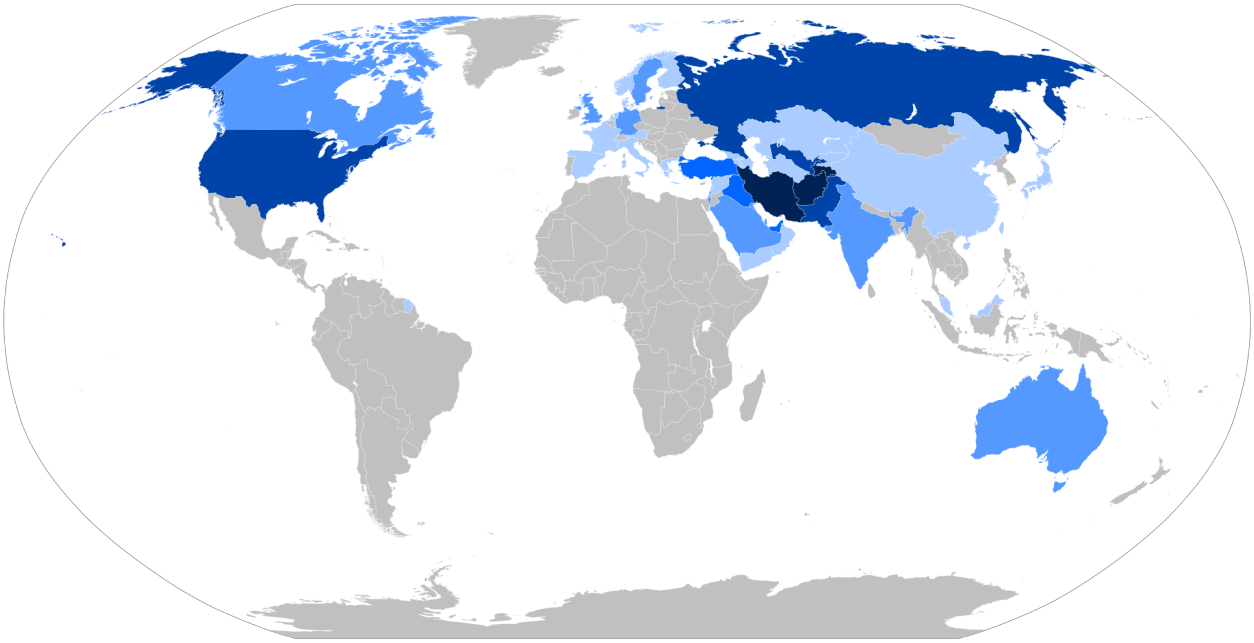
FIFTYNINE

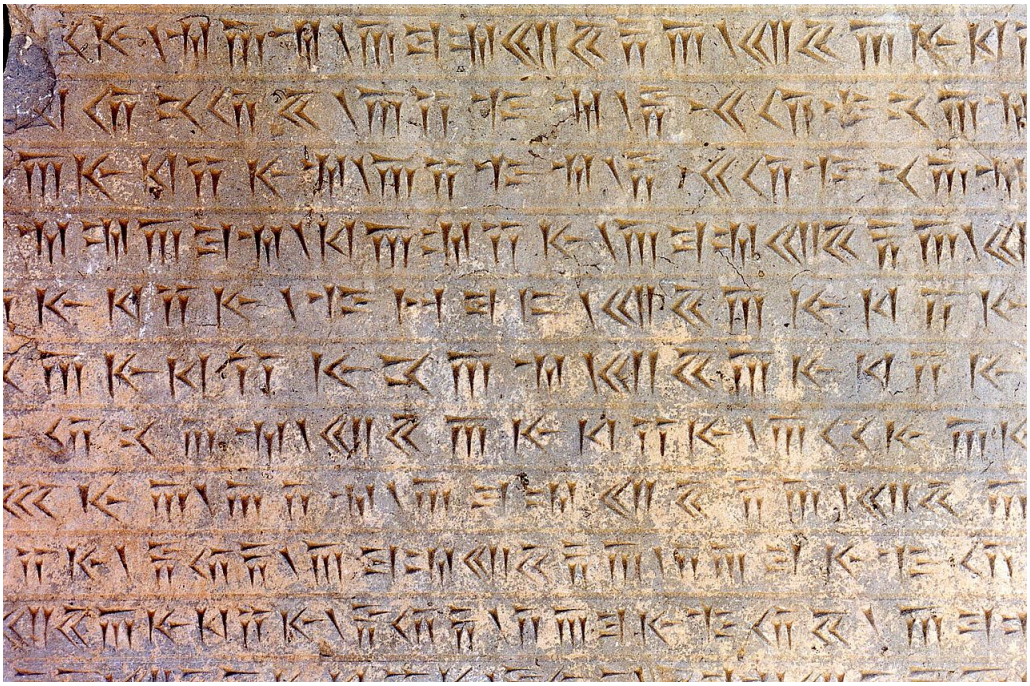
PERSIAN OR FARSI

Persian is a language which is mostly used in the country of Iran. As you know **Farsi** is an alias of Persian.

Which means, Persian and Farsi both are same. Feel free to call it Farsi or Persian.







59.1 About the Author

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CHAPTER

SIXTY

IRAN'S BEST WRESTLERS

Iran has provided some of the best talent that the world has seen throughout the many years of Iranian wrestling dominance.

That tradition has been long-standing, and today we showcase the top five Iranian wrestlers. Coming in, the youngest star for Iran who's enjoying the prime of his career Hassan Yazdani.

You don't earn the nickname The Greatest without earning it and Yazdani has certainly did his part to carry on the tradition of Iranian wrestling.

The 25-year-old won the 2016 Rio Olympic gold medal at 74 kilos and has captured a pair of world championships to go along with a bronze and silver medal as well. The Greatest knows a thing or two about the power of social media with nearly 500,000 followers on Instagram making him a national star and certainly the greatest in Iran.

Rasoul Khadem enters our list too, one of the most monumental moments in Iranian wrestling history took place in the 1996 Olympic games when Khadem stunned two-time Olympic gold medalist and five-time world champion Makharbek Khadartsev to capture his lone Olympic gold in his storied career.

After a near miss following a bronze medal performance in the 92 Olympic games Khadem's Olympic title run will be a story long told in Iranian culture. Khadem went on to win a pair of world titles along with five asian championships.

A blast from the past checks in, with Abdulla Movahed, a five-time world champion raised eyebrows in his senior level debut back in 1959 and his career took off from there.

Movahed was a two-time Olympic champion bringing the prestigious gold back to Baboslar in both the 64 and 68 games.

Movahed was perfect during a five year stretch in the prime of his career, not losing a match while claiming five world titles.

Iran's first ever Greco-Roman Olympic champion comes in. Hamid Sourian was part of an unparalleled powerhouse 2012 Iranian squad. Sourian was one of three Greco-Roman champions for Iran in the London games and also represented Iran in both the 2008 and 2016 Olympic games.

The six time world champion won 34 consecutive matches before disqualification and a bad streak in the 2015 world quarter finals. And the strong tradition of Iranian wrestling can be found back in 1951 that's when Gholamreza Takhti made his senior level debut.

Takhti comes in at number one. Nicknamed the World Champion, Takhti was a three-time Olympic medalist capturing gold at the 56 Olympic games. He also earned a pair of silver medals in both the Helsinki and Rome Olympic games. The two-time world champion was inducted into the United World Wrestling Hall of Fame in 2007.

The native of Tehran passed away at the all too young age of 37, but his legacy and the impact he had on Iranian wrestling will last forever.

60.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

SIXTYONE

PERSEPOLIS

The full glory of the great Persian Empire was Persepolis a massive palace complex which was the ceremonial center of the ancient empire.

In 330 BC Alexander the Great destroyed Persepolis. In recent times there has been efforts to rebuild and restore some of the amazing columns, buildings, carved reliefs and even the original staircase built by Darius. Giant carved bearded bull like men stand guard flanked alongside an entryway.

Persepolis was the capital of the Achaemenid Empire (c. 550–330 BC) in the plains of Marvdasht which are surrounded by the southern Zagros mountains of Iran.

- https://en.m.wikipedia.org/wiki/Persepolis

CHAPTER

SIXTYTWO

SHAPOURI HOUSE

Shapouri House or Shapouri Pavilion and Garden is an early 20th-century Persian building and garden in the city of Shiraz, Iran.

The historical house of Shapouri belongs to the early Pahlavi dynasty in Persia (Iran), c. 1925. This nice house is located in city centre (Anvari Street) of Shiraz and is recorded as an Iranian national monument.

62.1 Gallery











62.2 About the Author

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CHAPTER

SIXTYTHREE

TABATABAI HOUSE

The Tabatabai House is a historic house museum in Kashan, Iran. It was built around 1880, during the reign of the Qajar dynasty, for the affluent Tabātabāei family.

It is one of the prominent historic houses of Kashan and Iran, together with the Āmeri House, the Borujerdi House, and others.

> We will add another article for Ameri and Borujerdi House, there are so many awesome historical houses in Kashan, IR.

63.1 Images

63.2 About the Author

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CHAPTER

SIXTYFOUR

ACID HOUSE

“Probably Roland itself didn’t even think what an epoch-making change would be triggered by the launch of the TB-303 analog bassliner in 1982.”



“The instrument was intended for guitarists practicing alone, as an automatic bass accompaniment for use with the TR606 drum machine, to achieve the” live band in the living room” effect. At first, the structure didn’t have a serious echo; Roland stopped production after a year and a half - after ten thousand TB-303 assemblies. “

64.1 What exactly is the TB-303?

“On a traditional instrument, we can play sounds of different pitches, either together or separately, but the tones are limited. In case of a monophonic TB-303, the opposite is true: we can always program only one pattern, but we can vary its sound through the various modification options to virtually infinity.”

The peculiarity of the genre is the synthesizer’s “squelching” sound, which is sometimes attributed to the merits of a certain Nathan “DJ Pierre” Jones, or just the session musician Charengjit Singh (who appeared to the audience mostly as a guitarist and synthesizer).

DJ Pierre’s, together with two of his friends, took a big step towards development when they approached Marshall Jefferson and then, using a novel synthesizer already mentioned, made a record that definitively changed the world of electronic music. It was released as “Acid Tracks”.

The genre quickly spread in the UK and parts of Europe, as DJs usually played this kind of music in their sets at acid house or rave parties, and as a result, the genre quickly spread around the world.

“The influence of acid house can be heard on later styles of dance music including trance, hardcore, jungle, big beat, techno and trip hop.”

You can find more details about its formation and development on Ishkur’s Guide to Electronic Music, and you can listen to acid house music right away.

https://music.ishkur.com/?query=Acid#

The Every Noise at Once platform provides an opportunity for people to get to know better the names of the creators who have ever been in the genre and thus the peculiarities of it. https://everynoise.com/engenremap-acidhouse.html

64.2 Sources

- MENNYEK KAPUI - Az elektroniks zene évtizede (The decade of electronic music)
- Wikipedia
- Every Noise at Once
- Ishkur's Guide to Electronic Music

64.3 About the Author

"Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub's music is filled with landscapes of emotions, dramatic twists and melancholic moods. He's one of the hosts of Tilos Rádió's MustBeat show, in which he's is focusing on drum'n'bass and chillout music. He's also one half of the duo Empty Universe."

CHAPTER

SIXTYFIVE

ACID TRANCE

“Not only by name, but in reality it is a hybrid trend, it lived its heyday between 1996 and 98. And if the initial trance and the jungle were tied to a city, so was the acid trance, namely to London. It’s hard to define even London acid trance, London techno trance, and even London acid techno trance. “

In the case of this genre, we can truly speak of an underground world, as the various events were literally organized in underground or abandoned venues. The end-of-world atmosphere was also particularly characteristic because it neglected luxury of all genders, and as a result, the audience visiting it was extremely mixed (business people and non-members alike appeared).



“Full democracy, everyone is equal, no one cares where you came from, who you are.”

The purpose of the DJs was not to make a profit (sometimes they played music almost for free), but this allowed them to play anything.

“Then they also conquered the surface, like Nuclear Free in Brixton, in the person of Liberator DJs.”

The genre itself began to spread in the 1990s based on the acid sound world (TB-303 synthesizer).

“Acid trance is the best known form of trance music in Belgium. The form was first showcased at the popular Antwerp Rave 24 in Belgium, and has created four national number one singles in the country since. [Citation needed.”

Acid trance can be derived directly from the acid house genre, as this line did not yet appear at the time of acid house’s heyday.

“The first volumes of Trancemaster compilations contains a few tracks in acid trance style, just as classic trance tracks. The difference is, while acid trance tracks focus more on the changing TB-303 lines, classic trance (e.g. Dance 2 Trance, Cosmic Baby, Age of Love, and Jam & Spoon) tracks are more atmospheric, they use “softer” synth-lines, often strings and other ambient music elements. The line between these two styles is quite blurred; they also emerged about the same time.”

It’s worth mentioning Acid Techno and Detroit Techno on the same page, as old skool Detoit producers have been fond of experimenting with TB-303 and so there’s a lot of overlap between the two genres.

You can find more details about its formation and development on Ishkur's Guide to Electronic Music, and you can listen to acid music right away.

https://music.ishkur.com/?query=Acid#

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"Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub's music is filled with landscapes of emotions, dramatic twists and melancholic moods. He's one of the hosts of Tilos Rádió's MustBeat show, in which he's is focusing on drum'n'bass and chillout music. He's also one half of the duo Empty Universe."

CHAPTER

SIXTYSIX

AMBIENT

“Aether sounds, rippling wave movements, mysterious, distant greenish-blue lights, breath-taking, almost indescribable moods. It’s like walking the highways of a fairy-tale empire, away from the monotony of everyday life, while techno pounding in the adjoining hall. “

One of the UK’s best-known musical figures in the field is Mixmaster Morris (‘Irrestistible Force’). Around the 80s, it usually appeared in chill out rooms as well, because no matter what hectic genre we are talking about, there will always be a point where one can relax a bit from the fatigue so far so that later one can throw oneself into the party resume with renewed vigor.

The recurring sounds in these music are the sounds of nature as well as the acoustic instruments (like the piano, violin, or just the flute) whose sound are modulated with different effects.

“The genre originated in the 1960s and 1970s, when new musical instruments were being introduced to a wider market, such as the synthesizer. It was presaged by Erik Satie’s furniture music and styles such as musique concrète, minimal music, Jamaican dub music and German electronic music, but was prominently named and popularized by British musician Brian Eno* in 1978 with his album Ambient 1: Music for Airports; Eno opined that ambient music “must be as ignorable as it is interesting.”



The name Future Sound of London may be familiar from the fact that they made the ambient music really famous with the album “Lifeforms” (1994).

The genre has become known around the world, including Ibiza, where the name of Jose Padilla (‘Café del Mar’), can be associated with ambient music.

“Then the ambient died in its beauty. The experimental spirits enriched other trends, especially trip hop with hitherto unknown colors, perhaps they themselves created a new style, as New York’s SD Spooky did with illbient. In England, there were only three ambient disc jockeys in the late 1990s: Mixmaster Morris, Patterson and Andrea Parker. Among the publishers, EM stood in the mud for a long time.”

You can find more details about its formation and development on Ishkur’s Guide to Electronic Music, and you can listen to ambient music right away. https://music.ishkur.com/?query=Ambient

The Every Noise at Once platform provides an opportunity for people to get to know better the names of the creators who have ever been in the genre and thus the peculiarities of it. https://everynoise.com/engenremap-ambient.html

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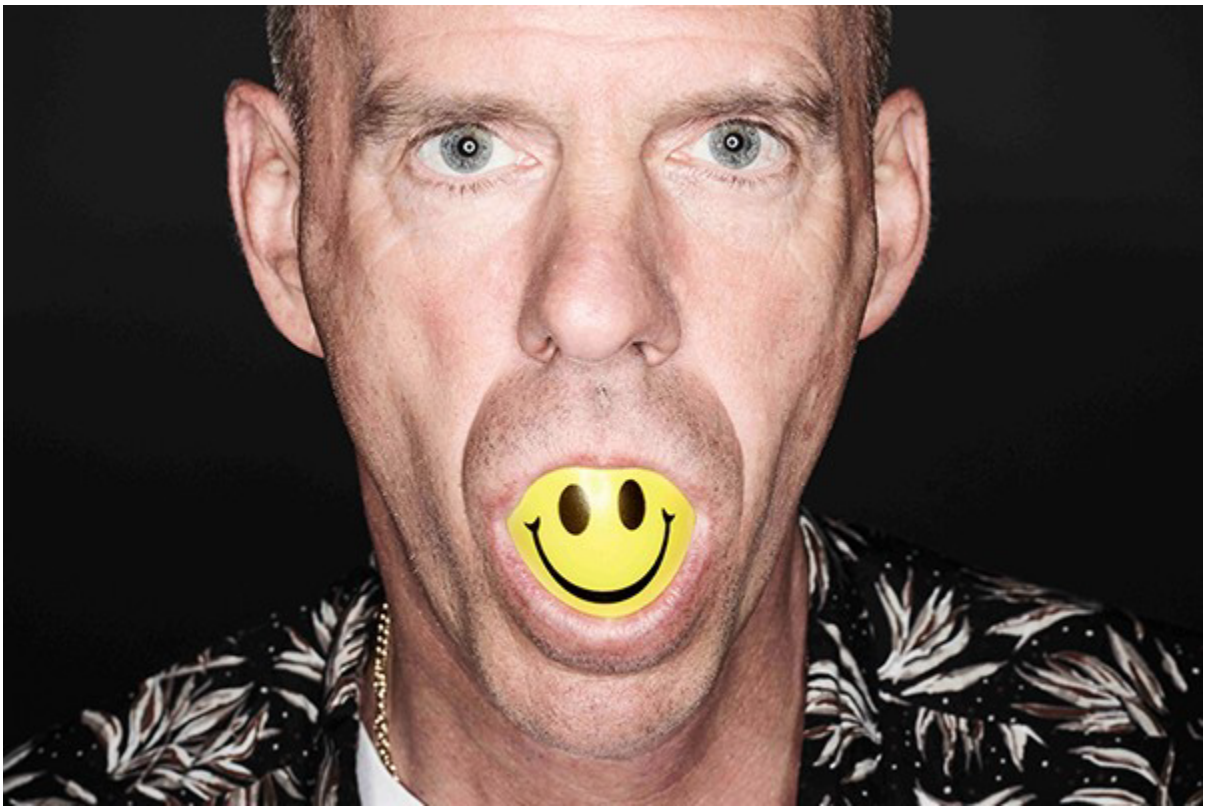
CHAPTER

SIXTYSEVEN

BIG BEAT

“While Chemical Breaks was mostly an American thing, Big Beat was mostly a UK thing.

“Big Beat is the most commercial genre of Breaks but not necessarily the worst (that would be Nu Skool). Legend purports that it got its name from the club Big Beat Boutique, where a then unknown DJ called Fatboy Slim would cane these kinds of tracks. That might be apocryphal (the Fatboy Slim inventing Big Beat thing, not the Fatboy Slim residency at Big Beat Boutique thing), but I don’t have any issues in claiming that Fatboy Slim is largely responsible for Big Beat. It’s all his fault. I don’t hold that against him.”



The trend became really well known between 1995 and 1998.

“Hip hop - flavored for middle-class college students” - said one of the critics of English DJ magazines.”

Breakbeat made the biggest impact on the genre, but there are plenty of jungle or techno elements, as well as the features of trip hop.

It’s worth knowing about the trend that it spins above 115 - 120 bpm, saturated with live (or live like) instruments, in many cases filled with typically pop elements, as well as bases borrowed from hip hop (even scratching).

“Big Beat still adhered to the Funky Drummer cadence of its progenitors although by the late 90s Clyde Stubblefield’s infamous drum break was rarely sampled and producers would just re-create it on their own gear with heavy compression, distortion, EQ and filtering. But Big Beat’s signature sound came from the big booming bass kick on the one of every bar – heavier, thicker, and more prominent than the rest of the percussion.”

“Big Beat may still be around, but it definitely overdosed on itself after 2000. The remnants of Big Beat went on to something even more unforgivable.”

You can find more details about its formation and development on Ishkur’s Guide to Electronic Music, and you can listen to big beat tracks right away. http://music.ishkur.com/?query=BigBeat

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CHAPTER

SIXTYEIGHT

DUBSTEP

"Dubstep can be described as the only true innovative Dance genre since 2000 (alongside Grime), and is sometimes even labeled as a super-genre on its own. After all, it's hard to categorize; falling somewhere in between Breakbeat, Drum 'n'Bass, Downtempo and Jamaican music (Dub). Drum 'n' Bass is chosen here, as Dubstep is most closely related to its subculture and most similar in instrumentation and sound manipulation, but there are large differences."

As for its formation, it is important to note that it is associated with the names of garage performers looking for underground sounds and separated from the garage after the genre spread. The names of the experimenters include El-B, Oris Jay, Steve Gurley and Zed Bias.

It is worth knowing about the peculiarities of the genre that it typically ranges from 135 to 145 bpm, shattered rhythms, the bass well known from dub in a slightly more modern way; can also be called distopic in terms of its atmosphere.



"Dubstep is basically halftime Grime and 2-Step, with maybe some light Dub flavoring (and when I say light I mean light mayonnaise light – this is a genre that went from the London black underground to offensively white Canadian frat dickheads within a nanosecond)."

"2004 was a year of breakthrough. Rephlex, known as Aphex Twin, released two selections featuring prominent dubstep performers called Grime and Grime 2, respectively. BBC Radio 1's record label Mary Ann Hobbs' Dubstep Warz has been airing weekly since 2006. In the same year, the trend reached the general public through the Anglo-American co-production Children of Men; in the science-fiction film we can hear recordings from Digital Mystikz, Kode9, DJ Pinch, Pressure and Random Trio."

The following names are worth noting if someone is more seriously interested in the genre.

Benga, Burial, Coki, Digital Mystikz, DJ Genius, DJ Hatcha, Kode9, Loefah, Plastician, Skream, Slaughter Mob, Toasty. In the field of labels: Big Apple Records (Mixing Records), DMZ Records, Hotflush, Hyperdub, Immigrant, Skull Disco, Tempa.

You can find more details about its formation and development on Ishkur's Guide to Electronic Music, and you can listen to dubstep music right away. https://music.ishkur.com/?query=Dubstep

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CHAPTER

SIXTYNINE

ELECTRO

“It’s one of the most mysterious, controversial genre in electronic music. It’s been around for a very long time, and it’s been reborn several times. Insiders are convinced that it’s really coming up now. But, with some exaggeration, we could say that it doesn’t exist: there are hardly any “clearly” electro music producers, and publishers aren’t crowded either. ”

The interesting thing about the genre is that it clearly merges with other musical worlds, be it hip hop, breakbeat, or even drum and bass (John B - 1998). Robotics (instrumentation, vocal) appears in almost all its elements. It is based on well-defined, simple rhythm formulas with an analog world of sound, sometimes accompanied by recorded sound samples (such as metal tools).

“Electro (or electro-funk) is a genre of electronic music and early hip hop directly influenced by the use of the Roland TR-808 drum machines, and funk. Records in the genre typically feature drum machines and heavy electronic sounds, usually without vocals, although if vocals are present they are delivered in a deadpan manner, often through electronic distortion such as vocoding and talkboxing. This is the main distinction between electro and previously prominent genres such as disco, in which the electronic sound was only part of the instrumentation. It also palpably deviates from its predecessor boogie for being less vocal-oriented and more focused on electronic beats produced by drum machines.”



[TR-808 drum machine]

“The roots are to be found in Germany’s seventies, in Kraftwerk’s studio in Düsseldorf. Then came the golden age between 1982 and 1985. This is New York, the years of post-disco vacuum. The trend was called electro-funk: the second part of the combination of words is clearly a reference to the North American black music tradition. Electro Phunk was also the title of Shock 82’s hit album. The big hit was a joint by Herbie Hancock and Bill Laswell, Rock It. “

“The early 1980s were electro’s mainstream peak. By the mid 1980s, the genre moved away from its electronic and funk influences, using harder edged beats and rock samples, exemplified by Run DMC. Electro became popular again in the late 1990s with artists such as Anthony Rother and DJs such as Dave Clarke. A third wave of popularity occurred in 2007. Electro has branched out into subgenres, including electrocore and skweee.”

You can find more details about its formation and development on Ishkur’s Guide to Electronic Music, and you can listen to acid house music right away. https://music.ishkur.com/?query=Electro

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CHAPTER

SEVENTY

GOA

“Strange style, many also dispute its self-existence, saying that it is a sub-genre of trance. It once undoubtedly started as a sub-genre, but by the end of the 1990s, it had moved so far away from its “mother” that, despite the musical similarities, we could speak of a truly independent style. There are also obvious Indian influences in appearance - even the name of genre refers to the former Portuguese colony.

The initial authentic, “small hotel” spirit slowly turned into a huge business. Many see charlatanism, one of the manifestations of the Western man’s inherited attraction to the dream mystery. They are partially right, as they forget that the trend known as Goa still creates real communities. And meanwhile, the music was pushed backwards, transformed, merged into the big whole: into visuals, into the kaleidoscopic carnival of costumes and scenery. On the other hand, the escape from the IT-electronic jungle of major European cities, or Israel, to the mere mystery of a barren full moon is sometimes anachronistic. Music quality - in inverse proportion to the growth of popularity indicators - is becoming more and more shallow…”

“In the 80s the House explosion reached India’s western shores, specifically Acid House with its alien-sounding trippy synthlines that complimented psychedelic drugs like peanut butter and chocolate (and it’s right there in the name). While a number of legendary Goa DJs will say they started the scene, the one who gave it that electronic edge was probably Goa Gil.”



“What’s more about historicity is that the most outstanding, really pioneering representative of the style was the Juno Reactor. Today, however, Goa is also adapting to the turn of the millennium: the numbers are becoming more and more eclectic, with more and more broken beats.”

Names to keep in mind for genre lovers:

Astral Projection, Doof, Darshan, Electric Universe, Etnica, Green Nuns, Lunar Asylium, Slinky Wizard, Transwave, Xenomorph, and many more.

You can find more details about its formation and development on Ishkur’s Guide to Electronic Music, and you can listen to goa music right away.

https://music.ishkur.com/?query=GoaTrance#

The Every Noise at Once platform provides an opportunity for people to get to know better the names of the creators who have ever been in the genre and thus the peculiarities of it.

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CHAPTER

SEVENTYONE

HARDCORE

“Hardcore is rooted in the 1970s and early 1980s industrial music, specifically the elements of hard electronic dance music. Groups such as Throbbing Gristle, Coil, Cabaret Voltaire, SPK, Foetus and Einstürzende Neubauten produced music using a wide range of electronic instruments. The message diffused by industrial was then very provocative. Some of the musical sounds and experimentation of industrial have directly influenced hardcore since the beginning of the movement.”

“Hardcore is Rave taken to another level. A more harder level. You might say a hard core level.

There is a logical progression to all this. Hardcore is a harder version of Rave, which was a harder version of Euro Techno, which was a harder version of Bleep Techno, which was a misunderstood interpretation of Detroit Techno. There may be other influences but that is the general gist.

This is how we got to this point – everyone outdoing one another each week by coming out with something harder and more menacing, in much the same way The Beatles wanted to make a harder record than The Who so they came up with Helter Skelter. And then a year later Black Sabbath came out with Paranoid.”



“The original hardcore usually starts at 150 BPM, and the sky is the limit. The pace is amazing, and if we add the armada of various distortions, larsen’s preference, the hypnotic, insane, ecstatic effect on the crowds is nothing to be surprised about. Simple music that can be called almost primitive. Some critics see it as the electronic equivalent of the heavy metal trashmetal subspecies.”

“Nu Style Gabber has essentially dominated Hardcore ever since, only lately it has slowed to the point where it sounds indistinguishable from Hardstyle, effectively merging the genres which is fine because the same Dutch prodouchers make both and the same Dutch douchelords listen to both.

So there’s almost no distinction anymore, both in the DJs who cane the crap at Sensation Black and the raging dork-mongers in attendance who think they’re too good for Rob Gee.”

You can find more details about its formation and development on Ishkur's Guide to Electronic Music, and you can listen to acid house music right away. https://music.ishkur.com/?query=Hardcore

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CHAPTER

SEVENTYTWO

HOUSE

“The house was born in Chicago, at least that’s the common (correct) view. played very similar to what drove the sons of Chicago to world fame. In their parties - at first - the lucky ones could hear practically everything: disco, soul, gospel, rock, reggae, European electro-pop, or even abstract krautrock (Manuel Götsching) compositions.”



“House is a genre of electronic dance music characterized by a repetitive four-on-the-floor beat and a typical tempo of 120 to 130 beats per minute. It was created by DJs and music producers from Chicago’s underground club culture in the 1980s, as DJs from the subculture began altering disco songs to give them a more mechanical beat and deeper basslines.

The genre was pioneered by DJs and producers mainly from Chicago and New York such as Frankie Knuckles, Larry Levan, Ron Hardy, Jesse Saunders, Chip E., Steve “Silk” Hurley, Mr. Lee, Farley “Jackmaster” Funk, Marshall Jefferson, Phuture and others. From its beginnings in the Chicago club and local radio scene, the genre expanded internationally to London, then to other American cities such as New York City and Detroit before becoming a worldwide phenomenon.”

“In its most typical form, the genre is characterized by repetitive 4/4 rhythms including bass drums, off-beat hi-hats, snare drums, claps, and/or snaps at a tempo between 120 and 130 beats per minute (bpm), synthesizer riffs, deep basslines, and often, but not necessarily, sung, spoken or sampled vocals. In house, the bass drum is usually sounded on beats one, two, three, and four, and the snare drum, claps, or other higher-pitched percussion on beats two and four. The drum beats in house music are almost always provided by an electronic drum machine, often a Roland TR-808, TR-909, or a TR-707. Claps, shakers, snare drum, or hi-hat sounds are used to add syncopation. One of the signature rhythm riffs, especially in early (Chicago) house, is built on the clave pattern. Congas and bongos may be added for an African sound, or metallic percussion for a Latin feel.”

“At least three styles of dancing are associated with house music: Jacking, Footwork, and Lofting. These styles include a variety of techniques and sub-styles, including skating, stomping, Vosho, Pouting Cat and shuffle steps (also see Melbourne Shuffle). House music dancing styles can include movements from many other forms of dance, such as waacking, voguing, African, Latin, Brazilian (including Capoeira), jazz dance, Lindy Hop, tap dance, and even modern

dance. House dancing is concerned with the sensuality of the body and setting oneself free in ecstasy — without the worry of outside barriers."

You can find more details about its formation and development on Ishkur's Guide to Electronic Music, and you can listen to house music right away. https://music.ishkur.com/?query=WorldHouse

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CHAPTER

SEVENTYTHREE

IDM

In the early nineties, several names (ambient techno, armchair techno, electronics) were used in the public domain not only for club purposes, but mainly to mark more in-depth recordings intended for listening to music at home. In 1992, WARP Records released the compilation album Artificial Intelligence, and promoted the works of the artists belonging to the label first as “electronic listening music” and then as “intelligent techno”. The activities of the publishers of the publication and the label have aroused considerable interest in the North American continent. The term IDM (Intelligent Dance Music) was first used by Alan Parry, a big fan of WARP publications, in August 1993, when he launched the IDM list on Usenet. The collective name refers to the quality production of performers who stood out from the rave era with their artistic attitude, individual sound and willingness to experiment.

The term “intelligent dance music” has been widely criticised and dismissed by most artists associated with it, including Aphex Twin, Autechre, and -Ziq.



73.1 The IDM List

In November 1991, the phrase "intelligent techno" appeared on Usenet in reference to Coil's The Show EP. Off the Internet, the same phrase appeared in both the U.S. and UK music press in late 1992, in reference to Jam & Spoon's Tales from a Danceographic Ocean and the music of The Future Sound of London. Another instance of the phrase appeared on Usenet in April 1993 in reference to The Black Dog's album Bytes. And in July 1993, in his review of an ethno-dance compilation for NME, Ben Willmott replaced techno with dance music, writing "…current 'intelligent' dance music owes much more to Eastern mantra-like repetition and neo-ambient instrumentation than the disco era which preceded the advent of acid and techno.

The common base is a peculiar approach to music, but the offer is quite mixed musically: the contemporary experimental electronic aspirations are sometimes dub, sometimes breakbeat, sometimes drum & bass, sometimes chill out, sometimes ambient, sometimes minimal techno, sometimes trance, but we find among them abstract hip hop works as well. With this in mind, it is understandable that IDM as a classification has provoked and continues to provoke ongoing debates to this day.

It has also been the subject of eternal debate - and is likely to be - about which performers can fall into this category. The following names were found frequently in the Usenet IDM list:

Andrew Weatherall, Aphex Twin, Autechre, Black Dog, Boards of Canada, FSOL, Leftfield, LFO, Luke Vibert, Massive Attack, -ziq, Orbital, Plastikman, Richard H. Kirk, Sabers of Paradise, System 7, The Orb, William Orbit.

You can find more details about its formation and development on Ishkur's Guide to Electronic Music, and you can listen to IDM music right away. http://music.ishkur.com/?query=AmbientTechno#

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CHAPTER

SEVENTYFOUR

JUNGLE DRUM BASS

Drum and bass (also written as Drum&Bass or drum'n'bass and commonly abbreviated as D&B, DnB, or D'n'B) is a genre of electronic music characterized by fast breakbeats (typically 165-185 beats per minute) with heavy bass and sub-bass lines, samples, and synthesizers. The genre grew out of the UK's jungle scene in the early 1990s.

When the party heroes of '89, Grooverider and Fabio, sometime in the early 1990s, moving away from hardcore in clubs in South London (Brixton, Elephant & Castle - most often in Rage), they enriched their music with completely unusual rhythm patterns - and they drove the audience crazy - they had no idea that the mainstream music of Britain's '97 grew out of these thoughts.

Of course, jungle didn't come out of nowhere: it roots in dub (rhythm world, sub-basses), hip hop (also featuring rhythm formulas, and MCs) and techno (studio process).

Sampling from the drums of former jazz (sometimes swing, or bossa nova) music, then accelerated to 160-180 bpm, a simplistic, almost trivial, but powerful reggae bass beat: this is pretty much the jungle base, from this point on, the most prolific and inventive musical style of the late 1990s branches off into a number of sub-genres. For example, a ragga muffin with up vocals, dub bass lines, reggae sound patterns, a fun-sounding jump up, or a reggae jungle (e.g. Mickey Finn, Aphrodite). Or drum & bass (e.g. Guy Called Gerald, Goldie, Photek, Doc Scott, Alex Reece), who no longer sampled rhythm guitars, but programmed the sound very finely, developing the sound to the finals: at first hearing inhuman and hyper-fast breakbeats are dissolved by the jazz and soul elements, ambient pads, vocals flowing on them.



Drum and bass is dominated by a relatively small group of record labels. Major international music labels had shown very little interest in the drum and bass scene until BMG Rights Management acquired RAM in February 2016. Since then, the genre has seen a significant growth in exposure. The origin and home of drum and bass music is in the UK, with other prominent fanbases located in Australia, Canada, New Zealand, United States, and South Africa. There's also a modest following in countries like Austria, Russia, Estonia, Czech Republic, Belgium, the Netherlands, and more.

You can find more details about its formation and development on Ishkur's Guide to Electronic Music, and you can listen to ragga jungle and drum and bass music right away.

http://music.ishkur.com/?query=RaggaJungle

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CHAPTER

SEVENTYFIVE

NU JAZZ

Nu Jazz is Acid Jazz without the Acid.

Nu Jazz is one of the youngest electronic music trends. In terms of its origins, the acid jazz of the early nineties, some easy listening, house, trip hop and of course jazz such as Sun Ra (with his intergalactic band) was the starting point. James Blood Ulmer's concept of new harmology, projecting the shadow of change, the new wind direction. Eclecticism, eclecticism, eclecticism .. Everything can go with everything, endless fusions, John Coltrane with world music, funky Brazilian motifs, 1975 jazz-rock with broken beats, and more. Perhaps we can't talk about any style, just aspirations that fall into the nu jazz collector category. Their only common feature is that one way or another, but jazz is always present. Actual jazz musicians, of course, see this quite differently, they associate it with something completely different when they hear the "nu jazz" expression. This time Berlin is the place of birth and not the UK. It all started sometime in the second half of the nineties, in Jazzanova's studio. House, downtempo, saxophones, Latin melodies, pleasant spins, champagne pops, beyond the rumble, the murmur: the boys had already composed post-millennium music before the millennium. The members of the renowned collective are: Jürgen von Knoblauch, Alexander Barck, Class Brieler (they are the record readers), Alex Reinemar, Stefan Leisering, Rosko Kretschmann (and they are the producers).

[Sun Ra Arkestra (All About Jazz)]

The best known label is Compost - including Les Gammas, the more abstract Kyoto Jazz Massive, Syrup and the Trüby Trio, among others. But still the Jazzanova, or the Voom Voom (Peter Kruder and Fauna Flash) also help. The spirit of Vienna haunted… Some selections include late pieces from Future Sound of Jazz, as well as Glücklich's opuses. Another prominent figure in the trend is the Italian Nicola Conte. His home pioneers are the Keyser-Shuriken duo.

There are other sonic markers that jazz scholars (yes, those exist) like to indicate as instrumental in the development of Nu Jazz including the works of Jon Hassel, Bugge Wesseltoft, and Miles Davis, because it always comes back to Miles Davis. But mostly it was 90s electronic-fusion that got the ball rolling. And because it sounded so different from the staunch traditional stuff of yore it could only be regarded as something new, or Nu. But not Gnu.

Labels who had supported Acid Jazz and other forms of Downtempo had no problem getting up on that Nu Jazz business (Wall Of Sound, Ninja Tune, Qaungo, Acid Jazz).

You can find more details about its formation and development on Ishkur's Guide to Electronic Music, and you can listen to nu jazz music right away. http://music.ishkur.com/?query=NuJazz#

The Every Noise at Once platform provides an opportunity for people to get to know better the names of the creators who have ever been in the genre and thus the peculiarities of it.

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75.1 About the Author

“Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub’s music is filled with landscapes of emotions, dramatic twists and melancholic moods. He’s one of the hosts of Tilos Rádió’s MustBeat show, in which he’s is focusing on drum’n’bass and chillout music. He’s also one half of the duo Empty Universe.”

CHAPTER

SEVENTYSIX

NU SKOOL BREAKS

Nu skool breaks (or nu breaks as it is sometimes referred) is a subgenre of breakbeat originating during the period between 1998 and 2002. The style is usually characterized by more abstract, more technical sounds, sometimes incorporated from other genres of electronic dance music, including UK garage, electro, and drum and bass.

Typically, tracks ranged between 125 and 140 beats per minute (bpm), often featuring a dominant bass line. In contrast with big beat, another subgenre of breakbeat, the sound set consisted less of hip hop samples and acid-type sounds, instead emphasizing dance-friendliness and "new" sounds produced by modern production techniques using synthesizers, effect processors, and computers.

The term "nu skool breaks" is widely attributed to Rennie Pilgrem and Adam Freeland, who used it to describe the sound at their night Friction, which was launched at Bar Rumba in 1996, with promoter Ian Williams.





The tracks "Renegades" by Uptown Connection and "Double Impact" by Boundarie Hunters are considered to be the earliest produced to formally adopt the genre.

In 1998, the term "Nu Skool Breaks" was used on two compilations, Nu Skool Breakz, Volume 1 and 2, mixed by Rennie Pilgrem and released through UK-based Kickin Records. The first volume of these was recorded live at the aforementioned London club night Friction.

Labels that featured early Nu Skool Breaks releases included Botchit & Scarper, Fuel Records (UK), Hard Hands, Marine Parade Records, TCR, and Ultimatum Breaks.

The original nu skool was basically more positive, cheerful music: the sounds of the future and not the end of the world mood half pointed the direction. Simultaneously dance-centric and twisting the brain, transmitting an amazing amount of auditory information. Unfortunately, by 2001, this genre had also set in, although this set-up still covered more exciting pieces (such as Meat Katie's compositions) than other styles.

If you think you're discovering human speech or something like that, don't be trapped: it's usually made using vocoders and various effects. Although the authors also work from samples, they usually generate the sounds themselves. And they are not averse to "strangeness" either: proving the fertilizing effect of folk music in the general sense, sometimes an accordion or flute is also played

You can find more details about its formation and development on Ishkur's Guide to Electronic Music, and you can listen to nu skool breaks music right away https://music.ishkur.com/?query=NuSkoolBreaks

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CHAPTER

SEVENTYSEVEN

PROGRESSIVE

The progressive marker was used to distinguish the works of performers experimenting with a fusion of jazz and rock in the late 1960s, and the first techno producers in Detroit and Chicago in the 1980s. In the electronic music scene, the word progressive refers both to the gradual construction that can be observed in the recordings and to the willingness to incorporate the characteristic stylistic elements of other trends. Again, the label was first used by Mixmag experts. Its roots go back to the early 1990s, with critics considering the early maxi of Guerrilla Records and Leftfield (especially the 1992 Song Of Live) as the very first progressive house recordings. The cradle of the trend is Mansfield, England, where the Renaissance Club opened its doors in 1992, with residents of later key players, Sasha and John Digweed. The popularity of progressive really grew until the mid-1990s, when the increasingly kitschy, distorted, commercial eurotrance no longer met the expectations of more demanding music listeners.



Progressive trance was created by mixing several trends; it also drew from elements of trance, (mostly deep) house, techno, dub and ambient. The recordings have typically four four rhythm, with 125-135 bpm deliberately more restrained than the then-fashionable "resident trance" 130-160 tempo. Its structures are more complex, more abstract, and the deeper, more definite bass line feeds on the aesthetics of the dub. The introductory, slowly recovering phase of progressive trance can take up to 3-4 minutes, and then rhythm and the main motif return after (often with a long break - with or without a snare drum). Progressive trance music is typically longer than trance pieces, at least 5-6, but often 10-12 minutes. Lots of music scenes have a "progressive" version that extends the framework of their aesthetics, from Progressive Breaks to Progressive Trance and Progressive House, and even non-electronic music like Progressive Rock and Progressive Metal. These "progressive" genres have nothing in common with each other other than a drive to explore and expand the quality of their genre's native essence. At least, that's what they think they're doing. And then there's this – an actual scene and genre called Progressive. Not Progressive anything, just Progressive, or Prog. A noun rather than an adjective. It probably got its name as a fusion genre between Progressive House and Progressive

Trance, producing something that simultaneously sounds like both and neither (but don't call it Trouse because that's just stupid. What kind of Dutch idiot would call it that?). Two Progressives = One Prog, if my math is correct.

You can find more details about its formation and development on Ishkur's Guide to Electronic Music, and you can listen to progressive music right away. https://music.ishkur.com/?query=Progressive

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CHAPTER

SEVENTYEIGHT

SPEED GARAGE

Speed garage (occasionally known as plus-8) is a genre of electronic dance music, associated with the UK garage scene.

Speed garage features sped-up NY garage 4-to-the-floor rhythms that are combined with breakbeats. Snares are placed as over the 2nd and the 4th kickdrums, so in other places of the drum pattern. Speed garage tunes have warped, heavy basslines, influenced by jungle and reggae. Sweeping bass is typical for speed garage. It is also typical for speed garage tunes to have a breakdown. Speed garage tunes sometimes featured timestretched vocals. As it is heavily influenced by jungle, speed garage makes heavy use of jungle and dub sound effects, such as gunshots and sirens.

A widely regarded pioneer of the speed garage sound is record producer, DJ and remixer Armand van Helden, whose Dark Garage remix of the Sneaker Pimps' "Spin Spin Sugar" in 1996 helped bring the style of speed garage into the mainstream arena.

Speed Garage differs from regular Garage in its affections for Jamaican culture and cliches. Not actual Jamaica, of course, but Jamaican transplants in England (this is a UK genre after all). Dancehall call and responses, gun shots and other stock reggae sound effects, and of course that stupid bassline which sounds like the school teacher in the Charlie Brown cartoons scolding one of the Peanuts kids for his inability to spit, sing and gargle at the same time.



Some like to point to the 1994 track George Morel - Let's Groove as the originator of the dumb bassline, but he was using the Reese bass – a rolling bassline that was a big thing in Darkstep at the time – in a high register for some

reason. So you can call that the first Speed Garage track if you like. The Electronic Music Standards and Classifications Consortium will not penalize you for it.

Speed Garage didn't invent time-stretched vocals but it abused them to the point of nausea. Garage music itself was moving toward a heavier, bassier sound and it is customary in electronic music that when someone comes up with a catchy hook, idea or technique, the next wave of imitators often take it to cartoonish extremes. It's like inventing an ice cream sundae, and the next guy comes along and thinks "If the fudge is everybody's favorite part, why not make a sundae that's all fudge?" So in effect, Speed Garage is like a late 90s parody of what Garage sounded like in the mid 90s.

Speed Garage also did one other thing regular Garage doesn't do: Breakdowns and builds. But hey, it was the 90s and every genre was doing that to some extent blame Eurotrance. Speed Garage was so popular that it often beat Eurotrance for the peak hour main room slot at massive raves.

Such overexposure and over-reliance on gimmicks meant that it could not possibly last and it didn't. By 2000 Speed Garage had almost dropped off the face of the Earth. All the producers shifted to making 2-Step Garage instead, which is basically just Speed Garage with downtempo breakbeats (and other lousy ideas).

10 years later, however, Speed Garage would make a triumphant yet subtle return as people remembered the goofy gimmicks and stupid sounding basslines and started making it all over again, this time influenced by Dubstep wubs and production gloss. They call it Bassline House or House Garage or Bass House or Dumb Bullshit House for some reason, probably because every generation wants to think that it invented something if it gets to come up with the name for it.

You can find more details about its formation and development on Ishkur's Guide to Electronic Music, and you can listen to progressive music right away. https://music.ishkur.com/?query=Progressive

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CHAPTER

SEVENTYNINE

TECHNO

Techno is a genre of electronic dance music (EDM) that is predominantly characterized by a repetitive and hard four on the floor beat which is generally produced for use in a continuous DJ set. The central rhythm is often in common time (4/4), while the tempo typically varies between 120 and 150 beats per minute (bpm). Artists may use electronic instruments such as drum machines, sequencers, and synthesizers, as well as digital audio workstations. Drum machines from the 1980s such as Roland's TR-808 and TR- 909 are highly prized, and software emulations of such retro instruments are popular.

Use of the term "techno" to refer to a type of electronic music originated in Germany in the early 1980s. In 1988, following the UK release of the compilation Techno! The New Dance Sound of Detroit, the term came to be associated with a form of electronic dance music produced in Detroit. Detroit techno resulted from the melding of synthpop by artists such as Kraftwerk, Giorgio Moroder and Yellow Magic Orchestra with African American styles such as house, electro, and funk. Added to this is the influence of futuristic and science-fiction themes relevant to life in American late capitalist society, with Alvin Toffler's book The Third Wave a notable point of reference. The music produced in the mid to late 1980s by Juan Atkins, Derrick May, and Kevin Saunderson (collectively known as the Belleville Three), along with Eddie Fowlkes, Blake Baxter, James Pennington and others is viewed as the first wave of techno from Detroit.

After the success of house music in a number of European countries, techno grew in popularity in the UK, Germany, Belgium and the Netherlands. In Europe regional variants quickly evolved and by the early 1990s techno subgenres such as acid, hardcore, ambient, and dub techno had developed. Music journalists and fans of techno are generally selective in their use of the term; so a clear distinction can be made between sometimes related but often qualitatively different styles, such as tech house and trance.

Techno also responded to the house becoming mainstream: while most clubs played house, techno or acid trance was played at free parties, with the exception of chill-out room ambient, triphop, drum & bass. Of course, this style also yielded its own successors: Carl Cox, who works with three turntables, Laurent Garnier of France, Joey Beltram of New York, the Orbit, or Dave Clarke. The most exciting drive of the style is the minimal, streamlined sounds, the ecstatic stream music of the repetitive rhythms unfolding like a snail. Its main representatives are Richie Hawtin (aka Plastikman), Maurizio (from Berlin), Robert Hood (from Detroit). But the rest of Detroit also likes to excel at a minimum, such as Mad Mike (the soul and lifeblood of Underground Resistance), Kenny Larkin, or Season Deason.

Some formations tried to marry the techno with the pop. The experiment proved successful and is still fantastically profitable. For them, the first gates of America were opened: Prodigy, Underworld, Daft Punk …

[Prodigy (Metal.hu)] [Underworld (IMDb)] [Daft Punk (Discogs)]

You can find more details about its formation and development on Ishkur's Guide to Electronic Music, and you can listen to techno music right away. https://music.ishkur.com/?query=DetroitTechno

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CHAPTER

EIGHTY

TRANCE

Trance is a genre of electronic dance music that emerged from the British new-age music scene and the early 1990s German techno and hardcore scenes.

Trance music is characterized by a tempo lying between 125–150 bpm (BPM), repeating melodic phrases and a musical form that distinctly builds tension and elements throughout a track often culminating in 1 to 2 “peaks” or “drops”. Although trance is a genre of its own, it liberally incorporates influences from other musical styles such as techno, house, pop, chill-out, classical music, tech house, ambient and film music.

A trance is a state of hypnotism and heightened consciousness. This is portrayed in trance music by the mixing of layers with distinctly foreshadowed build-up and release. A common characteristic of trance music is a mid-song climax followed by a soft breakdown disposing of beats and percussion entirely, leaving the melody or atmospherics to stand alone for an extended period before gradually building up again. Trance tracks are often lengthy to allow for such progression and commonly have sufficiently sparse opening and closing sections to facilitate mixing by DJs.

Trance is mostly instrumental, although vocals can be mixed in: typically they are performed by mezzo-soprano to soprano female soloists, mostly without a traditional verse/chorus structure. Structured vocal form in trance music forms the basis of the vocal trance subgenre, which has been described as “grand, soaring, and operatic” and “ethereal female leads floating amongst the synths”. However, male singers, such as Jonathan Mendelsohn, are also featured.

Its more prominent representatives ventured into other musical landscapes, with Goa remaining almost exclusively a herald by the mid-1990s - if it had anything to do with trance at all … The period of stagnation may have followed: Descent from A-category to Z-series, repetitions, popularization in shopping malls. Trance was pushed to the periphery of electronics.

In the second half of the nineties, the activities of the undead, who ran to the zenith of glory in the turn of the millennium, mainly Global Underground disc jockeys (Sasha, John Digweed, Anthony Pappa, Timo Maas). Allegedly, they don’t even play trance anymore, but something else, spiced with deep house and other notes, even breakbeat elements, which struck minds have called progressive…

And the euro-trance sector is more popular than ever, even in polar spices in all supermarkets.

Kitschy, for example, the well-off Paul Paul Dyk.

You can find more details about its formation and development on Ishkur’s Guide to Electronic Music, and you can listen to trance music right away.

https://music.ishkur.com/?query=Trance

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CHAPTER

EIGHTYONE

TRIP HOP

Trip hop (sometimes used synonymously with “downtempo”) is a musical genre that originated in the early 1990s in the United Kingdom, especially Bristol. It has been described as “a fusion of hip hop and electronica until neither genre is recognizable”, and may incorporate a range of styles, including funk, dub, soul, psychedelia, R&B, and house, as well as other forms of electronic music. Trip hop can be highly experimental and its also known for its melancholic sound..

Deriving from later idioms of acid house, the term was first used by the British music media to describe the more experimental variant of breakbeat emerging from the Bristol sound scene in the early 1990s, which contained influences of soul, funk, and jazz. It was pioneered by acts like Massive Attack, Tricky, and Portishead. Trip hop achieved commercial success in the 1990s, and has been described as “Europe’s alternative choice in the second half of the ’90s”.



Naturally, the British rags were quick in declaring this Fresh Sound Of British Urban Soul as the New Hotness, though the chap credited with first associating the name Trip Hop with the sound is Mixmag scribe Andy Pemberton. Remember that factoid for the Trivial Pursuit version of this Guide.

Labels that made Acid Jazz their go-to sound for inner city cred switched over. Thanks to some savvy signings one print did it so completely that most think of them as the ones who nurtured Trip Hop right from the start. No, not Ninja Tune though they certainly had their fingers in the pot.

Rather, it was Mo Wax, run by James Lavelle (ie: UNKLE).

Common musical aesthetics include a bass-heavy drumbeat, often providing the slowed down breakbeat samples similar to standard 1990s hip hop beats, giving the genre a more psychedelic and mainstream feel. Vocals in trip hop are oftentimes female and feature characteristics of various singing styles including R&B, jazz and rock. The female-dominant vocals of trip hop may be partially attributable to the influence of genres such as jazz and early R&B, in which female vocalists were more common. However, there are notable exceptions: Massive Attack and Groove Armada collaborated with male and female vocalists, Tricky often features vocally in his own productions along with Martina Topley-Bird, and Chris Corner provided vocals for later albums with Sneaker Pimps.

Trip hop tracks often incorporate Rhodes pianos, saxophones, trumpets, flutes, and may employ unconventional instruments such as the theremin and Mellotron. Trip hop differs from hip hop in theme and overall tone. Contrasting with gangsta rap and its hard-hitting lyrics, trip hop offers a more aural atmospherics influenced by experimental folk and rock acts of the seventies, such as John Martyn,combined with instrumental hip hop, turntable scratching, and breakbeat rhythms. Regarded in some ways as a 1990s update of fusion, trip hop may be said to "transcend" the hardcore rap styles and lyrics with atmospheric overtones to create a more mellow tempo.

You can find more details about its formation and development on Ishkur's Guide to Electronic Music, and you can listen to trip hop music right away.

https://music.ishkur.com/?query=TripHop

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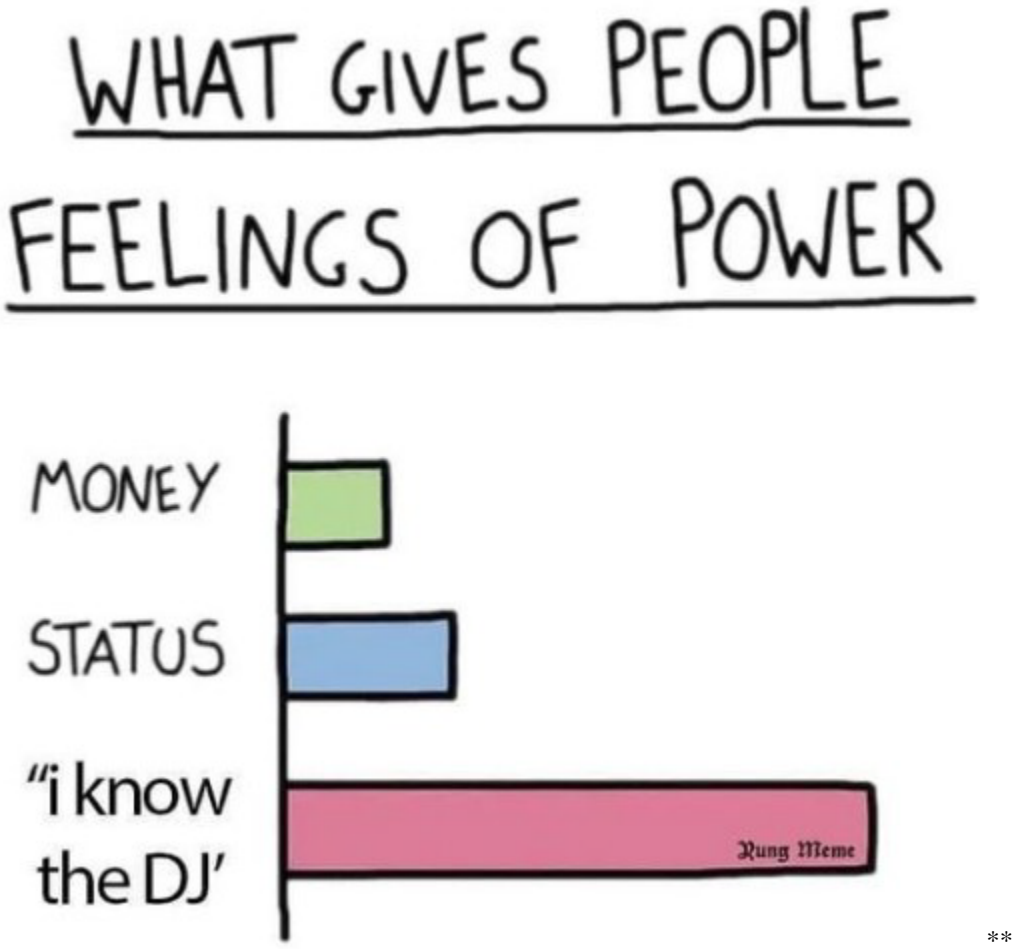
CHAPTER

EIGHTYTWO

THE DJ

“In a year before the turn of the millennium, a survey in Germany found that 70% of young people surveyed would like to be a disc jockey.” *



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The question may arise as to what might be the reason for this. What does a DJ (disc jockey) actually do? What is his/her role and what makes someone a good DJ? What is the future of DJing?

As incredible as it may be, DJing itself dates back to the wartime, when some wanted to entertain their comrades in this way. Since then, a lot of time has passed, and the name itself has got a completely different meaning, but the role has also changed a lot with the development of technology and needs.

What are the basic tasks of a DJ? Selection (compiling a musical program for a given set), technical skills (mixing), presence (keeping in touch with the audience). *

The basic requirement for a DJ is to perform his set as smoothly as possible, for which it is essential to have a good knowledge of the songs played and the playing device (mixer), as this allows him to mix two music tracks in a completely unique way, thus achieving the effect of continuity and appropriate enhancement of mood.

“A disc jockey can be neither a slave nor a dictator.” *

A DJ can really measure the success of his set from the reaction of the audience, as the goal is to entertain. Therefore, it is important to pay attention to the needs and feedback of the audience (even in the form of body language), but this should not be the sole goal, as the process may lose its meaning because a set can be really successful if both the audience, and the DJ feel good during the process.

82.1 The present and the future

It is interesting to note that in many cases today we cannot talk about spinning disks at all, as modern technology allows us to take our music with us when stored on an external storage device (pendrive, external HDD), thus protecting the music from amortization.

On the other hand, this is exactly what makes a DJ, who plays music from vinyl, special, but no matter how we look at it, analog sound is a kind of ancient, instinctive world that makes it a curiosity forever.

Of course, in the meantime, transcoding systems have emerged (e.g. Serato), which is a kind of hybrid of the two worlds, because one can play music from a vinyl(-like) plate using a digital signal.

Today, systems have been introduced that make it no longer necessary to have an external storage device, because thanks to the latest developments, music can also be played directly from the cloud.

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- – MENNYEK KAPUI - Az elektroniks zene vtizede (The decade of electronic music) ** - Facebook

CHAPTER

EIGHTYTHREE

ELECTRONIC MUSICAL INSTRUMENT

An electronic musical instrument or electrophone is a musical instrument that produces sound using electronic circuitry. Such an instrument sounds by outputting an electrical, electronic or digital audio signal that ultimately is plugged into a power amplifier which drives a loudspeaker, creating the sound heard by the performer and listener.

An electronic instrument might include a user interface for controlling its sound, often by adjusting the pitch, frequency, or duration of each note. A common user interface is the musical keyboard, which functions similarly to the keyboard on an acoustic piano, except that with an electronic keyboard, the keyboard itself does not make any sound. An electronic keyboard sends a signal to a synth module, computer or other electronic or digital sound generator, which then creates a sound. However, it is increasingly common to separate user interface and sound- generating functions into a music controller (input device) and a music synthesizer, respectively, with the two devices communicating through a musical performance description language such as MIDI or Open Sound Control.



[Robert Moog, inventor of the Moog synthesizer (Wikipedia)]

All electronic musical instruments can be viewed as a subset of audio signal processing applications. Simple electronic musical instruments are sometimes called sound effects; the border between sound effects and actual musical instruments is often unclear.

In the 21st century, electronic musical instruments are now widely used in most styles of music. In popular music styles such as electronic dance music, almost all of the instrument sounds used in recordings are electronic instruments (e.g., bass synth, synthesizer, drum machine).

Development of new electronic musical instruments, controllers, and synthesizers continues to be a highly active and interdisciplinary field of research. Specialized conferences, notably the International Conference on New Interfaces for Musical Expression, have organized to report cutting- edge work, as well as to provide a showcase for artists who perform or create music with new electronic music instruments, controllers, and synthesizers.

In the 18th-century, musicians and composers adapted a number of acoustic instruments to exploit the novelty of electricity. Thus, in the broadest sense, the first electrified musical instrument was the Denis d'or keyboard, dating from 1753, followed shortly by the clavecin électrique by the Frenchman Jean-Baptiste de Laborde in 1761. The Denis d'or consisted of a keyboard instrument of over 700 strings, electrified temporarily to enhance sonic qualities. The clavecin électrique was a keyboard instrument with plectra (picks) activated electrically. However, neither instrument used electricity as a sound-source.

Next topic: Denis d'or

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83.2 About the Author

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CHAPTER

EIGHTYFOUR

DENIS D'OR



The Denis D'or, the "Golden Dionysis", was an early one-off keyboard instrument built by the Czech theologian and pioneer of electrical research Václav Prokop Diviš (1698 – 1765). Described as an 'orchestrion' because of its ability to imitate the sounds of wind and string instruments, it is often described as the first electronic musical instrument, yet, due to lack of detailed historical documentation and conflicting contemporary reports this claim remains uncertain.

The earliest written mention of the Denis d'or dates from 1753, but it is likely that it already existed around 1748. Some sources even date its existence as far back as the year 1730, but this claim is historically untenable and not supported by any available information on Diviš's biography and work. Unfortunately, after Diviš's death in 1765 the unique instrument was sold and eventually brought to Vienna, where it vanished without trace.

Several accounts describe the instrument as an electro-acoustic instrument where the strings are vibrated using electromagnets: "...In 1730 the Moravian preacher Prokop DIVIS generated sound by electromagnetic excitation of piano strings . He called his invention Denis d'or " (Schiffner 1994 , p 62) and "His experiments were based on the electromagnetic excitation of piano strings, but could not prevail despite initially considerable interest to the public." (Harenberg 1989, p 26 quoted in Ruschkowski 1983, p 347) yet this seems unlikely as the relationship between electricity and electromagnetism only became understood as late as 1820.

Other accounts suggest that the Denis D'Or was an elaborate joke whereby the performer could be electrocuted at will by the inventor Denis d'or, an electric "Mutationsflugel" with one pedal, created in 1730 by the Moravian preacher

Prokop Diviß of Prendnitz in Znojmo… This instrument was 5 feet long and 3 feet wide, with 790 strings. However, the suspension and the tautening of the numerous metal strings were much more elaborate. The ingenious mechanism, which had been worked out by Diviš with painstaking mathematical accuracy was such that the Denis d'or could imitate the sounds of a whole variety of other instruments, including chordophones such as harpsichords, harps and lutes, and even wind instruments. An untimely anti joke was that the player of the instrument could receive an electric shock whenever the inventor wanted.

Denis D'or named by Procopius Divisz, pastor Prendnitz in Znojmo in Moravia, in 1730 he invented keyboard instrument with pedals, which is the time that efforts in the area of instrument making became almost a caricature . The instrument was 1.57 meters long and 0.95 meters wide, and had a reference of 790 strings that could be tuned in three-quarter hours to 130 notes. This instrument allowed, among the sounds of almost all known string and wind instruments were represented, and even also loose jokes such that the player were given an electric shock as often as the inventor or owner wished. Apparently only one copy of this instrument was made which was purchased by the prelates of Bruck, Georg Lambeck.

84.1 About the Author

Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub's music is filled with landscapes of emotions, dramatic twists and melancholic moods. He's one of the hosts of Tilos Rádió's MustBeat show, in which he's is focusing on drum'n'bass and chillout music. He's also one half of the duo Empty Universe.

84.2 References

- Wikipedia
- 120years.net

CHAPTER

EIGHTYFIVE

ELECTROMECHANICAL PIANO

85.1 What is an 'electromechanical' instrument?

One in which some sort of electric pick-up system, either electromagnetic or electrostatic, detects and amplifies certain mechanical movements.

The German Matthias Hipp was a "serial inventor": he was engaged in chronoscopes, chronographs, galvanometers, signaling equipment for railways, watches and gyros. He was probably the inventor of the world's first "real" electronic musical instrument.

It is interesting that the specific descriptions or sketches of the Hipp device did not survive: we know about its electromechanical piano from fragments of descriptions that have come down to us by contemporaries, later processed by other authors.

Matthias (or Matthäus) Hipp's – (Blaubeuren, 25 October 1813 – 3 May 1893 in Fluntern) –many inventions and adaptations include; Chronoscopes, Chronographs, Galvanometers, railway signalling equipment, watch and clock mechanisms, Telegraphic time detectors, telexes, networked electronic clocks, fire alarms, Microphones, Seismographs, electronic Gyroscopes and possibly the first electro-magnetic musical instrument.



[Matthias Hipp " The Swiss Edison"]

Hipp described his invention in the 1867 edition of the Polytechnisches Journal – Das elektrische Clavier; von M. Hipp, Director der Telegraphen-Fabrik in Neuenburg (Schweiz). 1 Hipp's instrument, a confluence of the technologies of watch mechanics, telegraphy and electro-magnetism, was an electro-mechanical player-piano, controlled by a perforated paper role. (and itself an improved version of an earlier (1861) attempt at building an electrical piano by Herr Andrea of Sindelfingen, Baden-Württemberg Germany). Music was encoded into the paper by cutting variable length perforations – pitch and duration– with a separate track for volume. The paper roll traversed over a set of

brushes or 'feathers' which they made contact through the perforations, closed a circuit and triggered the piano hammer mechanism of a standard acoustic piano:



[Mechanism of an ancient chime in Notre-Dame]

"A small instrument serves as a player–machine, in which there is a resilient metal tip for each key; these tips rest on a metal roller with corresponding pressure and send the electric current through the associated electromagnet every time this roller is touched, thus causing the relevant note to strike. Over the roller and between it and the tips runs (as in Bain's telegraph) a wide, perforated paper tape; the position of the holes across the strip determines the height or depth of the notes to be played at the same time, the length of the holes in the direction of the length of the strip determines the duration of each note. The correct guidance of the paper tape on the Hipp's Piano is effected by guide tips on the metal roller, by engaging the same in guide holes on the two edges of the paper tape."

85.2 About the Author

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85.3 References

- Wikipedia / 120years.net / Jedistar.com / Sudonull.com

CHAPTER

EIGHTYSIX

MUSICAL TELEGRAPH

86.1 What Is An Electrical Telegraph?

An electrical telegraph was a point-to-point text messaging system, used from the 1840s until the mid 20th century when it was slowly replaced by other telecommunication systems.

86.2 Musical Telegraph

One of the first synthesizers that used electricity to generate and transmit sounds. Invented by Elisha Gray in 1876. (And here we must digress. Elisha Gray also "invented" the telephone, in 1874, but arrived at the U.S. Patent Office a scant three hours after Alexander Graham Bell did, and thus lost out on the glory. After years of lawsuits, Gray's company, Western Electric, became the sole-source manufacturer of telephones, while Bell's company controlled the transmission lines.)

Elisha Gray would have been known to us as the inventor of the telephone if Alexander Graham Bell hadn't got to the patent office one hour before him. Instead, he goes down in history as the accidental creator of one of the first electronic musical instruments. Gray was inspired to investigate electro-acoustic effects after witnessing his nephew playing with his uncle's equipment. The child had connected one end of a battery to himself and the other to a bathtub; by rubbing his hand on the bathtub's surface he created an audible humming tone proportional to the electric current.



Gray discovered that he could control sound from a self vibrating electromagnetic circuit and in doing so invented a basic single note oscillator. The original intention was to use this principle to develop an early version of multiplex telegraphic transmission; sending multiple telegraphic messages encoded as different pitches simultaneously over the same line which could be decoded at the receiving end. Using this principle he designed a musical instrument; The 'Musical Telegraph' or 'Electro-Harmonic Telegraph' initially to demonstrate and promote his ideas.

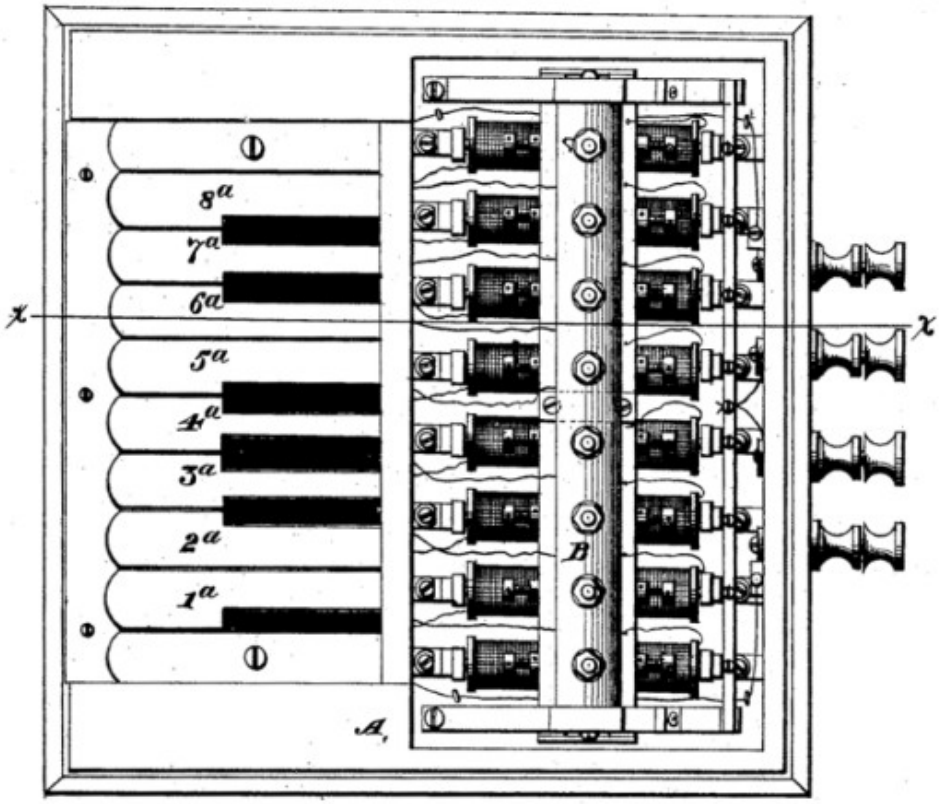
3 Sheets—Sheet 1

E. GRAY.

ELECTRO-HARMONIC TELEGRAPH.

No. 173,618. Patented Feb. 15, 1876.

Fig. 1.



WITNESSES

Wm. J. Peyton.
F. Atch

Elisha Gray INVENTOR

By his Attorney

W. D. Baldwin

Elisha Gray's Musical Telegraph keyboard transmitter.

"My invention primarily consists in a novel art of producing musical impressions or sounds by means of a series of properly-tuned vibrating reeds or bars thrown into action by means of a series of keys opening or closing electric circuits. It also consists in a novel art of transmitting tunes so produced through an electric circuit and reproducing them at the receiving end of the line."

Elisha Gray; Patent notes No. 173,618, Feb. 15, 1876.

86.3 Next Topic: Telharmonium

86.4 Sources

- Wikipedia / 120years.net / Sweetwater.com

86.5 About the Author

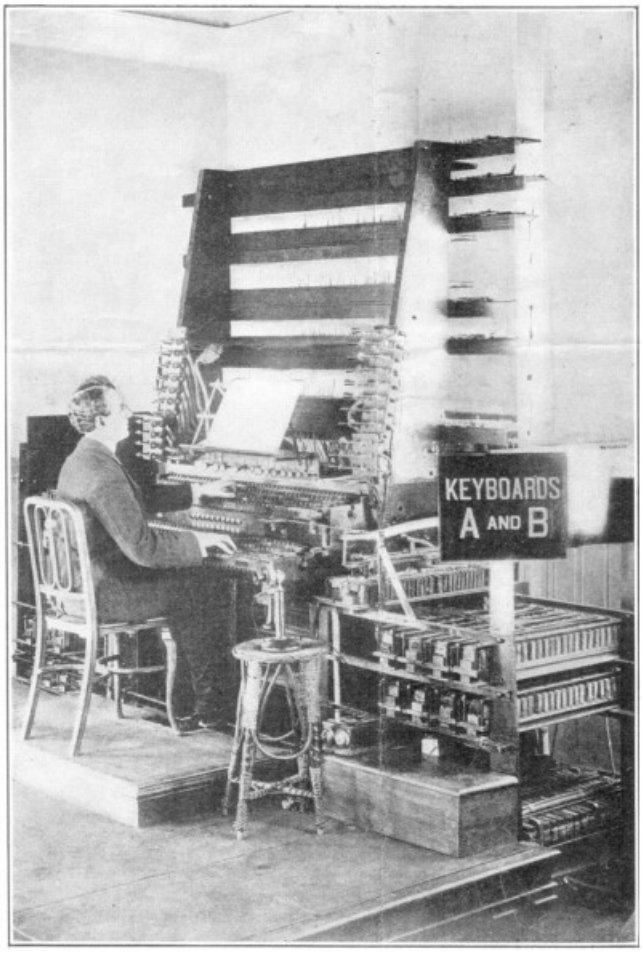
"Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub's music is filled with landscapes of emotions, dramatic twists and melancholic moods. He's one of the hosts of Tilos Rádió's MustBeat show, in which he's is focusing on drum'n'bass and chillout music. He's also one half of the duo Empty Universe."

CHAPTER

EIGHTYSEVEN

TELHARMONIUM

The Telharmonium (also known as the Dynamophone) was an early electrical organ, developed by Thaddeus Cahill c. 1896 and patented in 1897. The electrical signal from the Telharmonium was transmitted over wires; it was heard on the receiving end by means of "horn" speakers.



87.1 [The Keyboard of the Telharmonium]

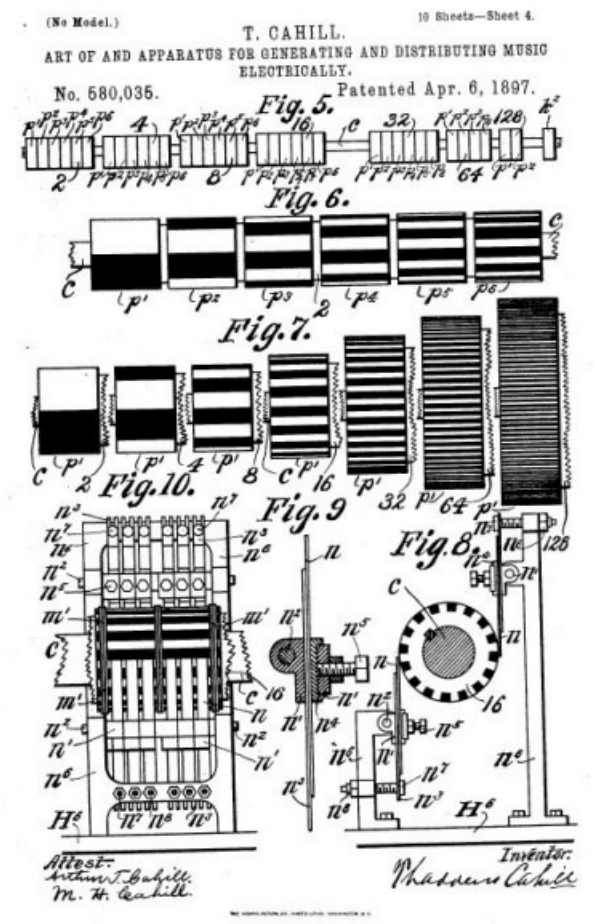
Like the later Hammond organ, the Telharmonium used tonewheels to generate musical sounds as electrical signals by additive synthesis. It is considered to be the first electromechanical musical instrument.

In 1895 Thaddeus Cahill submitted his first patent for the Telharmonium "The Art of and Apparatus for Generating and

Distributing Music Electrically". The Telharmonium can be considered the first significant electronic musical instrument and was a method of electro-magnetically synthesising and distributing music over the new telephone networks of victorian America.

This first patent was initially rejected by the patent office because the "plan contained principles and practices found in other patented devices". Cahill, a trained lawyer, eventually succeeded in having his patent accepted in 1897.

The first design of the instrument set out the principles of the 'Telharmonium' or 'Dynamophone' that would be developed by Cahill over the next twenty years. Cahill's vision was to create a universal 'perfect instrument'; an instrument that could produce absolutely perfect tones, mechanically controlled with scientific certainty. The Telharmonium would allow the player to combine the sustain of a pipe organ with the expression of a piano, the musical intensity of a violin with polyphony of a string section and the timbre and power of wind instruments with the chord ability of an organ. Having corrected the 'defects' of these traditional instruments the superior Telharmonium would render them obsolete.


(No Model.) 10 Sheets—Sheet 4.

T. CAHILL.

ART OF AND APPARATUS FOR GENERATING AND DISTRIBUTING MUSIC ELECTRICALLY.

No. 580,035. Patented Apr. 6, 1897.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 10.

Fig. 9

Fig. 8.

Attest: Arthur J. Cahill. M. H. Cahill.

Inventor: Thaddeus Cahill

87.2 [Thaddeus Cahill's patent documents for the first Telharmonium of 1897]

Telharmonium tones were described as "clear and pure" — referring to the electronic sine wave tones it was capable of producing. However, it was not restricted to such simple sounds. Each tonewheel of the instrument corresponded to a single note, and, to broaden its possibilities, Cahill added several extra tonewheels to add harmonics to each note. This, combined with organ-like stops and multiple keyboards (the Telharmonium was polyphonic), as well as a number of foot pedals, meant that every sound could be sculpted and reshaped — the instrument was noted for its ability to reproduce the sounds of common orchestral woodwind instruments such as the flute, bassoon, clarinet, and also the cello. The Telharmonium needed 671 kilowatts of power and had 153 keys that allowed it to work properly.

87.3 About the Author

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87.4 References

- Wikipedia / 120years.net / Sweetwater.com

CHAPTER

EIGHTYEIGHT

SINGING ARC

Prior to the invention of the incandescent light bulb, arc lamps were used to light the streets. They created light using an electrical arc between two carbon electrodes.

The problem with this method of lighting, apart from the dullness of the light and inefficient use of electricity was a constant humming, shrieking or hissing noise emitted by the electric arc.

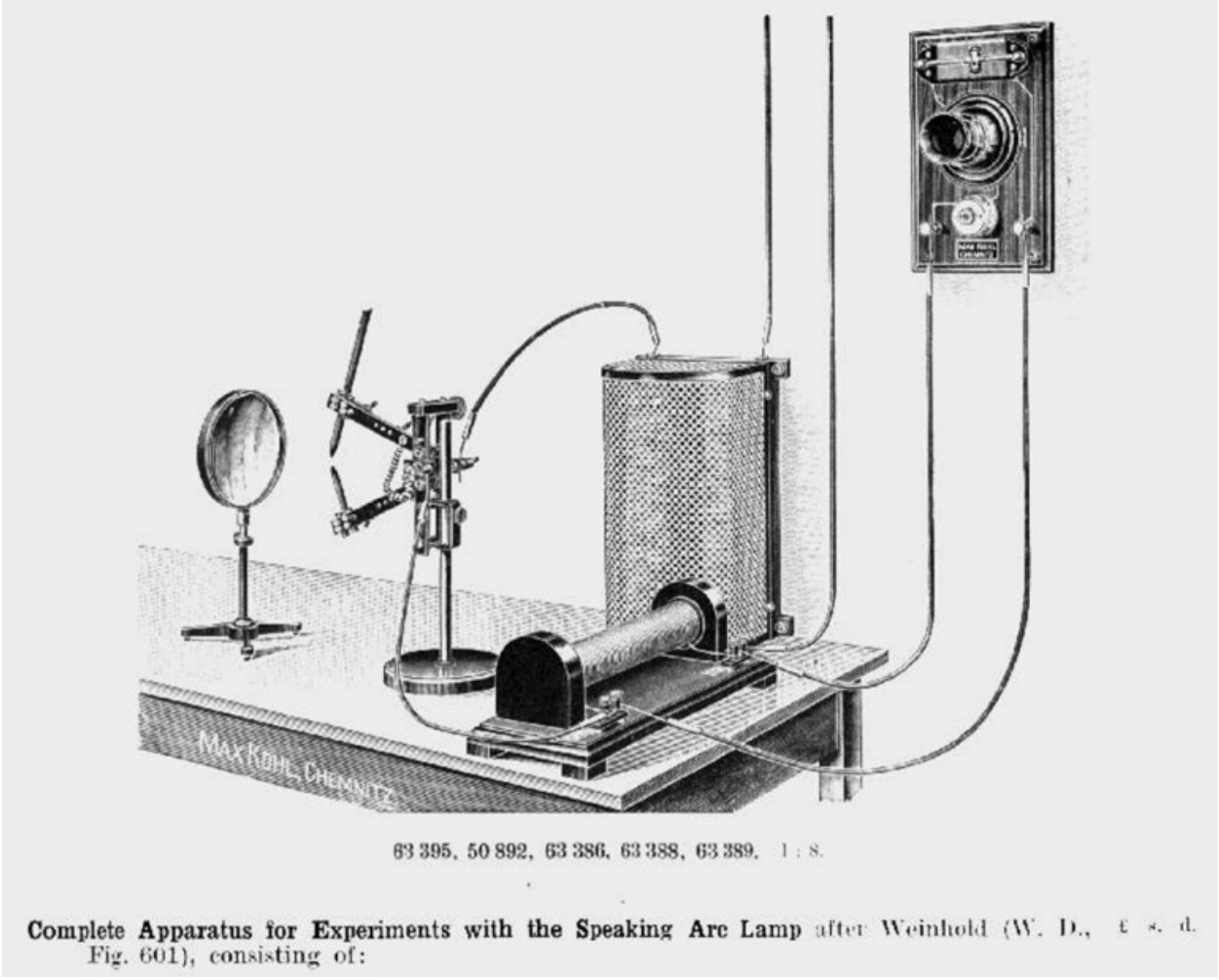
The British physicist and electrical engineer William Duddell was appointed to solve the problem in London in 1899. During his experiments Duddell found that by varying the voltage supplied to the lamps he could create controllable audible frequencies from a resonant circuit caused by the rate of pulsation of exposed electrical arcs.

Duddell connected a tuned circuit consisting of an inductor and capacitor across an arc. The negative resistance of the arc excited audio frequency oscillations in the tuned circuit at its resonant frequency, which could be heard as a musical tone coming from the arc.

Duddell used his oscillograph to determine the precise conditions required to produce oscillations. To demonstrate his invention before the London Institution of Electrical Engineers, he wired a keyboard to produce different tones from the arc, and used it to play a tune, God Save the Queen making it one of the first examples of electronic music. This device, which became known as the "singing arc", was one of the first electronic oscillators.

When Duddell exhibited his invention to the London institution of Electrical Engineers it was noticed that arc lamps on the same circuit in other buildings also played music from Duddell's machine this led to speculation that music delivered over the lighting network could be created.

"All three arcs were found to be supplied with current from the street mains, and it was clear that this main current had been varied in such a way by Mr. Duddell's keyboard as to reproduce in the two other laboratories the tunes which he supposed he was playing only to his audience in the lecture room…This obviously meant that by playing on one properly arranged keyboard tunes could be reproduced in a number of different arcs and at a distance from the musician."



63 395, 50 892, 63 386, 63 388, 63 389. 1 : 8.

Complete Apparatus for Experiments with the Speaking Arc Lamp after Weinhold (W. D., £ s. d.
Fig. 601), consisting of:

The carbon arc lamp's audio capabilities were also used by Thaddeus Cahill to amplify the sound produced by his Telharmonium during his public demonstrations of the instrument some ten years later – a direct ancestor of today's plasma-loudspeaker. In the 1930s Wolja Saraga experimented with spark-gap sound with his Saraga Generator.

Here you can see the singing arc in action: https://youtu.be/cCEU3ShVE2E

88.1 Next topic: Helmholtz Sound Synthesiser

88.2 Sources

- Wikipedia / 120years.net / Youtube

88.3 About the Author

"Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub's music is filled with landscapes of emotions, dramatic twists and melancholic moods. He's one of the hosts of Tilos Rádió's MustBeat show, in which he's is focusing on drum'n'bass and chillout music. He's also one half of the duo Empty Universe."

CHAPTER

EIGHTYNINE

WIRELESS ORGAN

89.1 Georges Désilets

Georges Désilets was born to farming parents in 1866 in Nicolet, Quebec. As a young adult he joined the seminary. By the age of 27 in July of 1893 he was ordained into the ministry. As part of the work of his spiritual vocation he began to teach astronomy, chemistry and physics at the seminary. Later he focused his instructional efforts on music and natural history. Around this time it was very common for those in the clergy to be involved in scientific and technological pursuits as hobbyists. Supported by a church or parish these men were often set up in well appointed homes, had access to books, and the prime resource of any hobbyist: free time to tinker.

89.2 First Version

The first version of the instrument had a short drum that delivered a 1 1/2 octave range, Désilets later attached a 4 octave touch sensitive organ keyboard to a much longer spark-drum and attached a foot controlled rheostat to allow expression control. To produce higher and lower octaves (without the complexity and scale of creating a longer spark-drum) the motor speed could be varied to double or half the speed to deliver the required pitch change. Semitones were achieved by a gearing mechanism:

"...semitones are obtained in the preferred form by a set of rows exactly corresponding to the rows 27 30, 36, 40 and 45 traveling at a rate -of speed 1/20 less than the rotor 1. For example, if the rotor 1 is revolving at 500 r. p. m.,.the semitone rows must revolve at 47 5 r. p. m. The different speeds of rotation may be obtained by gearing"

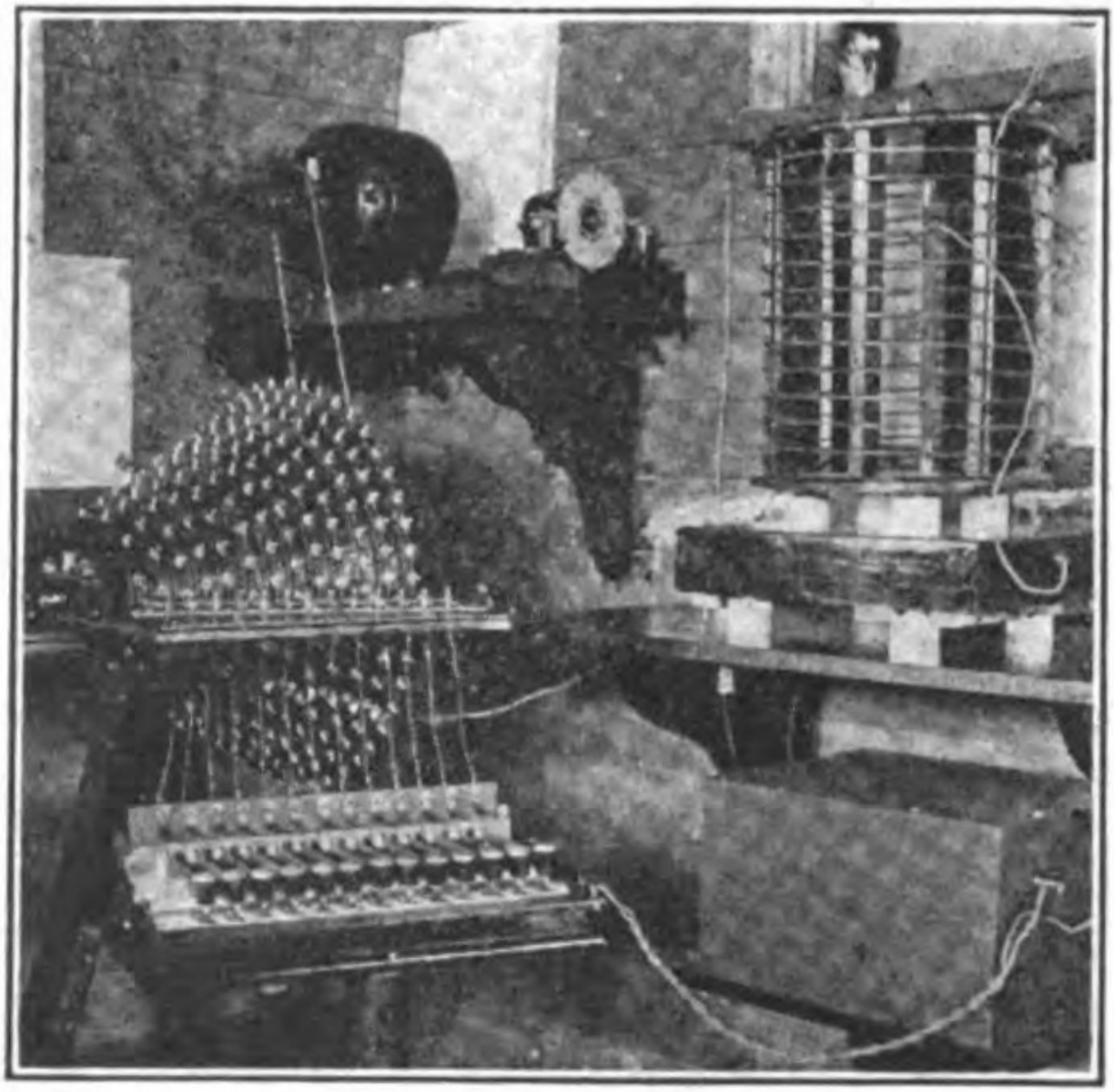


Fig. 2—First Model of the Original Radio Organ Constructed by the Inventor in 1916.

The instrument was capable of playing polyphonically if the input charge was boosted to allow multiple spark generation:

"…Obviously, in order to produce chords, it is only necessary to supply a current of sufficient intensity to permit of a plurality of different sets of sparks at the same time consequent upon the pressure of the corresponding number of keys."

Désilets radio station was closed during the 19-14-18 war – the Canadian government closed all non-military radio stations for security reasons –and his wave-organ silenced. When the station reopened, the invention and popularity of the vacuum tube by Lee De Forest and others had made his spark-generating experiments obsolete.

89.3 Next topic: Optophonic Piano

89.4 Sources

- Wikipedia / 120years.net / Sothismedias

89.5 About the Author

“Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub’s music is filled with landscapes of emotions, dramatic twists and melancholic moods. He’s one of the hosts of Tilos Rádió’s MustBeat show, in which he’s is focusing on drum’n’bass and chillout music. He’s also one half of the duo Empty Universe.”

CHAPTER

NINETY

OPTOPHONIC PIANO

The Optophonic Piano was a one-off electronic optical instrument created by the Russian Futurist painter Vladimir Baranoff Rossiné (Born in 1888 at Kherson , Ukraine – Russia, died Paris, France 1944). Rossiné started working on his instrument c1916. The Optophonic Piano was used at exhibitions of his own paintings and revolutionary artistic events in the new Soviet Union, Rossiné later gave two concerts with his instrument (with his wife Pauline Boukour), at the Meyerhold and Bolchoi theatres in 1924. Rossiné was influenced by the ideas of Alexander Scriabin who connected sound and colour with music to produce a aesthetic synthesis – this current formed an important, almost mystical theme within Russian electronic music; through the photo-audio experiments of the 1930's until the ANS Synthesiser (itself named after Alexander Nikolayevich Scriabin- ANS) in the 1940s.

"The Optophonic Piano projected revolving patterns onto a wall or ceiling by directing a bright light through a series of revolving painted glass disks, filters, mirrors and lenses."

" The keyboard controlled the combination of the various filters and disks. The variations in opacity of the painted disk and filters were picked up by a photo-electric cell controlling the pitch of a single oscillator. The instrument produced a continuous varying tone which–accompanied by the rotating kaleidascopic projections–was used by Vladimir Rossiné at exhibitions and public events."





[Rossiné's Optophonic Piano] [Painted glass disk of The Optophonic Piano]

"Imagine that every key of an organ's keyboard immobilises in a specific position, or moves a determined element, more or less rapidly, in a group of transparent filters which a beam of white light pierces, and this will give you an idea of the instrument Baranoff-Rossiné invented."

Here you can see the Optophonic Piano in action: https://youtu.be/I2BnanDDeFg

Next topic: Synthetic Tone

90.1 Sources

- Wikipedia / 120years.net / umatic.nl / baranoff-rossine.com/

90.2 About the Author

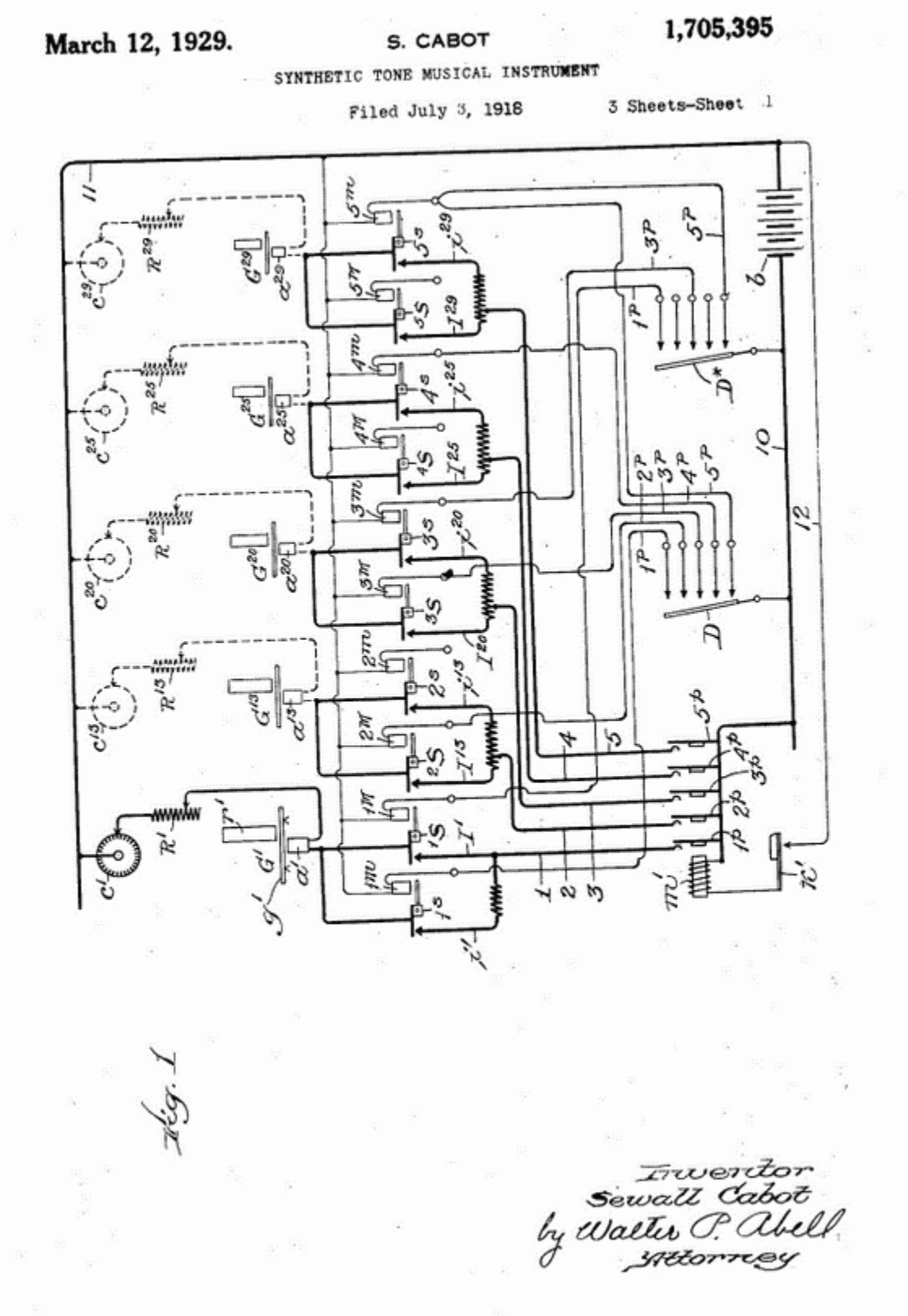
“Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub’s music is filled with landscapes of emotions, dramatic twists and melancholic moods. He’s one of the hosts of Tilos Rádió’s MustBeat show, in which he’s is focusing on drum’n’bass and chillout music. He’s also one half of the duo Empty Universe.”

CHAPTER

NINETYONE

SYNTHETIC TONE

The ‘Synthetic Tone’ was an electro-mechanical instrument similar but much smaller to the Choralcelo designed by the Brookline, Massachusetts electrical engineer Sewall Cabot (Cabot, Quincy Sewall b: 4 SEP 1901 in New York d: MAR 1957 in New York). The instrument created complex tones by resonating metal bars with a tone- wheel generated electromagnetic charge.


March 12, 1929. S. CABOT 1,705,395

SYNTHETIC TONE MUSICAL INSTRUMENT

Filed July 3, 1918 3 Sheets-Sheet 1

Fig. 1

Inventor
Sewall Cabot
by Walter P. Abell
Attorney

[Patent documents of Cabot's Synthetic Tone] Instrument

"One object of my present invention is to provide an improved musical instrument of relatively small cost and small

dimensions in comparison to those of a pipe-organ, but capable of attaining all the musically useful results of which a pipe-organ is capable. Another object is to provide an instrument that will produce desirable tonal effects not heretofore obtainable from a pipe-organ."

[Sewal Cabot Patent documents]

A Synthetic Tone-Mixer

A device designed to demonstrate the phenomenon of "tone-mixing". By means of this apparatus a vibrato may be synthetically produced with the number of pulses per second, extent of frequency fluctuation, and intensity relationship under control.

The manner in which each of these variables influences the perceived tone can thus be determined. It is also possible to reproduce a vibrato whose rate, extent, and intensity relationship are identical with those of artistic singing. One factor at a time can then be varied and the relative importance of the several elements in the artistic tone determined. The device is also very convenient for demonstrating in the classroom the principle of sonance.

Next topic: Electrophon

91.1 Sources

- Wikipedia / 120years.net / Scholarworks.uni.edu

91.2 About the Author

"Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub's music is filled with landscapes of emotions, dramatic twists and melancholic moods. He's one of the hosts of Tilos Rádió's MustBeat show, in which he's is focusing on drum'n'bass and chillout music. He's also one half of the duo Empty Universe."

CHAPTER

NINETYTWO

ELECTROPHON

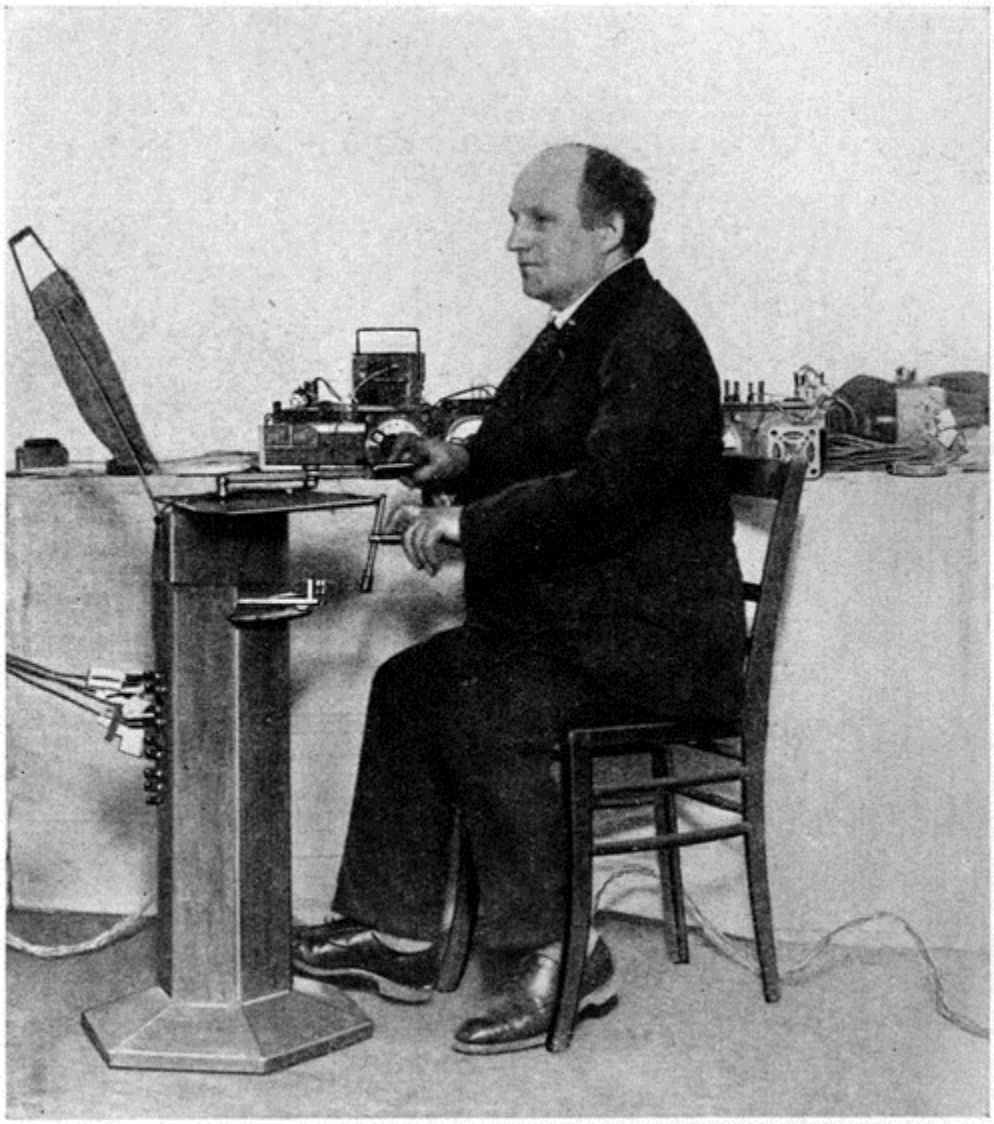
Jörg Georg Adam Mager was a German musician and inventor, who was a pioneer of early electronic music.

Mager was born in Eichstätt in Bavaria, in 1880. An idealist by nature, he worked as a schoolteacher and organist to fund his research into electronic instruments. In 1911, after hearing an organ that had become slightly detuned due to temperature variations, Mager began researching quarter tones, and built a harmonium based on quarter- tonal divisions. This became the basis for many of his later instruments.

Fascinated by the instruments strange sounds he began to explore the concepts of half and quarter tone music which he eventually self-published in his ‘ Vierteltonmusik’ of 1915. At the same time he began to design an instrument that was capable of delivering micro-tonal and quarter tone scales, the first of which was an acoustic harmonium, the ‘Vierteltonharmonium’ (Four-Tone harmonium) in 1912.

To survive in post WW1 hyper-inflationary Berlin, Mager accepted any unskilled labour he could find. It was while working in a radio vacuum tube factory that he hit upon the idea of using vacuum tubes as the basis for his first electronic microtonal instrument, the Electrophon in 1921. The Electrophon was a simple monophonic instrument based on the same heterodyne principal as that of the Theremin; a method by which two frequencies are combined within the radio frequency spectrum (not perceptible by the human ear) to produce a third frequency that is equal to the difference between the latter two frequencies and that itself is within the audible spectrum humans. In case of Electrophon two 50 Khz frequency oscillators were used. The novel feature of the Electrophon was that rather than being controlled by a fixed tone manual, notes were instead triggered by rotating a metal handle, creating a glissando type effect on a continuous tone. Under the handle was a semicircular plate marked with chromatic scale intervals. Changes in timbre could be applied through various filters. Further developments of the Electrophon were christened the Sphärophon after the Pythagorean legend of the music of the spheres.

Further developments of the Sphärophon lead to the Kurbelsphärophon unveiled at the 1926 Donaueschingen summer music festival (alongside Leon Termen’s Theremin). This adaptation added a second manual dial that allowed the player to interrupt the instrument’s continuous output and avoid the continuous glissando of the Sphärophon by queuing up another note and added two pedals to control each note’s volume and envelope.



Jörg Mager an seinem »Sphärophon«

[Mager playing the Kurbelsphärophon]

With this resource at his disposal Mager continued to develop his instrument design, creating the Klaviatursphäraphon in 1928. In this model he replaced the handles of the Kurbelsphäraphon with two short keyed monophonic keyboards – the shorter keys allowing the player to play both keyboards simultaneously thereby producing a duophonic tone. It was also possible by adjusting the capacitance of the sound generating circuit to alter the intervals between each key and scale the acoustic length of the keyboard. An octave could be made as small as a major second, so that each successive step represented an interval of a 12th tone. Additional tone colour was added by mechanical resonators, series of filters and specially formed resonant speakers.

Next topic: Hugoniot Organ

92.1 Sources

- Wikipedia / 120years.net

92.2 About the Author

“Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub’s music is filled with landscapes of emotions, dramatic twists and melancholic moods. He’s one of the hosts of Tilos Rádió’s MustBeat show, in which he’s is focusing on drum’n’bass and chillout music. He’s also one half of the duo Empty Universe.”

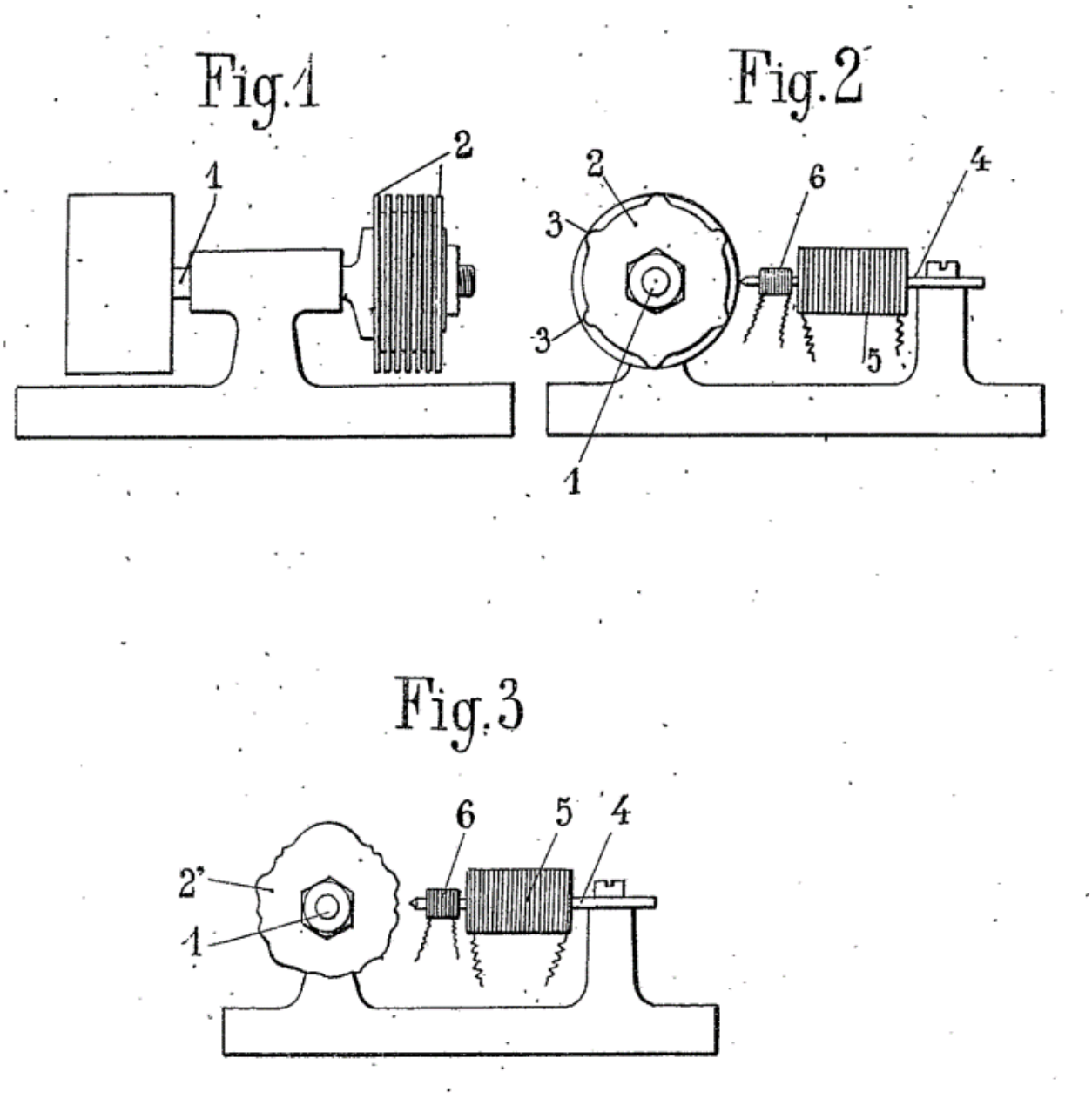
CHAPTER

NINETYTHREE

♪ HUGONIOT ORGAN

French researcher (died; France, 1927) into electronic sound systems and inventor of an early electronic organ, the photoelectric Hugoniot organ. From the end of World War I Hugoniot systematically explored and improved on all the electronic sound-generating and -recording methods known at the time, starting in 1919 with the rotating electromagnetic tone-wheels pioneered in the Telharmonium and known in France from Cahill's patents, and continuing with electromagnetic steel discs. He also tried out audio and beat-frequency oscillators. The only instrument that he appears to have completed was a photoelectric organ (1921), in which rotating tone-wheels with concentric rings of radial slits interrupted beams of light (there were presumably 12 discs, each producing all the octave registers of a single note); behind the wheels were shaped timbre masks that modified the light beams before they reached photoelectric cells.

"With this scheme the various types of wave forms for different timbres may be placed in radial sectors on a disk; another disk carrying the scanning slits in circular tracks rotates before this wave-form disk. A source of light and photocell complete the translating arrangements. Each slit track scans its corresponding wave cycle at a speed corresponding to one pitch of an approximate tempered scale. Thus, one wave and one slit track serve for each tone frequency of the tempered scale. Naturally the lowest pitch tracks are nearest the center and the highest are nearest the circumference of the scanning disk.



[A diagram from Hugoniot's patent for a tone-wheel sound generator December 1919]

Another interesting arrangement is that used by Lesti and Sammis in the Polytone. Here, instead of using a series of similar wave-form cycles on a continuous track, with a single scanning device, only one complete such cycle is used with periodic scanning by a series of similar scanning slits, equispaced on a continuous track.

The slit spacing is precisely equal to the wave-form lengths, so that this wave form is repeated at the scanning frequency; i.e., the number of slits passing it per second. The same method was disclosed as early as 1921 by the French inventor Hugoniot, who described an electrical musical instrument of this type in his patent'"

[A description of Hugoniot's photo-electrical sound generation method from 'Electronic Music and Instruments' Institute of Radio Engineers, 1936]

Hugoniot's died in 1927 before he could develop his ideas any further than prototypes yet he left behind a legacy of innovation that influenced a new generation of French pioneering instrument designers including Pierre Toulon and Givelet & Coupleaux.

Next topic: Theremin

93.1 Sources

- Wikipedia / 120years.net / Oxfordmusiconline.com

93.2 About the Author

“Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub’s music is filled with landscapes of emotions, dramatic twists and melancholic moods. He’s one of the hosts of Tilos Rádió’s MustBeat show, in which he’s is focusing on drum’n’bass and chillout music. He’s also one half of the duo Empty Universe.”

CHAPTER

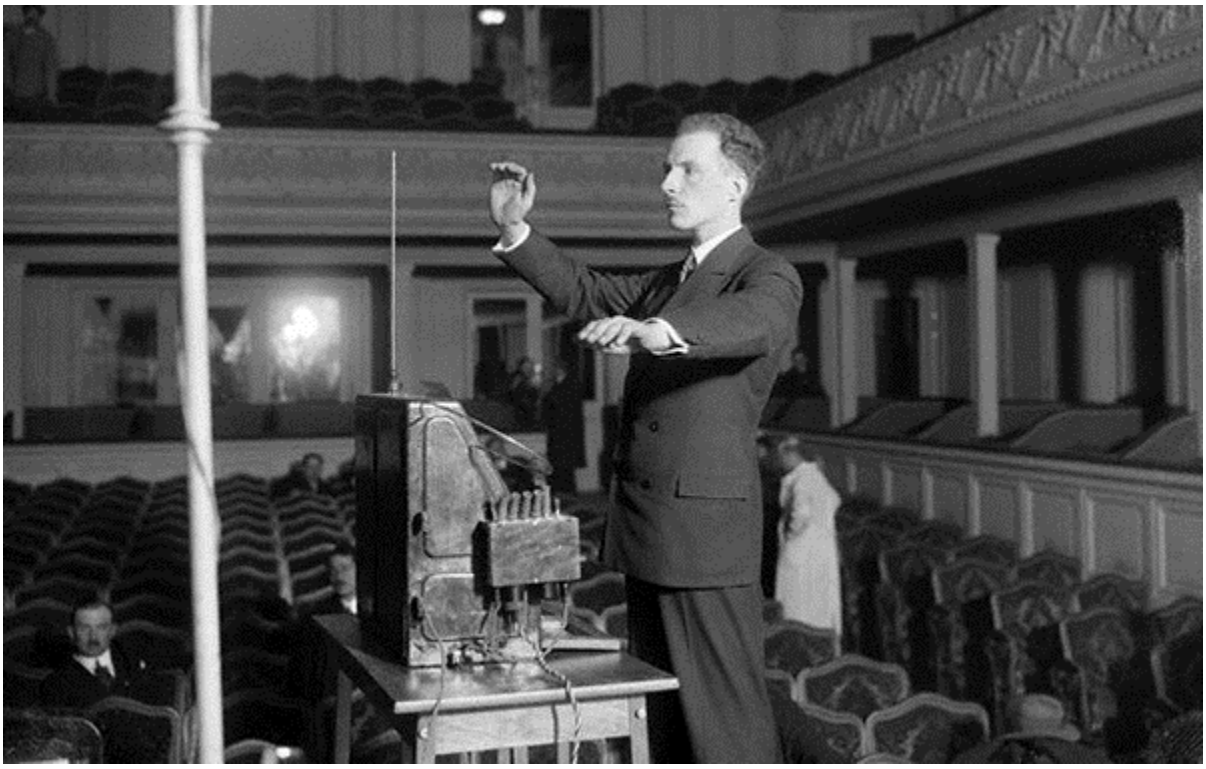
NINETYFOUR

THEREMIN

The theremin (/rmn/; originally known as the ætherphone/etherphone, thereminophone or termenvox/thereminvox) is an electronic musical instrument controlled without physical contact by the thereminist (performer). It is named after its inventor, Leon Theremin, who patented the device in 1928.

Leon Theremin (born Lev Sergeyevich Termen; 27 August [O.S. 15 August] 1896 – 3 November 1993) was a Russian and Soviet inventor, most famous for his invention of the theremin, one of the first electronic musical instruments and the first to be mass-produced. He also worked on early television research. His listening device, "The Thing", hung for seven years in plain view in the United States Ambassador's Moscow office and enabled Soviet agents to eavesdrop on secret conversations.

The principles of beat frequency or heterodyning oscillators were discovered by chance during the first decades of the twentieth century by radio engineers experimenting with radio vacuum tubes. Heterodyning effect is created by two high radio frequency sound waves of similar but varying frequency combining and creating a lower audible frequency, equal to the difference between the two radio frequencies (approximately 20 Hz to 20,000 Hz). The musical potential of the effect was noted by several engineers and designers including Maurice Martenot, Nikolay Obukhov, Armand Givelet and the Russian Cellist and electronic engineer, Leon (or Lev) Sergeivitch Termen.



[Leon Termen plays the 'Theremin' or 'Thereminvox'.Paris, 1927]

One problem with utilising the heterodyning effect (heterodyning is the effect where two high frequency signals are added producing a third audible tone which is the difference of the two high frequencies. This effect was the basis of many "vacuum tube based electronic instruments".) for musical purposes was that as the body came near the vacuum tubes the capacitance of the body caused variations in frequency.

Leon Termen realised that rather than being a problem, body capacitance could be used as a control mechanism for an instrument and finally freeing the performer from the keyboard and fixed intonation. Termen's first machine, built in the USSR in 1917 was christened the "Theremin" (after himself) or the "Aetherophone" (sound from the 'ether') and was the first instrument to exploit the heterodyning principle.

The original Theremin used a foot pedal to control the volume and a switch mechanism to alter the pitch. This prototype evolved into a production model Theremin in 1920, this was a unique design, resembling a gramophone cabinet on 4 legs with a protruding metal antennae and a metal loop. The instrument was played by moving the hands around the metal loop for volume and around the antennae for pitch. The output was a monophonic continuous tone modulated by the performer. The timbre of the instrument was fixed and resembled a violin string sound. The sound was produced directly by the heterodyning combination of two radio-frequency oscillators: one operating at a fixed frequency of 170,000 Hz, the other with a variable frequency between 168,000 and 170,000 Hz. The frequency of the second oscillator being determined by the proximity of the musician's hand to the pitch antenna. The difference of the fixed and variable radio frequencies results in an audible beat frequency between 0 and 2,000 Hz. The audible sound came from the oscillators, later models adding an amplifier and large triangular loudspeaker.

Here you can see the Teremin in action: https://youtu.be/VJ4dfYUlW1w, or https://youtu.be/ajM4vYCZMZk

Next topic: Staccatone

94.1 Sources

- Wikipedia / 120years.net

94.2 About the Author

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CHAPTER

NINETYFIVE

STACCATONE

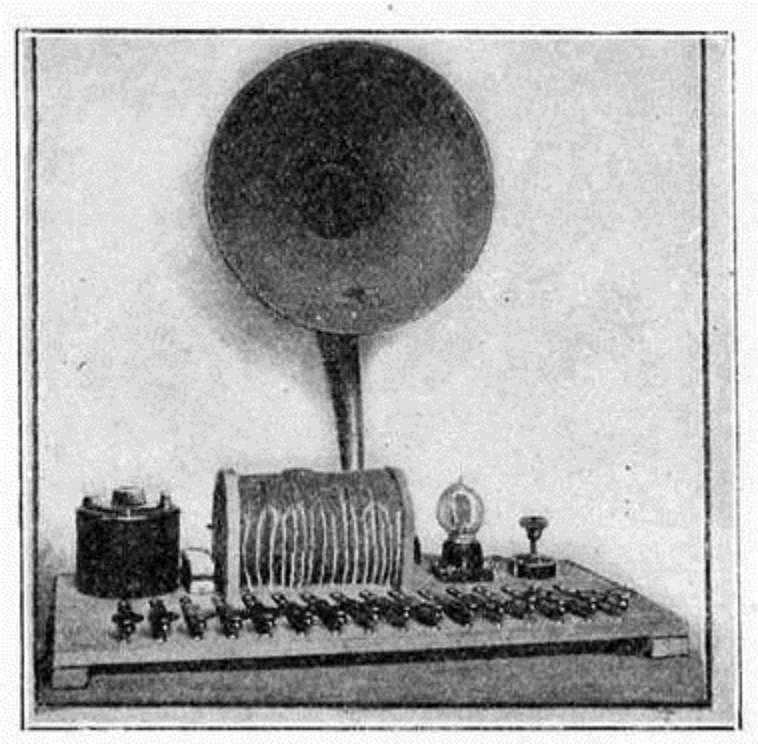
The staccatone is an electronic musical instrument invented in 1923, by the journalist radio and writer of science fiction Hugo Gernsback.

As Audion piano of Lee Forest, the staccatone was based on the vacuum valve .

Hugo Gernsback (born Hugo Gernsbacher, August 16, 1884 – August 19, 1967) was a Luxembourgish–American inventor, writer, editor, and magazine publisher, best known for publications including the first science fiction magazine. His contributions to the genre as publisher—although not as a writer—were so significant that, along with the novelists H. G. Wells and Jules Verne, he is sometimes called "The Father of Science Fiction". In his honour, annual awards presented at the World Science Fiction Convention are named the "Hugos".

Hugo Gernsback, perhaps better known as the 'Father of Science Fiction' (and currently eponymously celebrated in the 'Hugos' Science Fiction Awards) also invented and built an early electronic instrument called the Staccatone in 1923 (with Clyde.J.Fitch) which was later developed into one of the first polyphonic instruments, the Pianorad in 1926. Gernsback was a major figure in the development and popularisation of television, radio and amateur electronics, his multiple and sometimes shady businesses included early science fiction publishing, pulp fiction, self-help manuals and DIY electronics magazines as well as his own science fiction writing.

The Staccatone was conceived as a self-build project for amateur electronics enthusiasts via Gernsback's 'Practical Electrics' magazine. The instrument consisted of a single vacuum tube oscillator controlled by a crude switch based 16 note 'keyboard'. The switch based control gave the note a staccato attack and decay – hence the 'Staccatone'. Gernsback promoted the instrument through his many publication and on his own radio station WJZ New York:



[Hugo Gernsback's 'Staccatone' c 1923]

"The musical notes produced by the vacuum tubes in this manner have practically no overtones. For this reason the music produced on the Pianorad is of an exquisite pureness of tone not realised in any other musical instrument. The quality is better than that of a flute and much purer. the sound however does not resemble that of any known musical instrument. The notes are quite sharp and distinct, and the Pianorad can be readily distinguished by its music from any other musical instrument in existence."

Next topic: Sphäraphon

95.1 Sources

- Wikipedia / 120years.net / Oxfordreference.com

95.2 About the Author

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CHAPTER

NINETYSIX

SPHÄROPHON

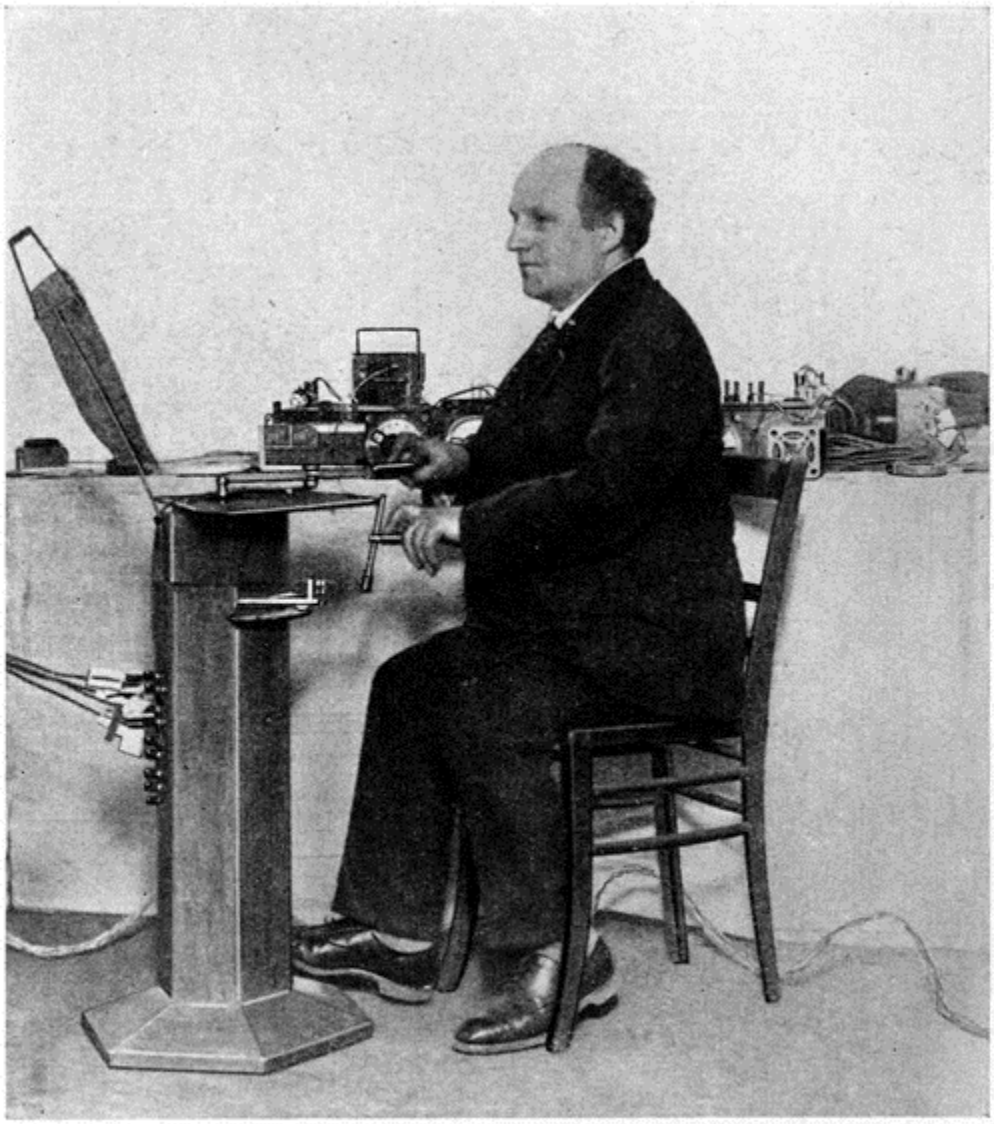
Jörg Georg Adam Mager was a German musician and inventor, who was a pioneer of early electronic music.

Mager was born in Eichstätt in Bavaria, in 1880. An idealist by nature, he worked as a schoolteacher and organist to fund his research into electronic instruments. In 1911, after hearing an organ that had become slightly detuned due to temperature variations, Mager began researching quarter tones, and built a harmonium based on quarter- tonal divisions. This became the basis for many of his later instruments.

Fascinated by the instruments strange sounds he began to explore the concepts of half and quarter tone music which he eventually self-published in his ‘ Vierteltonmusik’ of 1915. At the same time he began to design an instrument that was capable of delivering micro-tonal and quarter tone scales, the first of which was an acoustic harmonium, the ‘Vierteltonharmonium’ (Four-Tone harmonium) in 1912.

To survive in post WW1 hyper-inflationary Berlin, Mager accepted any unskilled labour he could find. It was while working in a radio vacuum tube factory that he hit upon the idea of using vacuum tubes as the basis for his first electronic microtonal instrument, the Electrophon in 1921. The Electrophon was a simple monophonic instrument based on the same heterodyne principal as that of the Theremin; a method by which two frequencies are combined within the radio frequency spectrum (not perceptible by the human ear) to produce a third frequency that is equal to the difference between the latter two frequencies and that itself is within the audible spectrum humans. In case of Electrophon two 50 Khz frequency oscillators were used. The novel feature of the Electrophon was that rather than being controlled by a fixed tone manual, notes were instead triggered by rotating a metal handle, creating a glissando type effect on a continuous tone. Under the handle was a semicircular plate marked with chromatic scale intervals. Changes in timbre could be applied through various filters. Further developments of the Electrophon were christened the Sphärophon after the Pythagorean legend of the music of the spheres.

Further developments of the Sphärophon lead to the Kurbelsphärophon unveiled at the 1926 Donaueschingen summer music festival (alongside Leon Termen’s Theremin). This adaptation added a second manual dial that allowed the player to interrupt the instrument’s continuous output and avoid the continuous glissando of the Sphärophon by queuing up another note and added two pedals to control each note’s volume and envelope.



Jörg Mager an seinem »Sphärophon«

[Mager playing the Kurbelsphärophon]

With this resource at his disposal Mager continued to develop his instrument design, creating the Klaviatursphäraphon in 1928. In this model he replaced the handles of the Kurbelsphäraphon with two short keyed monophonic keyboards – the shorter keys allowing the player to play both keyboards simultaneously thereby producing a duophonic tone. It was also possible by adjusting the capacitance of the sound generating circuit to alter the intervals between each key and scale the acoustic length of the keyboard. An octave could be made as small as a major second, so that each successive step represented an interval of a 12th tone. Additional tone colour was added by mechanical resonators, series of filters and specially formed resonant speakers.

Next topic: The Luminaphone

96.1 Sources

- Wikipedia / 120years.net

96.2 About the Author

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CHAPTER

NINETYSEVEN

THE LUMINAPHONE

Harry Grindell Matthews was born on 17 March 1880 in Winterbourne, Gloucestershire. He studied at the Merchant Venturers' School in Bristol and became an electronic engineer. During the Second Boer War he served in the South African Constabulary and was twice wounded.

In 1911 Matthews said he had invented an Aerophone device, a radiotelephone, and transmitted messages between a ground station and an aeroplane from a distance of two miles. His experiments attracted government attention and on 4 July 1912 he visited Buckingham Palace. However, when the British Admiralty requested a demonstration of the Aerophone, Matthews demanded that no experts be present at the scene. When four of the observers dismantled part of the apparatus before the demonstration began and took notes, Matthews cancelled the demonstration and drove observers away.

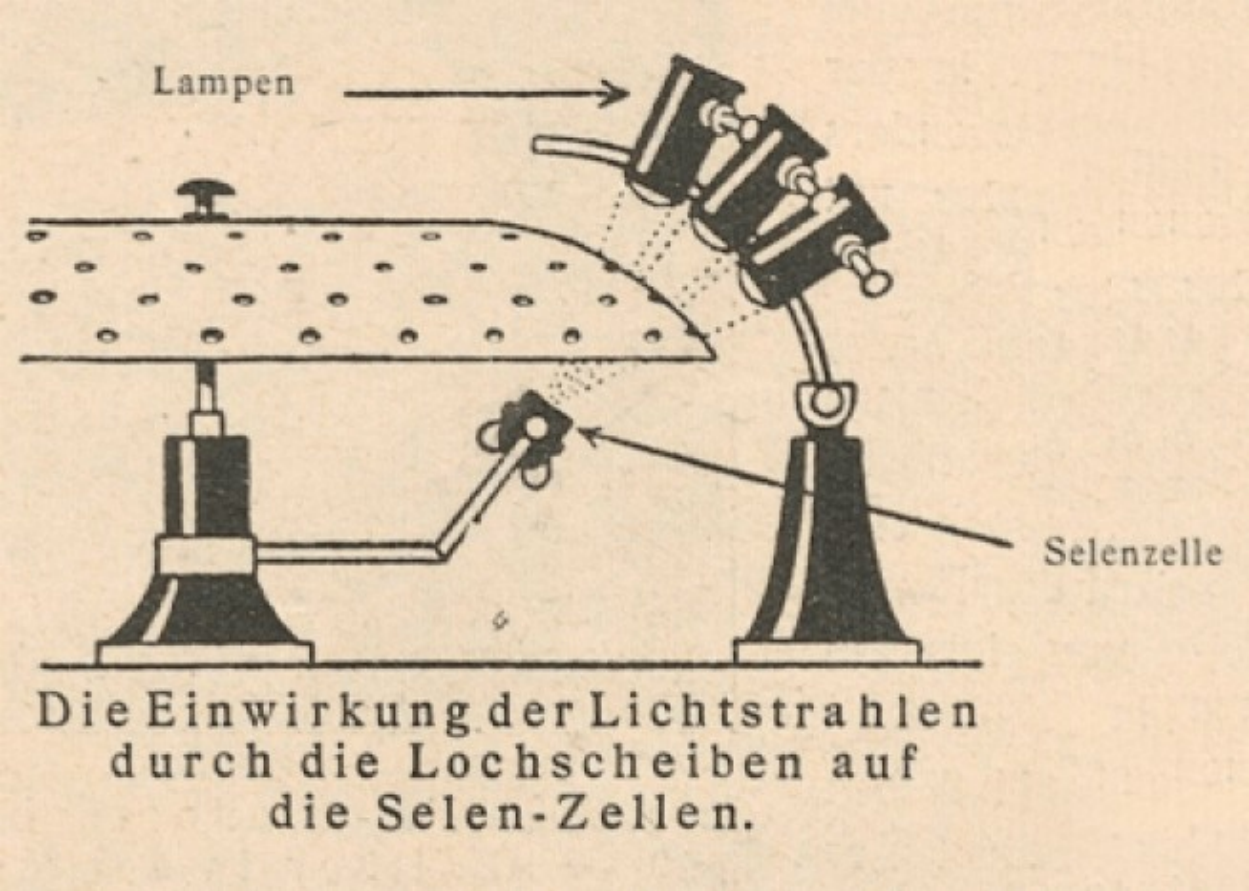
Newspapers rushed to Matthews' defence. The War Office denied any tampering and claimed that the demonstration was a failure. The government later stated that the affair was just a misunderstanding.



Die Versuche des Erfinders Matthews am Luminaphon zur Umwandlung von Licht in Klang. Phot. Atlantic.

[The Luminaphone]

The Luminaphone of 1926 was one of a long line of inventions by the British inventor Harry Grindell Matthews, well known at the time for his much publicised invention of a 'Death Ray' in 1923 – an unsubstantiated or proven method of destroying objects and stopping electric engines through an invisible ray-gun. Matthew's roster of inventions included a light controlled submarine (from which he received a £25,000 prize from the British admiralty), a mobile projector for projecting images onto clouds, an early method of recording sound on to film (1921), an underwater submarine detector, ground-to-plane radio-telephone, and a self-righting flying machine, amongst many others.



[Diagram showing the operation of the light beams]

The Luminaphone, patented in 1925 (Patent GB254437A), was an early example of a photo-electric technique for creating pitched tones (originally derived from optical sound film technology); in this case a series of light beams – each light beam representing one frequency or note – were projected through a rotating perforated metal dome onto a selenium photo-cell that generated a pitched voltage pulse. The frequency of the pitch was determined by the frequency of the perforation in the metal dome. The luminaphone's three octave keyboard had one lamp per key (a total of 36 keys and lamps) – when a key was pressed the assigned lamp would illuminate and project through the rotating perforated dome onto the photo-cell, generating the relevant pitch.

Next topic: Radio Harmonium

97.1 Sources

- Wikipedia / 120years.net

97.2 About the Author

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CHAPTER

NINETYEIGHT

THE RADIO HARMONIUM

One of the earliest electronic instruments of the Soviet period, the Radio (or 'Cathodic') Harmonium was a three voice polyphonic cathode vacuum tube instrument controlled by a manual keyboard, designed for playing atonal music by the audio physicist Sergeĭ Nikolaevich Rzhevkin (1891-1981). The instrument was used by the philosopher Ivan Orlov in his investigations of aural phenomena.

98.1 Vacuum tube

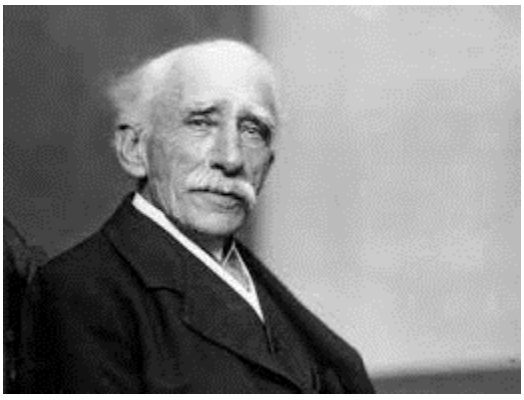
A vacuum tube, electron tube, valve (British usage), or tube (North America), is a device that controls electric current flow in a high vacuum between electrodes to which an electric potential difference has been applied.

The type known as a thermionic tube or thermionic valve utilizes thermionic emission of electrons from a hot cathode for fundamental electronic functions such as signal amplification and current rectification. Non- thermionic types such as a vacuum phototube, however, achieve electron emission through the photoelectric effect, and are used for such purposes as the detection of light intensities. In both types, the electrons are accelerated from the cathode to the anode by the electric field in the tube.

Audio power amplifier using tubes, in operation. Red-orange glow is from heated filaments.

Illustration representing a primitive triode vacuum tube and the polarities of the typical dc operating potentials. Not shown are the impedances (resistors or inductors) that would be included in series with the C and B voltage sources.

The simplest vacuum tube, the diode, invented in 1904 by John Ambrose Fleming, contains only a heated electron-emitting cathode and an anode. Electrons can only flow in one direction through the device—from the cathode to the anode. Adding one or more control grids within the tube allows the current between the cathode and anode to be controlled by the voltage on the grids.



[Sir John Ambrose Fleming]

These devices became a key component of electronic circuits for the first half of the twentieth century. They were crucial to the development of radio, television, radar, sound recording and reproduction, long-distance telephone networks, and

analog and early digital computers.

Although some applications had used earlier technologies such as the spark gap transmitter for radio or mechanical computers for computing, it was the invention of the thermionic vacuum tube that made these technologies widespread and practical, and created the discipline of electronics.

Not all electronic circuit valves/electron tubes are vacuum tubes. Gas-filled tubes are similar devices, but containing a gas, typically at low pressure, which exploit phenomena related to electric discharge in gases, usually without a heater.

Next topic: Pianorad

98.2 Sources

- Wikipedia / 120years.net

98.3 About the Author

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CHAPTER

NINETYNINE

THE PIANORAD

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[Gernsback's 'Pianorad' at the WRNY radio studio]

The Pianorad, designed by Hugo Gernsback and built by Clyde Finch at the Radio News Laboratories in New York was a development of Gernsback's Staccatone of 1923. the Pianorad had 25 single vacuum tube oscillators, one for every key for its two octave keyboard making the instrument the first valve based electronic instrument to achieve full polyphony. The sound from the tubes was passed through a rudimentary mechanical filter that removed harmonic distortion producing virtually pure sine tones. The instrument played sound through a top mounted speaker or could be connected directly for radio broadcast.

99.1 Theory of the Instrument

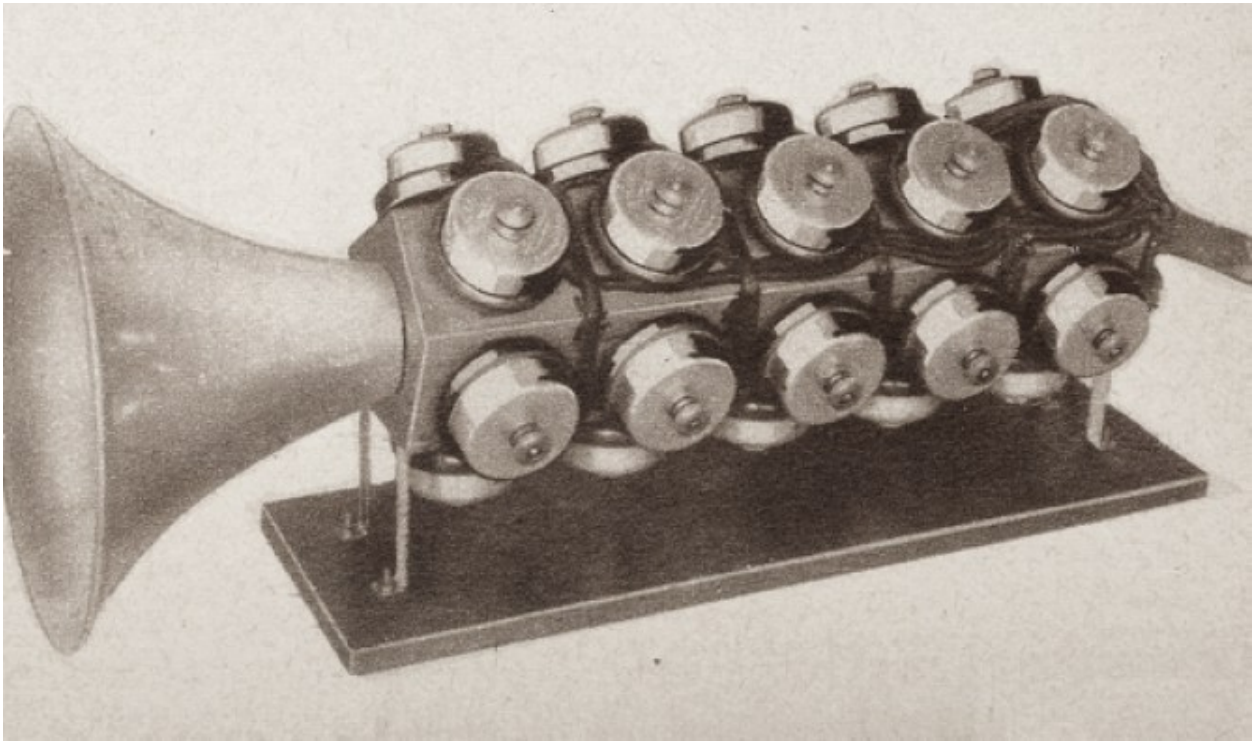
The Pianorad has a keyboard like an ordinary piano, and there is a radio vacuum tube for each one of the piano keys. Every time a key is depressed, there is energized a radio-oscillator circuit which gives rise to a pure, flutelike note through the loud-speaker connected to the device.

It is possible to connect any number of loud-speakers to the Pianorad if it is desired to flood an auditorium with its

tones. Also, by arranging suitable outlets for loud-speakers on different floors or different rooms, the sounds of the Pianorad can be heard all over any large building.

The musical notes produced by the vacuum tubes in this manner have practically no overtones. For this reason the music produced on the Pianorad is of an exquisite pureness of tone not realised in any other musical instrument. The quality is better than that of a flute and much purer. the sound however does not resemble that of any known musical instrument. The notes are quite sharp and distinct, and the Pianorad can be readily distinguished by its music from any other musical instrument in existence.

[An article by Clyde J. Fitch describing the construction of the Pianorad will appear in the December issue of Radio News.]



[Pianorad's 25 units designed to eliminate harmonics.]

Each one of the twenty five oscillators had its own independent speaker, mounted in a large loudspeaker horn on top of the keyboard and the whole ensemble was housed in a housing resembling a harmonium. A larger 88 non keyboard version was planned but not put into production. The Pianorad was first demonstrated on june 12, 1926 at Gernsback's own radio station WRNY in New York City performed by Ralph Christman. The Pianorad continued to be used at the radio station for some time, accompanying piano and violin concerts.

Next topic: Keyboard Electric Harmonium

99.2 Sources

- Wikipedia / 120years.net

99.3 About the Author

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KEYBOARD ELECTRIC HARMONIUM

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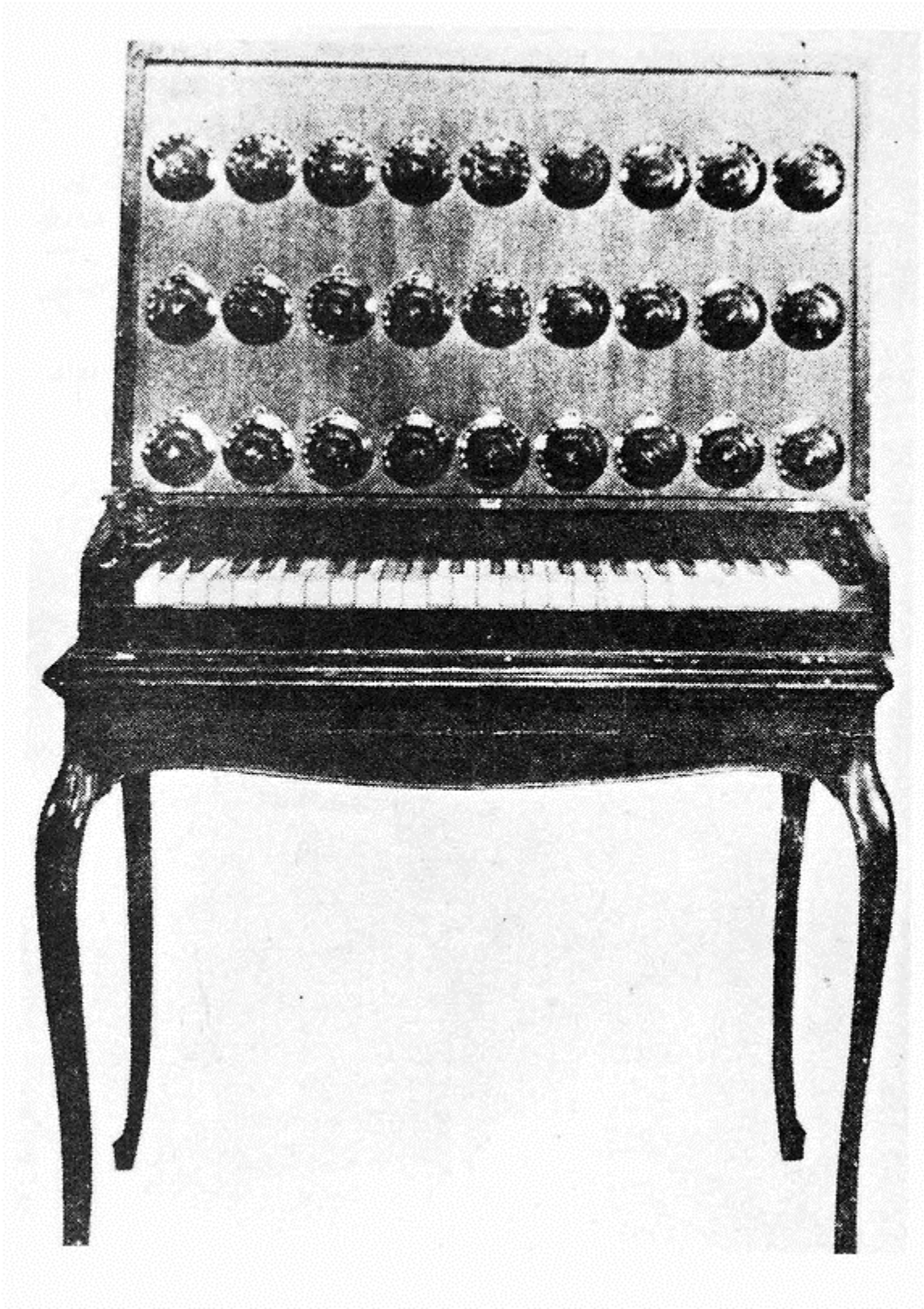
Lev Sergeyevich Termen most famous for creating the 'Theremin' also invented many other electronic instruments based on the heterodyning vacuum tube technology of the day – including the Keyboard Theremin, Theremin Cello, Terpsitone, Rhythmicon and the 'Electric Harmonium' or 'Theremin Harmonium'.



[Theremin Harmonium]

Termen's Harmonium was an early vacuum tube based polyphonic instrument designed to accompany vocal perfor-

mances. The instrument had a three octave keyboard with a variable tuning that allowed 1,200 micro-tonal divisions per octave. The timbre and volume of the sound could be varied using twelve dials fixed to the front of the instrument.



[Early version of the Theremin Harmonium]



[Theremin's later version of the Harmonium]

Next topic: Kurbelsphärophon

100.1 Sources

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100.2 About the Author

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CHAPTER

ONE

KURBELSPHAROPHON

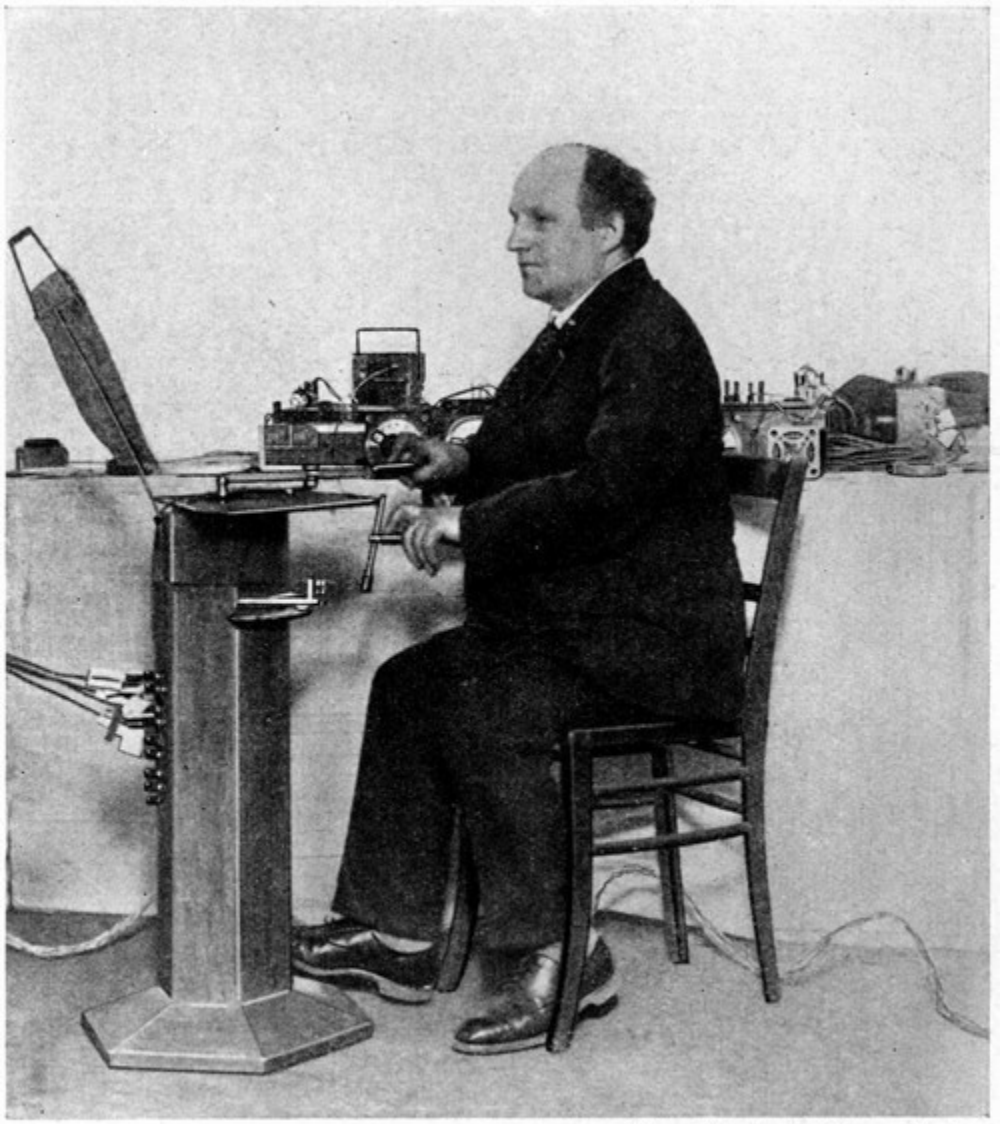
Jörg Georg Adam Mager was a German musician and inventor, who was a pioneer of early electronic music.

Mager was born in Eichstätt in Bavaria, in 1880. An idealist by nature, he worked as a schoolteacher and organist to fund his research into electronic instruments. In 1911, after hearing an organ that had become slightly detuned due to temperature variations, Mager began researching quarter tones, and built a harmonium based on quartertonal divisions. This became the basis for many of his later instruments.

Fascinated by the instruments strange sounds he began to explore the concepts of half and quarter tone music which he eventually self-published in his ‘ Vierteltonmusik’ of 1915. At the same time he began to design an instrument that was capable of delivering micro-tonal and quarter tone scales, the first of which was an acoustic harmonium, the ‘Vierteltonharmonium’ (Four-Tone harmonium) in 1912.

To survive in post WW1 hyper-inflationary Berlin, Mager accepted any unskilled labour he could find. It was while working in a radio vacuum tube factory that he hit upon the idea of using vacuum tubes as the basis for his first electronic microtonal instrument, the Electrophon in 1921. The Electrophon was a simple monophonic instrument based on the same heterodyne principal as that of the Theremin; a method by which two frequencies are combined within the radio frequency spectrum (not perceptible by the human ear) to produce a third frequency that is equal to the difference between the latter two frequencies and that itself is within the audible spectrum humans. In case of Electrophon two 50 Khz frequency oscillators were used. The novel feature of the Electrophon was that rather than being controlled by a fixed tone manual, notes were instead triggered by rotating a metal handle, creating a glissando type effect on a continuous tone. Under the handle was a semicircular plate marked with chromatic scale intervals. Changes in timbre could be applied through various filters. Further developments of the Electrophon were christened the Sphärophon after the Pythagorean legend of the music of the spheres.

Further developments of the Sphärophon lead to the Kurbelsphärophon unveiled at the 1926 Donaueschingen summer music festival (alongside Leon Termen’s Theremin). This adaptation added a second manual dial that allowed the player to interrupt the instrument’s continuous output and avoid the continuous glissando of the Sphärophon by queuing up another note and added two pedals to control each note’s volume and envelope.



Jörg Mager an seinem »Sphärophon«

[Mager playing the Kurbelsphärophon]

With this resource at his disposal Mager continued to develop his instrument design, creating the Klaviatursphäraphon in 1928. In this model he replaced the handles of the Kurbelsphäraphon with two short keyed monophonic keyboards – the shorter keys allowing the player to play both keyboards simultaneously thereby producing a duophonic tone. It was also possible by adjusting the capacitance of the sound generating circuit to alter the intervals between each key and scale the acoustic length of the keyboard. An octave could be made as small as a major second, so that each successive step represented an interval of a 12th tone. Additional tone colour was added by mechanical resonators, series of filters and specially formed resonant speakers.

101.1 Next topic

The Luminaphone

101.2 Sources

- Wikipedia / 120years.net

101.3 About the author

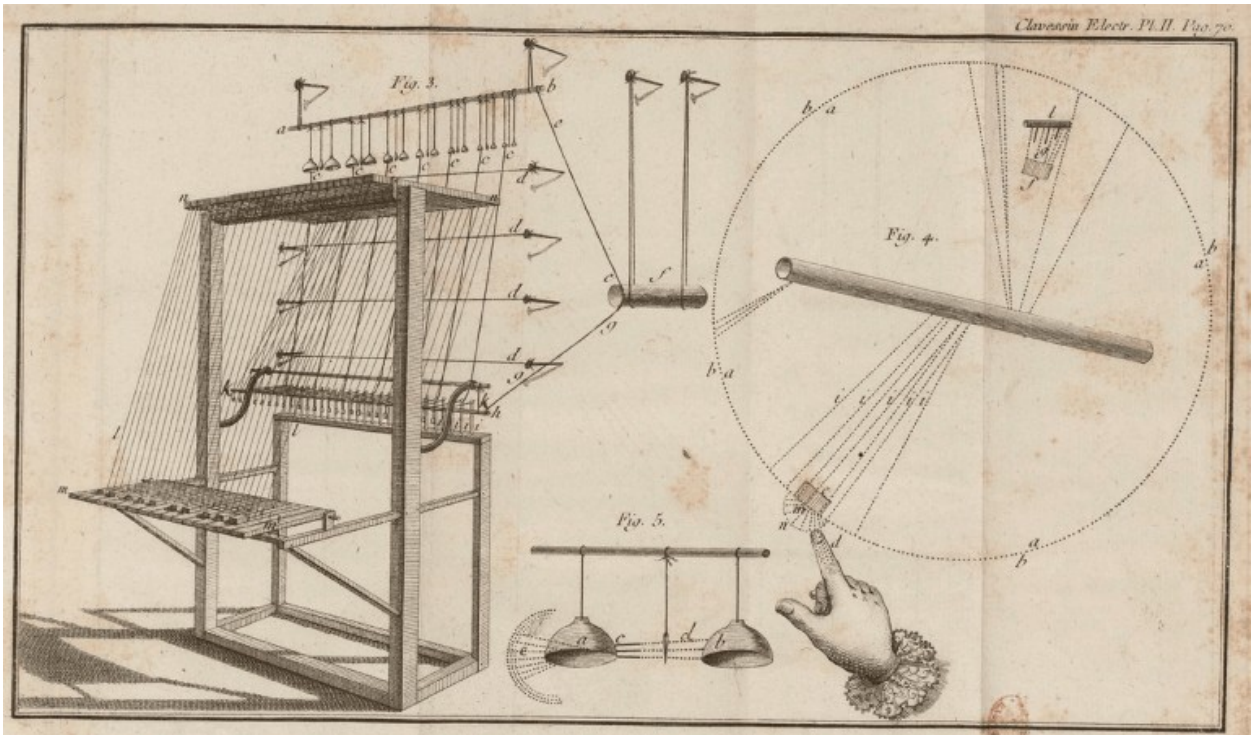
“Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub’s music is filled with landscapes of emotions, dramatic twists and melancholic moods. He’s one of the hosts of Tilos Rádió’s MustBeat show, in which he’s is focusing on drum’n’bass and chillout music. He’s also one half of the duo Empty Universe.”

CHAPTER

TWO

CLAVECIN ÉLECTRIQUE

This instrument was constructed by the Jesuit priest Jean-Baptiste Delaborde in Paris, France, 1759. The Clavecin Électrique or 'Electric Harpsichord' is one of the earliest documented instruments that used electricity to create musical sound. Despite it's name The Clavecin Électrique was not a stringed instrument but a carillon type keyboard instrument using a static electrical charge (supplied by a Leyden Jar, an early form of capacitor invented by the Dutch scientist Pieter van Musschenbroek of Leiden around 1745) to vibrate metal bells – The mechanism based on a contemporary warning-bell device: "The warning bell mechanism was based on an apparently unnamed method used in early electrical laboratories to audibly warn an experimenter of the presence of an electrical charge; it was probably invented by Andreas [Andrew] Gordon in Erfurt in 1741 and was described or demonstrated to Benjamin Franklin in Boston in 1746.

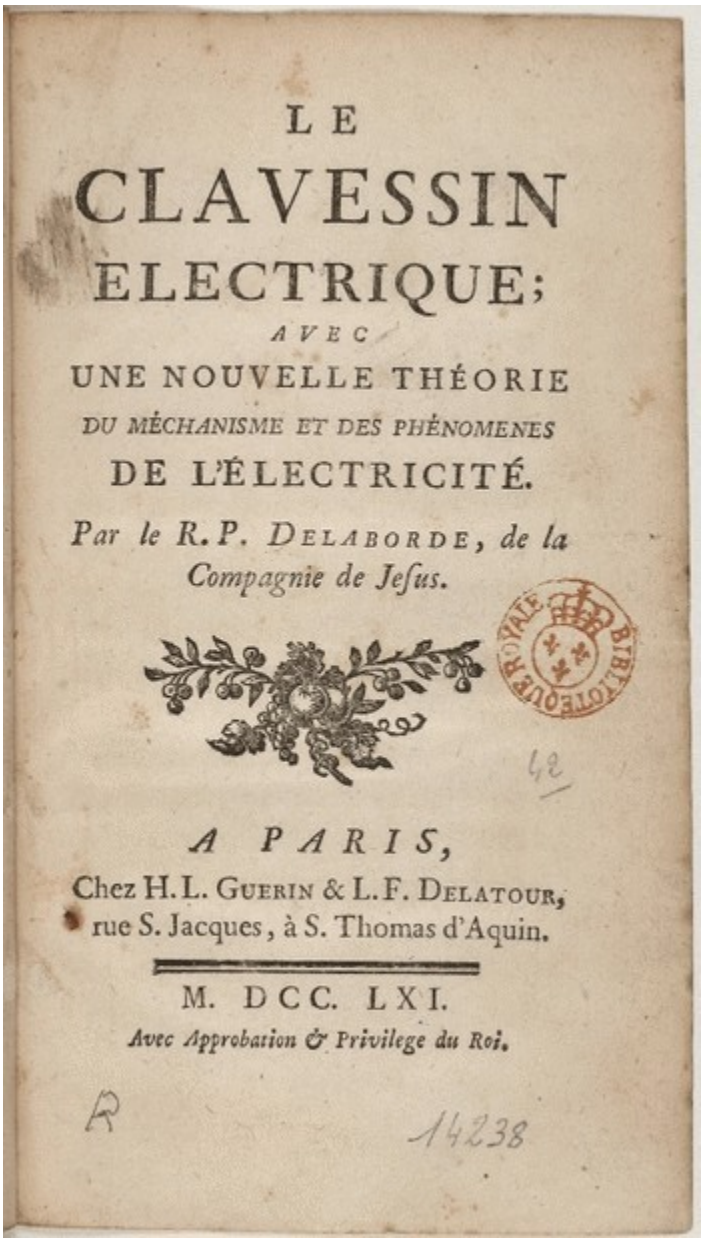


The 'Clavessin Electrique' from Jean-Baptiste Laborde's "Le Clavessin électrique; avec une nouvelle théorie du mécanisme et des phénomènes de l'électricité" 1761.

An eight-bell instrument based on this principle was developed in about 1747 by Ebenezer Kinnersley, an associate of Franklin in Philadelphia, and the device subsequently received substantial publicity when it was mentioned in Franklin's publication of his experiments with atmospheric electricity. Nearly 80 years were to elapse before the next sounds were produced by electricity.

This method allowed the player to create a series sustained notes from the bells, similar to an organ:

“Two metal bells tuned in unison are hung, one with a silk thread, one with a wire onto a metal rod itself both hanging free by means of a silk thread at each end. Based on the principles of static electricity a beater, also hung on a silk thread is alternately attracted and rejected by each bell as soon at is released through holding down a key, n positive and negative fields being created in the bells.”


LE
CLAVESSIN
ELECTRIQUE;
AVEC
UNE NOUVELLE THÉORIE
DU MÉCHANISME ET DES PHÉNOMENES
DE L'ÉLECTRICITÉ.
Par le R. P. DELABORDE, de la Compagnie de Jesus.
A PARIS,
Chez H. L. GUERIN & L. F. DELATOUR, rue S. Jacques, à S. Thomas d'Aquin.
M. DCC. LXI.
Avec Approbation & Privilege du Roi.
BIBLIOTEQUE ROYALE
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14238

[The cover of Delaborde’s ‘Clavessin Electrique’ of 1761(120years.net)]

Next topic: Clavecin Magnetique

102.1 Sources

- Wikipedia
- 120years.net

102.2 About the Author

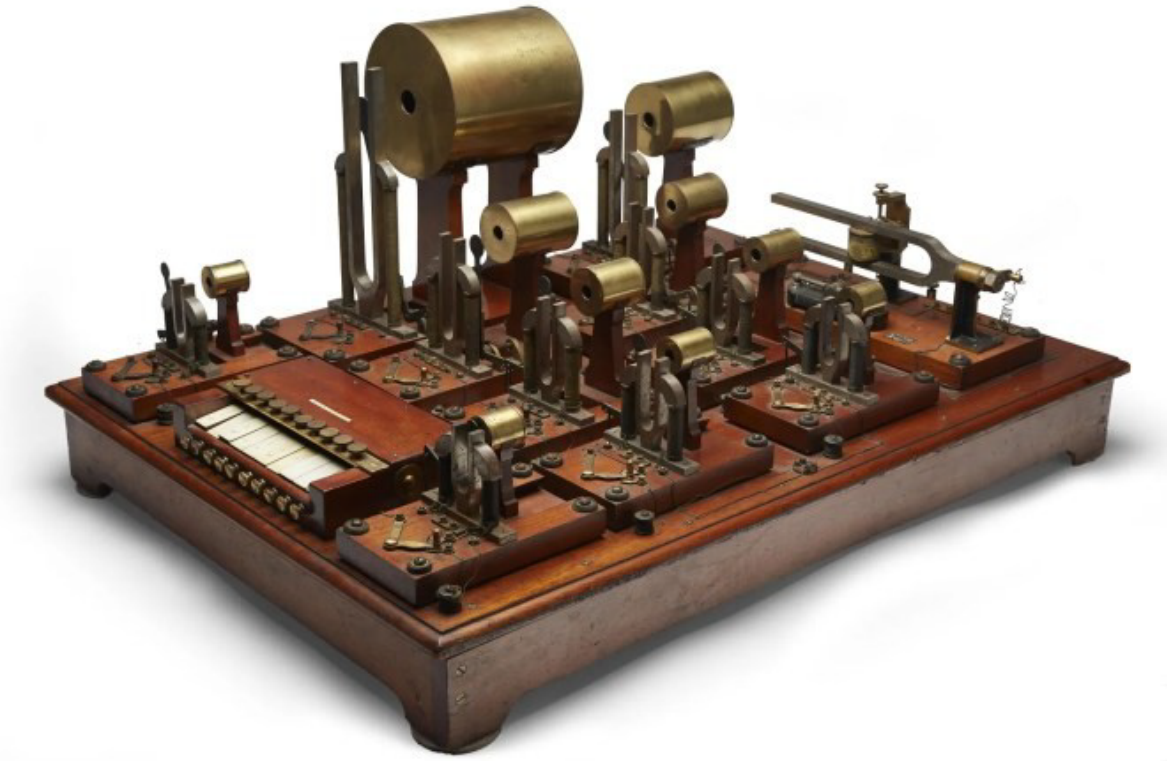
“Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post- production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub’s music is filled with landscapes of emotions, dramatic twists and melancholic moods. He’s one of the hosts of Tilos Rádió’s MustBeat show, in which he’s is focusing on drum’n’bass and chillout music. He’s also one half of the duo Empty Universe.”

CHAPTER

THREE

HELMHOLTZ SOUND SYNTHESISER

Born in Potsdam, Germany, Helmholtz was a scientist and philosopher, best known for his work in physiology,electrodynamics, and for his law of the conservation of energy. He was particularly concerned with theories of vision and the mechanics of the eye. In 1851, Helmholtz invented the ophthalmoscope, a tool enabling observation inside of the eye. He is also known for his experiments on the speed at which signals travel along nerves, which he studied on a frog model.



Max Kohl AG founded on 14 March 1876 was a well known company that designed and built scientific mechanical and electrical instruments and was based on Andorfer Str,Chemnitz, Germany. The company created a huge range of equipment sold throughout the world to laboratories and universitiesincluding a sound instrument based on a design by Hermann von Helmholtz.

The Max Kohl AG factory in Chemnitz was destroyed by allied bombing during WW2 and most of the remaining equipment was transported intact after the war to the Soviet Union.

The ‘Sound Synthesiser’ was not intended as a musical instrument but a scientific tool to demonstrate and analyse the effect of overtones in complex sound as described in Helmholtz’s revolutionary book ‘On the Sensations of tone as a

Physiological Basis for the Theory of Music' (Hermann von Helmholtz 1870) which had a huge impact on musicologists and instrument designers throughout the twentieth century. Using resonators, Helmholtz demonstrated the components of complex sounds are a combination of overtones of a fundamental note (e.g. a "fundamental" pitch G 440Hz contains a harmonic series of whole number multiples of this 440Hz frequency or overtones – 880Hz G , 1320Hz, 1760Hz, etc. at variable volumes). The Sound Synthesiser used a number of tuning forks – which produced almost pure tones – vibrated by electromagnets which in turn were amplified by a Helmholtz Resonator to generate overtones.The range of overtones could be 'filtered' by a mechanical shutter.The instrument helped in the understanding of the nature of speech and vowel sounds; vowel sounds being varied combinations of resonant overtones or 'formants' created by the muscles of the vocal tract.



[Herman Van Helmholtz]

Here you can see the Helmholtz Resonator in action: https://youtu.be/A9XLNH8FPd0

103.1 Next topic: Choralcelo

103.2 Sources

- Wikipedia / 120years.net / Braintour.harvard

103.3 About the Author

"Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub's music is filled with landscapes of emotions, dramatic twists and melancholic moods. He's one of the hosts of Tilos Rádió's MustBeat show, in which he's is focusing on drum'n'bass and chillout music. He's also one half of the duo Empty Universe."

CHAPTER

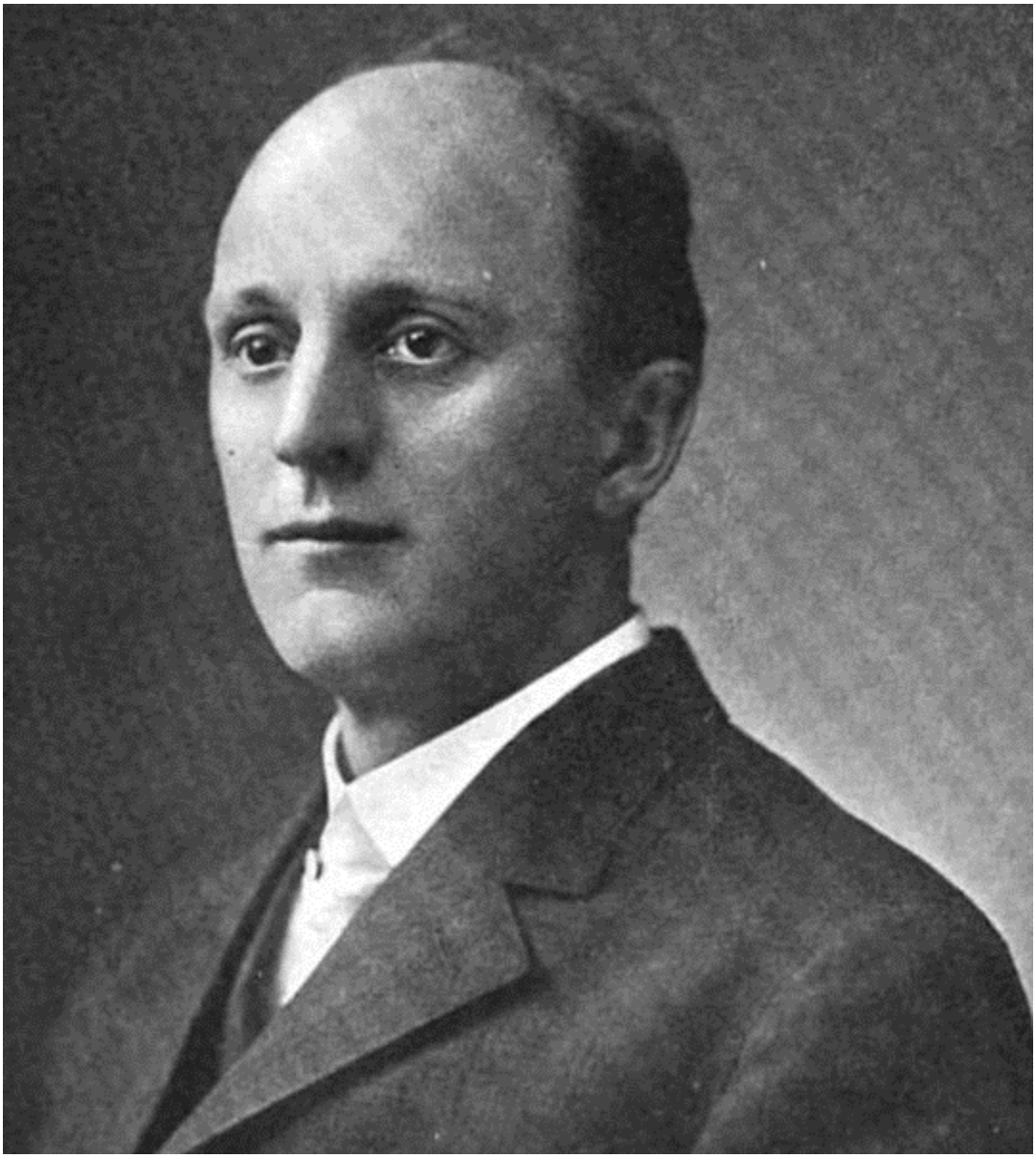
FOUR

CHORALCELO

The story of the Choralcelo is the story of two unique men. Melvin Every, the brilliantly gifted, many-faceted inventor, and Wilber Farrington, an idealistic, philosophic visionary who devoted his life to his vision, and his life would come to include a talented young wife, who believed and committed herself as deeply as he did.

The Choralcelo ("heavenly Voices") was a hybrid electronic and electro-acoustic instrument conceived as a commercial high-end domestic organ, sold to wealthy owners of large country houses in the USA. The Choralcelo was designed and developed by Melvin Severy with the assistance of his brother in law George B. Sinclair and manufactured by the 'Choralcelo Manufacturing Co' in Boston, Massachusetts. Later models were extensively redesigned and improved by Quincy Sewall Cabot, inventor of the 'Synthetic Tone'.

Severy was a versatile inventor, engineer musician, composer and author. Before the Choralcelo, Severy's inventions already included patents for printing presses, solar heating systems, a camera, fluid drives, and many others.The Choralcelo was developed by Severy from 1888 until 1909. The instrument was first presented to the public on the 27th April 1909 at the Boston Symphony Hall,in Boston, Mass. At it's unveiling the Choralcelo was accompanied by A soprano voice and about forty members of the Boston Symphony Orchestra and was said to have been 'enthusiastically received' by some of 'Boston's best known families'.



[Melvin Severy b.1863 Melrose, Mass; d.California 1951]

“First Choralcelo concert proves highly successful As for the Choralcelo itself, it proved an interesting and unique instrument. Fronting the audience from the platform was a mahogany box to disguise an upright piano somewhat exaggerated, and with two rows of keys. The Instrument, it was announced, resulted from twenty one years of persistent labour on the part of it’s inventor Melville (sic) L. Severy and George D. Sinclair both of Boston

The Choralcelo obtains sound of the violincello, the trumpet and the French horn, the oboe and the bassoon, the harp and the pipe organ from a single compass from the wire strings used in the pianoforte, which are vibrated by means of small electro- magnets stationed at scientifically determined points along their length. The surprise in the Choralcelo is that the ordinary piano string can be made to give more sounds than those obtained from it under the blows of the hammer, and the variety of these sounds is great on the account of the immensely increased possibility of making what the student musician knows as overtone. The concert this evening faithfully demonstrated the merits of the Choralcelo, and it may be expected to contribute important things to music.Great skill is required in it’s handling. The player is embarrassed somewhat by the very largeness of the means at his disposal. He must learn to select. With careful study this new instrument is designed to do many and large things and the contention of it’s inventor seems to be fully justified”



[Remains of a Choralcelo at the National Music Museum, Vermilion Sands, South Dakota]

Next topic: Audion Piano

104.1 Sources

- Wikipedia / 120years.net / Stacks.stanford

104.2 About the Author

“Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub’s music is filled with landscapes of emotions, dramatic twists and melancholic moods. He’s one of the hosts of Tilos Rádió’s MustBeat show, in which he’s is focusing on drum’n’bass and chillout music. He’s also one half of the duo Empty Universe.”

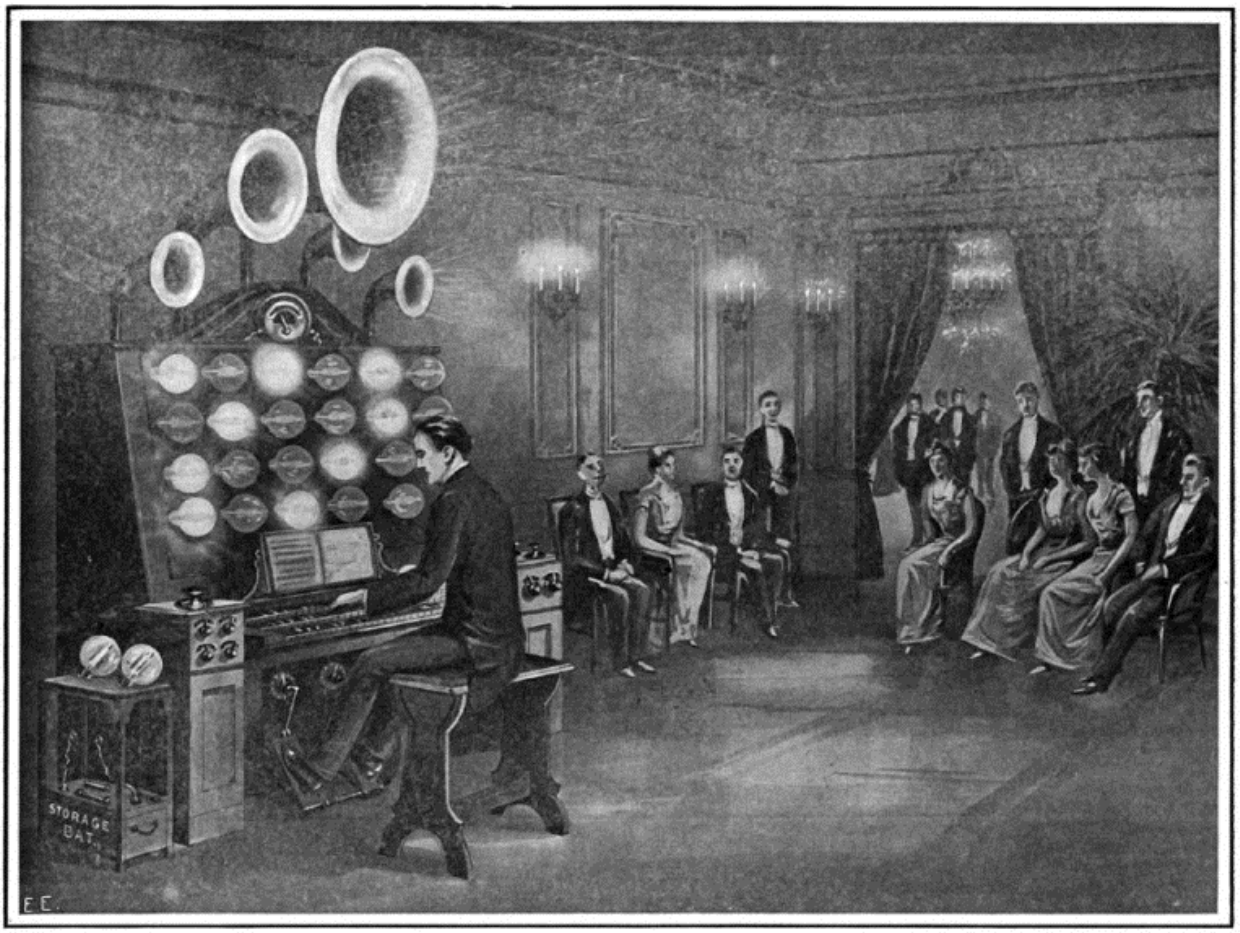
CHAPTER

FIVE

AUDION PIANO

Lee De Forest, inventor of the triode electron tube, the Audion, also invented one of the first electronic musical instruments, the Audion piano. Invented in 1915, De Forest's simple keyboard instrument used electron tubes in circuits called "oscillators," which produced electromagnetic waves at a particular frequency. The waves were fed to a loudspeaker to make them audible.

In the Audion piano each "octave," or set of eight notes on the keyboard, had a single electron tube dedicated to it, so that only one note per octave could be played at a time. So, while the Audion Piano could not play ordinary chords (complementary sets of keys) like a regular piano, it did produce some interesting musical sounds. In fact, because the wave-form of the oscillations could be modified to suit the player, the piano could produce many different kinds of sounds. De Forest described the sound of the piano as "resembling a violin, cello, woodwind, muted brass," or even as an entirely new sound never before possible with ordinary instruments. Sometimes, he admitted, the sound was grating and unpleasant, leading the inventor to nickname his instrument the "squawk-a-phone."

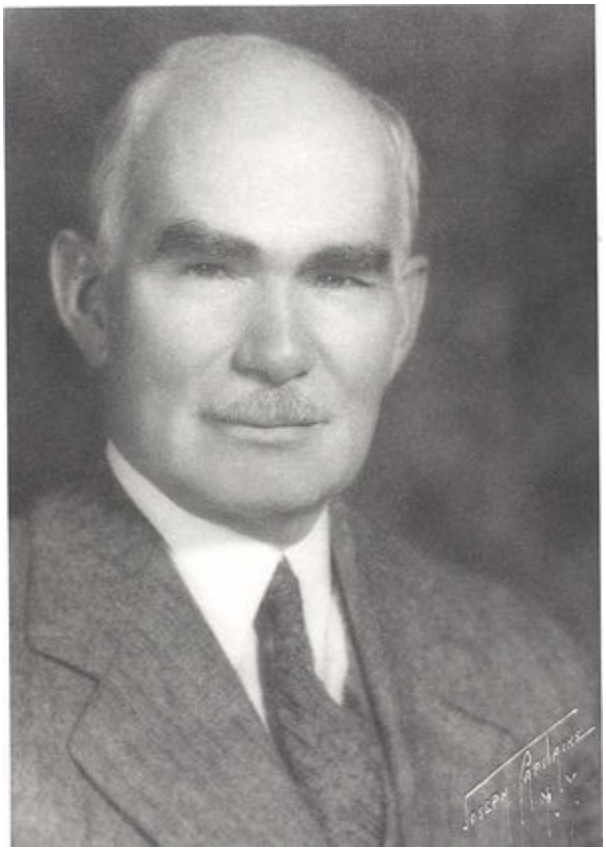


The Audion Piano May Entertain Us in the Near Future With Music Purer Than That Obtainable With Any Instrument Now Available. Also It Will Imitate Faithfully Any Orchestral Piece.

["Audion Bulbs as Producers of Pure Musical Tones" from 'The Electrical Experimenter' December 1915]

The immediate application of De Forest's triode valve was in the emerging radio technology of which De Forest was a tenacious promoter. De Forest also discovered that the valve was capable of creating audible sounds using the heterodyning or beat frequency technique: a way of creating audible sounds by combining two high frequency signals to create a composite lower frequency within audible range – a technique that was used by Leon Termen in his Theremin and Maurice Martenot in the Ondes Martenot some years later. In doing so, De Forest inadvertently invented the first true audio oscillator and paved the way for future electronic instruments and music.

In 1915 De Forest used the discovery of the heterodyning effect in an experimental instrument that he christened the 'Audion Piano' . This instrument – based on previous experiments as early as 1907 – was the first vacuum tube instrument and established the blueprint for most future electronic instruments until the emergence of transistor technology some fifty year later.



[De Forest]

The Audion Piano, controlled by a single keyboard manual, used a single triode valve per octave, controlled by a set of keys allowing one monophonic note to be played per octave. This audio signal could be processed by a series of capacitors and resistors to produce variable and complex timbres and the output of the instrument could be sent to a set of speakers placed around a room giving the sound a novel spatial effect. De Forest planned a later version of the instrument that would have separate valves per key allowing full polyphony- it is not known if this instrument was ever constructed.

Next topic: Sound-Producing Device

105.1 Sources

- Wikipedia / 120years.net / Ethw.org

105.2 About the Author

“Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub’s music is filled with landscapes of emotions, dramatic twists and melancholic moods. He’s one of the hosts of Tilos Rádió’s MustBeat show, in which he’s is focusing on drum’n’bass and chillout music. He’s also one half of the duo Empty Universe.”

CHAPTER

SIX

SOUND-PRODUCING DEVICE

Co-inventor of the Choralcelo – an electro magnetic organ, Severy also invented and secured patents on a camera, solar heater, printing press and several other items. In addition to inventing, Severy was a musical composer, author and artist. The Choralcelo, an expensive home organ, was sold for social music recitals. The instrument used an electromagnetic tone wheel to generate the organ sounds and also had piano type strings that were struck with piano hammers or that vibrated electromagnetically. It had two keyboards – the upper had 64 notes that sounded like a piano and the lower had 88 notes that worked more as an organ. Later on the Choralcelo was designed to use player piano type rolls for recording and playing music.

Severy was also responsible for numerous patents on inventions as diverse as typewriters (1903), bottling machines (1882), piano-tuning devices (1912), telegraphic systems, steam boilers (1893), steam engines (1894), cameras (1907), orthopaedic shoes, thermo-chemical batteries (1899), solar panels for generating electricity (1894), an iron-lung (1916) and what is probably the first sampling instrument, the 'Sound Producing Device' of 1912.

"The object of the present invention is the construction of an improved musical instrument in which the sonorous vibrations are produced electromagnetically by the movement of phonograms of magnetic material past electromagnetic sound producing mechanism."

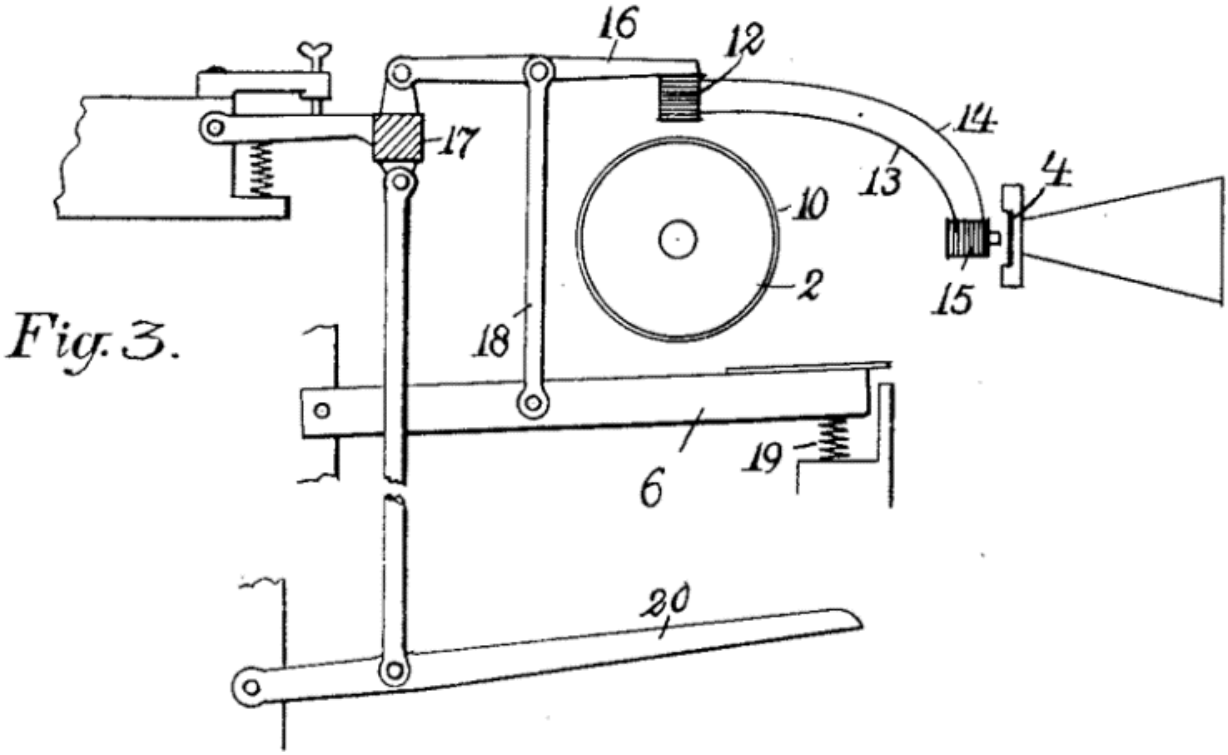


Fig. 3.

[Diagram showing the key-action that moves the magnetic pick-up closer to the sound wheel.g]

It is unknown weather the 'Sound-Producing Device' was actually built – Severy didn't use any similar mechanisms in the Choralcelo – yet the 'Sound- Producing Device' predicted the future of sampling instruments such as the Chamberlin and Mellotron by half a century and perhaps invented the concept of sampling. Severy's device was based around the concept of printing numerous magnetic spectrogram or recorded sounds as endless loops on rotating wheels.

A magnetic pick-up would be placed near the spectrogram disk and in turn, transmit a variable magnetic pulse that would active a speaker membrane – or, in a manner similar to Cahill's Telharmonium, transmit the signal through the newly established telephone network.

The instrument was to have numerous spectrogram for each note representing the various fundamentals and timbres of the recorded sound – a concept that was new for the time and most likely inspired by H. Helmholtz's 'On the Sensations of Tone as a Physiological Basis for the Theory of Music' (first published in English in 1875). These different timbres could be mixed using organ-style stops. Variation in pitch was achieved simply by altering the speed of the disc for each note and the volume of each note by keyboard pressure which moved the pick-up nearer to the sonogram disc.

Each note of the instrument had it's own speaker making the 'Sound-Producing Device' fully polyphonic as well as velocity sensitive.

Next topic: Wireless Organ

106.1 Sources

- Wikipedia / 120years.net / Findagrave

106.2 About the Author

"Guido F. Matis (a.k.a. widosub), a seasoned producer-composer authority with an unquenchable compassion towards the musical expression, and many years of experience in the fields of event organizing, movie post-production, and recording with professional musicians. His devotion to movie sounds shows in his art - widosub's music is filled with landscapes of emotions, dramatic twists and melancholic moods. He's one of the hosts of Tilos Rádió's MustBeat show, in which he's is focusing on drum'n'bass and chillout music. He's also one half of the duo Empty Universe."

CHAPTER

SEVEN

AMMAN - THE CAPITAL OF JORDAN

With a population of 4 million people, which makes it the largest city in Jordan which has a population of 10 million people in total. Amman considered one of the oldest cities in the middle east,

When you land in Queen Alia airport, and check yourself in one of the many global hotels around Amman, you should first head to "Albalad" area which means "Downtown", despite the growing urban area that has brought many changes, much remains of its old character, it is considered one of the oldest alive areas in history of Amman, it was originally inhabited around 6500 B.C. where a mix of old buildings collide with modern vibes.

You should definitely start your day with breakfast in Hashem restaurant in Albalad where you get to taste one of the best Falafel in the country, afterwards, with a full tummy, you burn these calories when you go tour the old shopping centers of Albalad, countless of goods and memorabilias can be found and once you're done shopping, you choose one of the many restaurants that serve local cuisines in Albalad, followed by sheesha and kunafa from the oldest kunafa places in Jordan "Habiba".

You also get to visit The Amman Citadel, a historic site in the center of downtown, one of the most visited sites by tourists.

And by the way, Amman is one of the oldest inhabited cities in the world, having evidence of settlement from 7250 B.C.! now it's considered one of the most modernized cities in the Arab world.

The night is coming, and you sure want to experience the nightlife in Jordan, and within a walking distance you head to rainbow street which is within what we call "The 1st circle" area.

Rainbow street is a very old area where it's filled with cafes, bars and restaurants. You might want to have a quite time in La Calle bar, or you want to party in an interesting way where you should definitely head to Scrabs bar.

Amman's increasing nightlife scene is shaped by Jordan's young population, it's very easy to find nightclubs, music bars, and shisha lounges, which are changing the city's old image as the conservative capital. Amman has become one of the most liberal and westernized cities of the Arab world.

Also close to Rainbow street area, a place we call "Lwaibdeh" which is considered number one in the places where expats prefer to live in, for its western and the same time, eastern vibes that come together to make a very attractive scene in Jordan, and is considered the art hub in Amman.

From the 1st circle, to the 8th circle, all modern urban scenes known can be found along the way, and ends in airport road where it's less than an hour away from the dead sea.

Generally, the most important areas in Amman are named after the hills, in Arabic it's called "Jabal", Amman was initially built on 7 hills but now spans over 19 hills "Jabal".

Jordan has been receiving refugees for the last century and has become the home of many people from Palestine, Syria, Iraq, Yemen… etc. which one of the causes that Amman has become one of the largest capitals in the middle east, and because of its geographical location, people often think that Jordan is not a stable and safe country, but once you set foot in Amman, you will notice a very different idea of what you would think of this middle eastern country.

107.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

107.2 References

- https://www.lonelyplanet.com/jordan/amman
- http://www.kinghussein.gov.jo/tourism1.html
- https://www.aviontourism.com/en/destinations/amman-17584

CHAPTER

EIGHT

AMSTERDAM

Amsterdam in the capital of the Netherlands and thanks to its liberal culture attracts tourists from all corners of the planet, offers a wide range of bars, accommodation and special festivals for the LGBT community and due to its thriving cannabis culture, you can smoke in over 200 cafes and bars in the city center.

The ring of canals is another of the interesting attractions of this city, since not only does it have more than 150 canals but they are also crossed by 1,281 bridges. An impressive and beautiful city to tour by bicycle.

Dam Square is considered to be the heart of the city, where you can observe its architecture and enjoy its atmosphere. The Royal Palace dominates the attention of the square for its classical facade, it also has fine sculptures that were made to glorify the city.



The canal belt that characterizes Amsterdam allows you to take a boat ride on the canals to get to know the city during the day, but at night you will be able to see the houses and the illuminated bridges that will provide you with a romantic experience.

In Amsterdam, prostitution is legalized and it has the Red Light District, where you will find hundreds of prostitutes plying their trade behind a cluster of windows with red lights. For obvious reasons, it is one of the most famous places in Amsterdam where you can enjoy a party atmosphere, beer and sex shops. The Red Light District is a kind of amusement park dedicated specifically to sex.



If you have plans to go out, the best thing is to head towards Leidsepelin Square where you will find endless nightclubs, bars, restaurants, cafes, theaters and cinemas. During the day it is filled with jugglers, street musicians, fire-eaters and other types of artists. However, many of the shows last until the early hours.

If you want a rest day on your tour, you can visit the Vondelpark which is considered the most famous park in the Netherlands and has more than 10 million visitors a year.

Another of the tourist attractions of this city is the flower market, since the stalls where flowers are sold are floating houses and it is there where you can buy souvenir bulbs and tulips.

If your interest is art, you should go to the Van Gogh museum where you will find more than 200 paintings by the genius of impressionism, it also includes more than 400 drawings by Van Gogh to delight lovers of his works. But then you must go to the Stedelijk Museum where you will find the representatives of contemporary and modern art such as neo-impressionism, pop art and the Bauhaus. Works by great artists such as Piet Mondrian, Kandinsky, Chagall, Matisse, Pollock and Andy Warhol, among others.

On the other hand, the A'dam Tower can be an interesting experience where a wide variety of music groups, events, restaurants, bars and a hotel are housed. The Skybar is especially outstanding, which is an exclusive site that is located on the upper floors and also rotates, so you can enjoy its spectacular view.

One of the most significant and historic sites in Amsterdam is the Anne Frank House, where she and her family de ella lived in hiding during the Nazi invasion. Entering the house they give you a brochure where they explain in detail the events that occurred in each room of the house and certain paragraphs taken from the famous diary of Anne Frank.

The Oude Kerk is a church built in 1306, being the oldest building in Amsterdam. But during the 16th century the side chapels, the portal that takes you to the Iron Chapel and the tower were added. The interior of the church is impressive where you can see the choir stalls made of finely carved wood and three Dutch Renaissance windows.

As far as technology is concerned, the city has the NEMO science museum, an ultramodern structure that emerges from the water as if it were the hull of a ship, there you will find five floors of interactive exhibitions where they show you the functioning of the mind, the human body, physical phenomena and all kinds of science, with innumerable high-tech gadgets to teach the functioning of the universe in the funniest way, being a magical place to visit with children.

One of the most important museums in the country is the Risksmuseum (National Museum) which stands out for housing the baroque paintings of the great masters of Dutch painting.

If you are interested in plants, you should go to the Botanical Garden, which is one of the oldest in the world. Among its most relevant structures is the palm room whose dome is made of glass, the greenhouses and the seed house, where there are more than 4000 species of plants and numerous tropical species.

As we all know, Amsterdam is famous for its tulips and one of the best places to see them is the Keukenhof garden, which has more than 32 hectares full of flowers, whose main protagonist is the tulip. You can buy seeds, bulbs and flowers in their greenhouses and in their surroundings you will see beautiful fountains, lakes and windmills.



You cannot miss the cuisine of the city and a great way to taste the local flavors is in the Foodhallen, whose center houses several restaurants serving all kinds of food on the same roof, but you can also try Dutch bitterballen among other traditional dishes. . You can also eat dim sum, sushi and other international foods. It's a place frequented by locals, so it doesn't exactly look like a tourist spot, but there is sometimes live music and you can have craft beer in its four bars.

For cheese lovers it is essential to visit Alkmaar, which although it is true you cannot buy cheese, they give you a demonstration in front of a scale from the Middle Ages and with merchants who show you how commercial operations were carried out, with all the atmosphere in keeping with the times. But don't worry, right next to it you will find a small market where you can buy all kinds of cheeses.

The last place we can recommend is Maduroam, which is a miniature park where you can see Holland on a small scale. There you can also enjoy models of many towns in the Netherlands, with interactive activities such as flying a plane, loading containers on ships, mixing music on DJ tables where you can enjoy with your children or feel like one of them.

108.1 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

NINE

ANDORRA

Andorra is a sovereign micro-state located in southwestern Europe and has no access to the sea, it is located between Spain and France in the Pyrenees, it is an independent democratic and social state, its form of government is the parliamentary co-principality.

Andorra is a small country that you will fall in love with for its natural landscapes that make up 90% of the territory, it has three natural parks, lakes and mountains that are more than 2500 meters high. In this country you can practice winter sports, hiking, visit one of its medieval towns, take a route through romantic churches or go shopping in its capital Andorra la Vella.



In this article we are going to guide you through the most impressive places in this small country, so that if you want to visit it, do not miss the most important thing.

109.1 Romanesque churches

Taking a route through the romantic churches by car is one of the best activities you can do in Andorra. You must bear in mind that there are more than 40 small churches that were built between the last years of the 8th century and the 13th century, they have been preserved in perfect condition thanks to the absence of wars and the isolation of this country.

One of the main characteristics that all these churches have in common is that they were built using slate stone, their bell towers have a square floor plan and some of them preserve wooden carvings and medieval paintings. Among the most outstanding churches are Sant Romà in Les Bons, Saint Climent de Pal, Saint Martí de La Cortinada, the church in Andorra la Vella de Santa Coloma, Saint Joan de Caselles and Saint Sergi de Nagol.

109.2 Andorra la Vella

Andorra la Vella is located at more than 1,000 meters above sea level and the capital is surrounded by mountains. The historic center of this city is especially beautiful and is full of stone buildings, among which the Casa de la Vall stands out, built at the end of the 16th century and was the seat of one of the oldest parliaments in Europe called the General Council. . The other oldest buildings located in the historic center are the Casa Guillermó, the Church of San Esteve (from the 12th century) and the Casa Felipó.

Although they are less old, we can also name other interesting places in the area such as Salvador Dalí's sculpture La Noblesse du Temps, Plaça del Poble which houses the sculpture Homage to the Immigrant, El Puente de París and the most commercial street in the city. which is Avenida Meritxell, with a multitude of shops that extend to the neighboring town of Escaldes Engordany.

If the stores on this avenue are not enough for your purchases, you can go to one of its most famous shopping centers such as Illa Carlemany or Pyrenees.

109.3 Tristaina Lakes

Andorra has three high mountain lakes: Ordino Arcalís, Tristaina and Estanys, which make up one of the most beautiful natural landscapes in this country, being one of the most popular excursions in Andorra due to its moderate difficulty, so if you go well equipped (just in case the weather changes) is suitable for any hiker.

To start this 4.4-kilometre route, you must reach the parking lot of the La Coma restaurant, which is adjacent to a ski resort called Ordino Arcalís. The route lasts approximately three hours and is perfectly marked with yellow lines, you can reach a height of 2,300 meters until you reach Lake Ordino Arcalís, the route is circular, surrounded by mountains where you can later reach the Tristaina peak, which is 2,878 meters above sea level. height and then, another route of low difficulty through the Vall d'inches, where you will find some small lakes in the Estanys de Juclar.



109.4 Important towns to see in Andorra

There are a series of small villages nestled between the mountains built with stone and slate roofs, where you will think that time has stopped. The most beautiful and recommended are:



Pal: This town is one of the best preserved from the romantic period, it stands out for its wooden and stone houses, as well as its beautiful church.

Les Bons: This town has the church of Sant Romà and the Torre de los Moros where you can see beautiful romantic paintings.

Ordino: It is considered the cultural capital of Andorra and has several museums such as the Areny-Plandoli house and the Postal Museum.

Fontaneda: It is one of the most isolated and small towns, with streets full of charm and without paving, it will impress you with its beauty.

Llorts: The reddish Valira del Norte river runs through this town, being the starting point of the Iron Route.

109.5 Naturland

Naturlandia is the best amusement park in the country located in Julià de Lòria. There you will find endless fun outdoor activities surrounded by 800 hectares of forest.

The complex is divided into two zones, the first located at 1,600 meters high where most of the attractions are located, and the other at 2,000 meters that offers you some more dizzying activities such as the longest alpine slide in the world called the Tobotronc with a drop of 400 meters and more than 5 km in length. There you can also climb a wooden structure called Airtrekk, about 13 m high with a 180-meter zip line full of obstacles, both activities are full of adrenaline.

109.6 Caldea

Caldea is a thermal water spa located in Escaldes-Engordany that is one of the largest in all of Europe. The thermal complex stands out for its 80-meter-high pyramid-shaped tower with a futuristic design. Inside you can enjoy all kinds of baths, in modern facilities with specialized treatments through its healing thermal waters.

109.7 Skiing in GrandValira

You can ski in GrandValira or snowboard in this resort, which is the largest in southern Europe, with more than 210 kilometers and 138 slopes. This station offers you numerous hotels, cafes, places for children and restaurants at the foot of the slopes with all the comforts. In summer, some of the tracks are transformed into golf courses located at 2,200 meters above sea level.



109.8 Roc of the Quer viewpoint

This viewpoint has spectacular panoramic views of the Pyrenees and its natural surroundings. It has a 20 meter long walkway where part of the floor is transparent and is suspended over the Canillo valley.

109.9 Andorran bridges

The romantic period is also reflected in several stone bridges, among which is the Puente de la Margineda over the Valira River built in the 12th century. The other recommended bridges are the Sant Antoni de la Grella, where Andorra la Vella used to connect with La Massana and will immediately take you back to the Middle Ages, the Pont d'Engordany and the Pont dels Escalls, the latter located in Escaldes-Engordany.

109.10 Meritxell Sanctuary

The Meritxell Sanctuary is the most important temple in the country, in 1972 it suffered a fire that burned most of it, but it was rebuilt by the famous architect Ricardo Bofill with a mixture of styles in perfect harmony with the environment.

Andorra is a beautiful little country that offers you a lot of dreamlike landscapes.

AUCKLAND

Auckland is the largest city in New Zealand and is also known as the city of candles. This port city stands out for its numerous attractions, for being the place where the Pacific Ocean and the Tasman Sea practically meet, for being multicultural, having a wide job offer, for its academic excellence and the temperature ranges between 20 ° C for the warmest months and 11 °C in its coldest time, so that its temperature is ideal throughout the year. For all these reasons, Auckland is one of the best cities to live in the world.



We are going to recommend the most important places in Auckland if you decide to visit.

110.1 Queen Street

Queen Street is the most important street in the city and one of its main arteries, so if you visit the city, you will surely end up walking it. Several buildings full of history are concentrated on this street, as well as a wide range of shops, restaurants, bars, theaters, art galleries and the Auckland City Hall.

110.2 Sky Tower

Sky Tower is the quintessential icon of the city, it is 328 m high and is considered the tallest building in the entire southern hemisphere, you can see this tower from anywhere in the city. Climbing to the top to go to its observation deck will allow you to feel that you have Auckland at your feet through its glass floor. Of course, from this point you

will have impressive panoramic views and you can enjoy them while having a cocktail. But if you like strong emotions, you can also jump into the void practicing skyjump.



110.3 Giapo Ice Cream

Giapo is an internationally famous ice cream parlor where they make delicious and extraordinary ice cream. To give you an idea, according to Lonely Planet it is the best ice cream place in the world and the ice cream parlor has a motto that says "art will save the world", so that their ice creams are definitely a mix between food and art, It really is a different place than any other ice cream parlor and it is more like a sculpture gallery or a museum.

You can even eat ice cream over fries or on top of traditional Maori bread. Many movie stars and famous people have visited Giapo, such as NBA players, the All Blacks, the impressive Cher, among many others.

110.4 Viaduct Harbor

Viaduct Harbor is one of the most fashionable areas in Auckland, in ancient times it was a commercial port and it underwent different processes of change. However, after the two America's Cups that were played in the city, they led this area to become a place of elegant bars and restaurants, from where you can see endless sailboats on the horizon.

110.5 Wynyard Quarter

Wynyard Quarter connects to Viaduct Harbor by bridge. This area is known for its entertainment venues and its restaurants, as well as a place called "La Lonja del Pescado", which stands out for its cafeterias, restaurants and its cooking school. It is the ideal place to taste the local gastronomy.

110.6 Mount Eden

Auckland is characterized by its large number of hills or mountains that were volcanoes in the past, with Mount Eden being the highest volcanic cone with its 196 meters in height. From its top you will have one of the best views of Auckland and the islands that surround the city. To climb to the top of the hill you will not have to make much effort, and the entire route is extraordinarily beautiful. However, if you prefer not to walk, you can take one of the buses that will take you to the top.

110.7 Auckland Harbor

The Port of Auckland is located in the heart of the city center, although its origins date back to the 14th century, it really became important as the economic development of the region grew. Today it is capable of providing links to 160 ports in 73 countries.



Strolling through the port is one of the best activities you can do in the city, you can also have a drink or eat in a large number of food trucks, while you observe the beautiful maritime landscape.

110.8 Auckland Domain

Auckland Domain is the largest park in the city, you can lose yourself among a multitude of trees in this large green space. Inside there is also the city greenhouse (Wintergarden), perfectly differentiated spaces to play rugby, soccer or cricket and you can also see the Auckland War Memorial Museum, the site in general is an entertainment complex.

110.9 Auckland War Memorial Museum

In this museum you will have the opportunity to delve into the history of the country, starting by delving into a war memorial dedicated to those who gave their lives during the two world wars, you will be able to witness several collections oriented to the history of New Zealand, observe true treasures of incalculable value of Maori culture, exhibitions of natural history, international and local culture, etc.

110.10 Winter Garden Botanical Garden

The Winter Garden Botanical Garden was built after the First World War, there you can see a wide variety of more than 1000 plants from all over the planet. Inside it has two buildings, the first is for temperate climate plants and the second houses tropical plants. There you can also see a wide variety of ducks and birds, as well as two artificial lakes, lagoons, streams and several small lakes.



110.11 Cornwall Park

Cornwall Park is located in the heart of the city, being a very large space of calm in the middle of traffic, presided over by One Tree Hill where you can walk, enjoy a good picnic or go cycling in the middle of nature. Even throughout the park you will find electric barbecues to enjoy a good meal.

110.12 Albert Park

Albert Park is another of the green lungs of the city, but it also has a beautiful garden that dates back to the Victorian era, still retaining the typical character of the time and with monuments such as the statue of Queen Victoria, as well as a beautiful source. You will be able to discover impressive floral displays, heritage statues and its location is perfect for festivals and events.

110.13 One Tree Hill

One Tree Hill is located around an important volcano with 182 m height, during the ascent you can enjoy a truly incredible natural landscape, where in addition to the environment you can see cows, sheep and birds.

Auckland is a city worth visiting, with an enviable climate and many tourist attractions.

110.14 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

ONE

BANGKOK

Bangkok is one of the cities in Thailand and one of the most intense in the world, pollution, traffic, humidity and chaos can shock you at first sight. But when you begin to visit its temples, markets, taste its food, you will be able to gradually understand its way of life and the charm of this city. It has a mixture of modernity and tradition where you can feel the magic of Asia, but with the comforts of a western city. We will give you a guide with the selection that we believe are the essential places that you must visit in Bangkok.



111.1 The Grand Palace in Bangkok

The Grand Palace is a large complex of buildings where the King of Thailand had his official residence from the 18th century to the middle of the 20th century. The Wat Phra Kaew stands out as the most important Buddhist temple in the country and inside it houses the statue of the Emerald Buddha, a jade figure of approximately 45 cm that until today is the main religious icon of the Thais, only you can see it from afar since they do not allow the proximity of visitors.

In this temple and throughout the enclosure in general you will be able to see statues and buildings embodied in Thai art.



111.2 Bangkok markets

Haggling in the markets is one of the best things to do in Bangkok. There are markets at night, during the day, on top of the train tracks, on the water, clothing, food, flowers, among others and the most famous are:

111.3 Chatuchak Market

Chatuchak has more than 8,000 stalls and is one of the largest markets in the world. It is best to arrive first thing in the morning as the large number of people who come daily can overwhelm you later. You can get to this market by taking the metro and going down the Chatuchak station.

111.3.1 – Damnoen Saduak Floating Market

Although it is true that this market is almost two hours by bus from Bangkok, this is the most touristic and famous market in the city, because it is traveled in a traditional boat, from where you can buy souvenirs, fruits, spices and handicrafts, either in the shops on the shore or in other street vendor boats.



111.3.2 – Maeklong Market

This market is one of the most impressive on the planet because it is located on the tracks of a working train and when the horn sounds, in a few minutes the market is dismantled and reassembled after the train passes.

111.3.3 – Patpong Night Market

It is located in the red zone of Silom, being one of the busiest and most famous markets in Bangkok, but you must be careful because most of its products are fakes, so you will have to pay little and haggle a lot. In addition to the market you will be able to see strip shows and clubs, so if you travel with children you should take this into account.

Other markets that are less touristy but that are also recommended to visit are the flower market on Chak Phet Road, the Sampeng Market in Chinatown, the Or Tor Kor food market, the Amphawa floating market, the amulets market that It is close to the Royal Palace and the Pratunam clothing market.

111.4 Khao San Road

This small street in the center of Bangkok is very popular with backpackers because it is surrounded by cheap hotels and hostels. The recommendation is to go towards sunset or at night, which are the hours with the greatest atmosphere, the bars and terraces begin to fill up and a large number of street food and drink stalls are set up. Due to its popularity, many massage parlors, shops, restaurants and hotels are now located near Rambutri Road, so the shopping area has expanded somewhat beyond Khao San Road.

111.5 Chao Phraya

The Chao Phraya River divides the city in two and also has a series of secondary channels that are known as klongs. You can rent a boat ride through the canals where you can see the floating houses on the shore and the way of life of its inhabitants. To travel along this river you have several options, since in addition to the small motor boats, you can use the public boat that stops at the different docks or also the ferry that crosses the river. You can even book a dinner cruise to see the illuminated temples and the city from a more romantic perspective.



111.6 Wat pho

The What Pho is a temple that houses a large reclining Buddha that is 15 meters high and 46 meters long. The great statue is covered in gold leaf and the recommendation is to look at the decoration on the sole of its feet. In this complex there are also several statues of Buddha and buildings of great beauty. If you are interested, you can have a relaxing massage at the Thai Medicine Center and at a fairly affordabl



111.7 Viewpoints of Bangkok

Bangkok is a city of many contrasts where next to a traditional house there can easily be a skyscraper. These great buildings are currently the viewpoints of the city and the most famous are:

111.7.1 – Mahanakhon

This viewpoint was just inaugurated in 2016, in this 78-story building and 314 meters high. The most impressive thing about the MahaNakhon Observatory is its glass floor and its beautiful 360-degree views of all of Bangkok. The viewpoint has a structure made up of glass boxes that produces a pixelated effect, which ultimately is not indifferent to anyone.

111.7.2 – Baiyoke Tower

In the Baiyoke Tower you can have a buffet dinner and have a drink from the top. In this skyscraper is the Sky Hotel, which is considered the tallest hotel in Southeast Asia, if you go up to its 84th floor you will have excellent views of the city.

111.7.3 – Sirocco

Sirocco is a restaurant with a spectacular outdoor terrace that is located above the Lebua at State Tower Hotel. Although its prices are exaggeratedly high, you can have a drink at its bar so you don't miss out on the fabulous atmosphere.

111.8 Wat Arun

The Wat Arun or also called Temple of Dawn is located on the banks of the Chao Phraya River and this Buddhist temple stands out for its towers decorated with pieces of porcelain and seashells, it also has magnificent views of the river from the top of its central tower and from the city.

111.9 Chinatown

Chinatown is one of the most authentic and chaotic neighborhoods in the city. It has two main streets that are Yaowarat Road and Charoen Krung that change radically if it is day or night, so it is interesting to visit it at different times.

During the day you can explore the hectic Sampeng clothing market or visit the Golden Buddha temple, while at night you can eat in the many street stalls or have a drink in one of its restaurants.

111.10 Malls

In Bangkok there are a lot of shopping malls and the most famous are:

111.10.1 – MBK

It is the most famous mall in Thailand with more than 2,000 stores and 150 restaurants, it was opened in 1985 and its eight floors include clothing and electronics stores.

111.10.2 – Siam Paragon

The Siam Paragon is Bangkok's most luxurious and expensive brand-name shopping mall, car dealerships such as Lamborghini and Maserati. There is also the Siam Opera and the largest aquarium in Asia, the Siam Ocean World.

111.10.3 – Central World

Central World is the third largest shopping center in the world and the first in Southeast Asia, on its eight floors you will find restaurants, electronics stores, clothes and prices are not as expensive as Siam Parangon, nor as affordable as MBK.

111.10.4 – Plaza Pantyhose

The Pantip Plaza specializes in electronics and computers, you can find all kinds of movies, music, software, hardware, all gadgets for the PC, in short, it is a paradise for those who love computers or electronics.

111.11 Jim Thompson House

The Jim Thompson House is one of the most significant examples of the traditional style of Thai architecture. Jim Thompson was an American and businessman highly regarded within the country, because he made Thai silk famous throughout the world.

The mansion is made up of six houses made of teak wood from Ayutthaya, in which its beautiful garden stands out.

Bangkok is a very interesting city that thrives in the midst of chaos.

111.12 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

TWO

BARCELONA

Barcelona is one of the most attractive and visited cities both in Europe and in the world in general, with an immense offer of cultural and leisure activities and it is an architectural jewel of modernism. This cosmopolitan city is full of charms and also has excellent Catalan cuisine.

We are going to take you by the hand through the most important places in Barcelona, so that if you go to visit, you will not miss any of them.

112.1 The Holy Family

The temple of La Sagrada Familia is the masterpiece of the architect Gaudí, who was the greatest exponent of modernism in Barcelona, although it is true that he could not finish the temple because he died, he left all the plans so that they could finish the work future architects.



Both the interior and exterior of La Sagrada Familia are a work of art, nothing compares to any other church in the

world, all its elements come together in complete harmony and its exterior highlights the towers that can reach up to 172 m in height. height (once the monument is finished) and three facades consecrated to the birth, passion and glory of Jesus Christ. Gaudí began its construction in 1883 and we all hope that the work will be completed, which is scheduled for the year 2026. When it is finished, it will become the tallest church in the world.

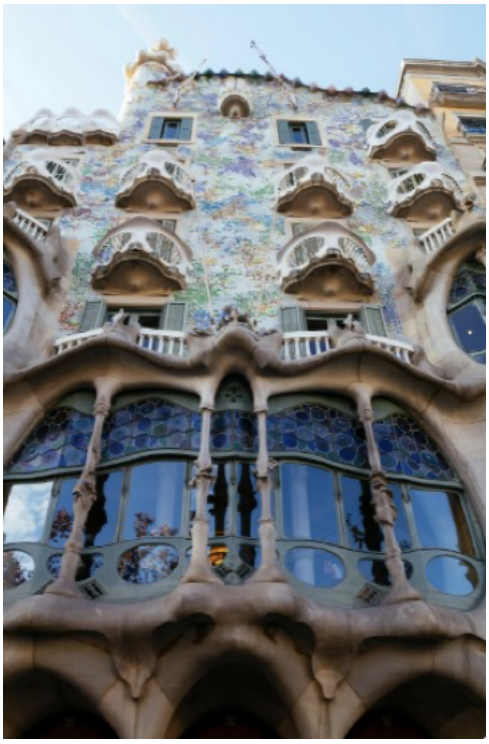
112.2 The Gothic neighborhood

The Gothic Quarter is the oldest and most beautiful to visit in Barcelona, its origin dates back to Roman times, but its maximum splendor was acquired during the Middle Ages with the construction of Gothic palaces and churches.

A Gothic marvel from the 14th century is the Cathedral of Santa Creu i Santa Eulalia, which stands out for its beautiful interior cloister, a carved wooden choir and a façade that will leave you speechless. Then we recommend you get lost in the narrowest streets of the neighborhood starting with Carrer del Bisbe and touring magical corners such as the Palau del Bisbe, the Plaza de Sant Felip Neri, the Plaza del Rey, the Templo de A augusto, the Plaza Sant Jaume. , the magnificent Plaza Real and the church of Santa Ana.

112.3 House Batllo

House Batlló is one of the best works of Antonio Gaudí and is considered a World Heritage Site, with a spectacular façade that impresses at first sight and thanks to its undulating shapes, it has an interior full of magic. The roof terrace full of amazing chimneys and the courtyard of lights have turned this house into a landmark of architecture.



Once you leave House Batlló we recommend you visit the neighboring buildings that are House Amatler, House Mulleras, House Josefina Bonet, and House Lleó Morera. They are all great works by modernist architects and together they form the so-called Manzana de la discord.

112.4 The Rambla

The La Rambla promenade is approximately 1.5 kilometers long and is located between Plaza Catalunya and the Columbus Monument. This promenade is always full of tourists and with a great activity at any time of the day, you will be able to see street artists, numerous stalls with quality products and restaurants to eat or have a drink.

You can also drink water at the Canaletas fountain where they say that everyone who drinks its water returns to Barcelona. You cannot miss the Joan Miró mosaic and in one of its adjacent streets, you will find another of Gaudí's wonderful works, the Güel Palace, where you can walk through its interior to the beautiful terrace with colored chimneys.

112.5 Hospital of Santa Creu i Sant Pau

This hospital was built between 1902 and 1930 by the architect Lluís Domènech i Montaner and his son, it is another modernist work that must be seen in Barcelona and was declared a World Heritage Site. It is made up of a large central square, surrounded by modernist buildings of great beauty.

112.6 El Born

El Born is a neighborhood that is fashionable in Barcelona and is located right next to the Gothic Quarter, its narrow cobbled streets are filled with bars, cafes, restaurants, boutiques and venues, to have the first drink of the night.

One of the most important places to visit in El Born is the wonderful basilica of Santa María del Mar, with spectacular Gothic-style architecture and in the same neighborhood is the impressive Palau de la Música Catalana, which is a modernist building built between 1905 in 1908 by the architect Lluís Domènech i Montaner and has a concert hall, which is the only one of its kind declared a World Heritage Site.

The Picasso Museum is also in the surroundings with the most important collection that the great painter was able to make during his youth. But you can also visit Passeig de Born, the old Born Market, the Marcus Chapel, Montcada Street, the Church of Sant Pere de les Puelles and taste traditional food at the Santa Catarina Market.

112.7 Park Guell

This park designed by Gaudí was also declared a World Heritage Site and is one of the most beautiful in the world. It is surprising to see its fountains, buildings and sculptures inspired by the undulating forms of nature, full of beautiful mosaics and with an incredible view of the entire city.



112.8 Viewpoints of Barcelona

In addition to Park Güell, there are other viewpoints that offer you the best views of the city and these are:

Montjuic is a 175 m high mountain that offers you views of various sites such as the National Art Museum of Catalonia, Montjuic Castle, the cable car and the Mirador del Alcalde Gardens.

Basilica Santa Maria del Pi offers you excellent panoramic views from its great 50 m high bell tower, from here you can see the old part of the city.

Bunkers del Carmel is a viewpoint that is 250 meters high and offers incredible views of the city next to the remains of anti-aircraft bunkers.

Tibidabo, in addition to being a viewpoint over 500 m high located in the Sierra de Collserola, has a fun amusement park.

112.9 House Mila

House Mila is another of Antonio Gaudí's great works, a modernist building built between 1906 and 1902, popularly known as La Pedrera thanks to its stone façade with its wavy arches.

Barcelona is in itself a work of art, which also offers you a festive atmosphere to have fun and that will make it unforgettable!

112.10 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

THREE

BEIJING

Beijing is not only the capital of China, but also the political, social and cultural heart of the country. It is a vibrant and chaotic city that is constantly evolving, developing by leaps and bounds but at the same time struggling to maintain its traditional structure. In Beijing you will find contrasts where you will see modern skyscrapers that rise majestically, next to small traditional houses that are located in the old hutongs of Beijing.

The Far East is considered a magical and peculiar place where every daily detail ends up being extremely curious for its visitors. This city is surrounded by myths and legends, with a past characterized by luxurious palaces and emperors of divine descent.



Communism is still very present in Beijing, which is why many of its citizens still remember with some nostalgia the time ruled by Chairman Mao, so they pay homage to him in the mausoleum that is located in Tiananmen, which is the largest square in the world. .

Beijing is definitely one of the most populous cities on the planet, but it is much more than traditional houses, tall skyscrapers, small temples and red lanterns. So we are going to recommend the most emblematic places in the city so that you do not miss an iota of its majesty.

It is essential to visit the Great Wall, which although it is true is not exactly inside Beijing, it is an attraction that is well worth visiting since it is part of the seven Wonders of the World. It is the quintessential symbol of the People's Republic of China in the world and has been built for more than 2000 years. The legendary Great Wall of China is a World Heritage Site and was built in order to protect China along its northern border from foreign attacks. You can get there from Beijing by bus and the trip takes about an hour and a half, but it is a must-see as you are going to see the most significant engineering work in the world.



Another of the most important attractions in Beijing is visiting the Forbidden City, where you can see endless rooms that have great historical importance. The Chinese Imperial Palace was closed for centuries and after a long time it opened its doors to the public, there you can see the places where the imperial ceremonies were held, its beautiful gardens and the immense courtyards that are part of the Forbidden City.



Touring the hutongs is an experience worth living, there you can see how the most traditional community of the city lives on a daily basis. You will be able to see children playing, women washing clothes in common places and older adults playing majong, accompanied by an intense movement of cyclists and pedestrians.

One of the most beautiful places in the city is the Summer Palace, which is made up of a series of gardens and buildings of singular beauty. It was specially designed for the enjoyment of the imperial family in the hot months and we are sure it will be a pleasant experience for you.

Another of the most important buildings in the city is the Temple of Heaven and in its rooms you can discover the divine rites that the emperor carried out in order to strengthen his power on earth and the silhouette of the triple blue roof is one of the best-known emblems around of the world. On the other hand, the park that is in the Temple of Heaven offers you the opportunity to see the inhabitants of the city who gather there to dance, sing and play, being an experience of complete cultural immersion.

Although it is true that the places mentioned in advance are essential visits, if you really want to get to know Beijing you should immerse yourself in its local culture, discover its historical corners, discover its flavors and feel the rhythm of this city of 22 million inhabitants and 17,000 km^2.

To live this excellent experience you must walk through Tiananmen Square, where you can see the embalmed body of Mao in his mausoleum; counting the dragons are carved in stone on the great staircase of the Forbidden City (there are 9) in addition to visualizing each one of the details of the impressive luxury.

When you visit the Great Wall, one of the best activities you can do is go to Mutianyu, which is one of the least crowded sectors and has a cable car that at its highest station, you can have a spectacular view of the forests that are in its vicinity surroundings.

It is advisable that you discover the marble boat where Empress Cixi held her great parties. Do not be disappointed when you realize that in reality it is not exactly a ship, but rather a pavilion and that it is not built in marble, but in wood. But its spectacular beauty more than justifies the visit and we anticipate that in order to achieve that appearance that is submerged in water, mirrors capable of reflecting the waters of the lake were used.

To get to know the local cuisine you must taste the dumplings they make in the city of Xian Lao Man. You will realize that it is one of the places where the local characters go to eat the best dumplings in the city, so much so that years ago its Menu was only in Chinese, but today you can find it in various places translated into English.

Continuing with the gastronomic route, you should get lost among the lights and red lamps of Gui Jie, being a colorful and vibrant street full of restaurants, where you can have at your disposal dishes from all parts of China.

If you are interested in buying souvenirs, the recommendation is to go to the famous Nanluoguxiang street which, in addition to being completely remodeled, is full of restaurants and shops. You can even visit the surrounding hutongs, as they are completely traditional and thus you can bring together the best of both worlds.

We invite you to discover the water lilies found in Beihai Park, which are definitely part of the most beautiful and curious details of the city. On the other hand, we recommend you get to know the bohemian area of Beijing and its street art found in the 798 artistic district, eat inside a floating boat in Shichahai, live a night of music, exotic drinks and fun in Sanlitun. Finally, try the caramelized sweet thangulu fruit, which you will find in the street stalls that are scattered throughout Beijing.

113.1 About the Author

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CHAPTER

FOUR

BELFAST

Belfast is the capital of Northern Ireland, after several years of riots and armed conflicts between unionists and supporters of independence, it has managed to be reborn to become a quiet place full of tourist attractions.



In the city center you can find a large number of traditional pubs and a wonderful town hall, it is the place in Belfast where the largest number of tourists are concentrated and in the western part of the city you can find, in addition to the port, the murals that represent the conflict and the impressive Titanic Belfast museum. We are going to guide you through this article through the most emblematic places in the city, so that if you visit it you will not miss the most important thing.

114.1 Route of the murals

The worst years of the conflict between Republicans and Unionists are reflected in the murals located on Falls Road and Shankill Road. Between these two neighborhoods you can see more than 2,000 murals, among which the International Wall stands out, dedicated to an IRA prisoner who died in 1984 on a hunger strike (Bobby Sands). The Peace Wall divides both neighborhoods and as you walk through it you can see the murals on the Unionist side of Shankill Road, these represent the UK and its fighters. The most popular way to carry out this visit is by agreeing with a black taxi, since the drivers serve as a guide and stop at the best-known murals explaining the whole story.

114.2 Belfast City Council

In Donegal Square is the Town Hall, a building built at the end of the 19th century in the Edwardian style where it stands out for its white stone construction and its green domes. The other interesting places to visit in the center with similar architecture to that of the city hall are the Spiers Mall and Conference Centre, the Gothic-style Albert Memorial Clock, The Entries alleys, the Big Fish sculpture and the neoclassical Custom House.



114.3 Harland and Wolff Shipyards

The shipyard "Harland & Wolff" was where the Titanic was built between 1909 and 1912, on whose maiden voyage to New York, she sank after hitting an iceberg, killing more than 1,500 people. Recently, and after years of neglect, these shipyards were recovered, building tourist attractions around this ocean liner and modernizing the neighborhood around the shipyards. Among the attractions that stand out is the Titanic Museum where you can see interactively from its construction, until its encounter at the bottom of the sea.

In the modern neighborhood you can also find other interesting places such as the old offices of "Harland & Wolff", the yellow cranes and a steam ship from the first world war "HMS Caroline and the SS Nomadic" that was used to transport supplies. and passengers to the Titanic.



114.4 Historic pubs

Among the most emblematic and historical pubs in the city is The Crown Liquor Saloon built at the end of the 19th century and in the Victorian style. This pub falls in love at first sight with its decoration made by Italian craftsmen with carved wood, gas lamps, private sections, tiles and stained glass, which make it a truly beautiful place.

Another of the most famous is the oldest tavern in Belfast, opened in 1630 and named "White's Tavern". There you can enjoy an excellent Irish stew with live music and accompanied by a Guinness. You can also check out other traditional pubs like Kelly's Cellar, McHugh, Robinson's Bar, The Perch and Duke of York.

114.5 Queen's University Belfast

This university is a Victorian-style jewel founded in 1845 and opened in 1849, it stands out for the incredible central building named Lanyon and its beautiful gardens. Inside you can see large rooms such as the library and a beautiful cloister.



Picture taken by William Murphy

114.6 Botanical Garden

The Botanical Garden is located next to the University and one of the great lungs of the city. You can enjoy a pleasant walk through its paths, find a rose garden, a pond and the most interesting place is the greenhouse called La Casa de las Palmeras, built with curvilinear architecture and inside it houses a large number of plants from different parts of the world. Later you can complete the visit by entering the Ulster Museum where you can find the history of the Northern Ireland Conflict, the Girona Frigate (one of the ships of the Invincible Armada), see an Egyptian mummy sarcophagus and dinosaur skeletons.

114.7 St Anne's Cathedral

The Santa Anna Cathedral was built at the beginning of the 20th century and one of its peculiarities is that it serves two different types of dioceses, it has excellent acoustics and inside you will find excellent carvings, mosaics, a Celtic cross, the monument to Edward Carson (Unionist) and a large pipe organ. Outside you can see the sculpted pediment, a large portico and the so-called "Aguja de la Esperanza". On the other hand, the neighborhood that surrounds the cathedral has an excellent nightlife with its many pubs and also many graffiti representing urban art.

114.8 Belfast Castle

Belfast Castle was built from sandstone in 1870 and is currently owned by the city council. At the back of its exterior you will see a beautiful staircase and when you enter you can walk through its perfectly neglected gardens. Although it is true that the building looks more like a Scottish mansion than a castle, it is still worth seeing.

114.9 St George's Market

St. George's Market is a Victorian-style covered market built in red brick in 1890 and its glass roof is truly impressive. It houses more than 200 stalls where you will find all kinds of antiques, clothing, fish, local crafts, food, plants and quality products, you can also listen to live music or eat their traditional dishes.

114.10 Giants Causeway

The Giants Causeway is located 60 miles from Belfast on the north coast, it was declared a World Heritage Site and is one of the most incredible places in Ireland. The landscape dates back 60 million years and seems from another planet, with the formation of impressive basalt columns from the rapid cooling of lava produced by a nearby crater. You can also see other impressive places that are in this area, such as the Carrick-a-Rede suspension bridge and Dunluce Castle.



Belfast is an impressive city full of history and with beautiful places that are really worth knowing.

114.11 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

FIVE

BOGOTA

This city located at more than 2600 meters of altitude is the largest in Colombia and its capital. Its people are very cheerful and have a mix between tradition and modernity. There are many interesting activities to do in Bogotá, among which are enjoying its street art, getting carried away by good music and rhythm or strolling through the La Candelaria neighbourhood.



One of the advantages of traveling to Colombia is how affordable it is for a tourist, both accommodation and food, it is not difficult to find good hotels for options that range between 10 and 20 dollars per person.

By means of the following list you will be able to know which are the most emblematic places and that you cannot miss seeing in Bogotá.

115.1 Monserrate Hill

The Monserrate Hill offers you one of the best views of the city, it is located at 3152 m high and also has magnificent restaurants as well as incredible viewpoints, in its upper part is the Basilica of the Lord of Monserrate, which is an important place for pilgrimage since colonial times. You can also go to the artisan market, and then walk the path of the cross and discover the hummingbirds that fly between the branches of the trees.

To get to Monserrate you can walk up for about an hour or take the cable car, thus avoiding altitude sickness.

115.2 The Candelaria

The Candelaria is the most famous neighborhood in Bogotá and is located in the historic center, where you can see the colonial houses with their colorful facades that are found in its narrow and cobbled streets. You can also find shops full of crafts and souvenirs in its shopping streets, among which Calle Real stands out, which is its most emblematic street, 10, 11 and the Calle del Divorcio.



In this neighborhood you can try the local gastronomy such as the delicious tamale, the ajiaco or the patacones in two of the best restaurants such as Gato Gris or La Puerta Falsa and try the wafers with arequipe in one of the street stalls.

115.3 The Gold Museum

This museum is considered among the 25 best in the world with more than 34,000 pieces of gold work where almost all are gold, 25,000 pieces of ceramics, shell, stone, textiles and bone, among which the Poporo Quimbaya stands out and the piece that generated the Legend of El Dorado, the Raft Muisca is a small gold raft that was used in the Guatavita lagoon for the coronation of the cacique.

115.4 Funnel Alley

This is the most beautiful alley in La Candelaria where the best street art murals are concentrated, especially that of the face of an indigenous woman. In the old houses on this street you can find many bars where you can try the traditional arepas or buy a souvenir in any of its stores. At the end of this street is the Plaza del Chorro de Quevedo, where you can see various graffiti and in the evenings it is filled with an excellent atmosphere.



115.5 Bolivar Square

This square is located in the heart of the old town, being the meeting point between Bogota citizens and tourists. Some of the most important buildings in Bogotá are concentrated there, such as the Palace of Justice, the Primate Cathedral, the Liévano Palace (headquarters of the city council) and the National Capitol.

The Cathedral was built between 1807 and 1823 in a neoclassical style. It is worth seeing the statue of Simón Bolívar who was a character who made Colombia and several Latin American countries independent.



115.6 Botero Museum

The renowned Colombian sculptor and painter Fernando Botero endowed this museum with more than 100 of his works, where the exuberance of voluminous bodies is shown. But you can also find other works by great masters such as Salvador Dalí, Picasso, Joan Miró, Klimt or Monet.

115.7 Church of San Francisco

The Church of San Francisco is the oldest in the city, it was built between 1550 and 1595. Inside you will find several chapels and an impressive main altarpiece in the Renaissance style, which will simply leave you very impressed.

115.8 Journalists' Park

The Gabriel García Márquez park or also called the Journalists' Park is located in the neighborhood of Las Nieves and in a place where writers, journalists and poets met in the 1960s, since the main media met in the surroundings.

115.9 Santa Clara Church Museum

The Santa Clara Museum is one of the colonial jewels and is located in the Royal Convent of Santa Clara. This baroque-style church was built in 1647 and it was not until 1983 that it became a museum for all Colombians. You will be left with your mouth open as soon as you enter its interior, the decoration of baroque-style wood carvings, sculptures, oil paintings, murals, Mudejar latticework, the ceiling decorated with wooden flowers, the Crypt, the Main Altarpiece and the Sacristy, they are a masterpiece.

115.10 Have a few drinks in the T Zone

Zona T or Zona Rosa is one of the places with the most atmosphere in Bogotá, it is located north of the city. You will be able to see a large number of restaurants, shops, bars and nightclubs to party until your body lasts, enjoy a night of drinks until dawn.

115.11 Usaquen neighborhood

In ancient times it was a town made up of beautiful colonial houses and today it has been integrated into the city. In the main square you will realize that the past is still very present and there you will find the beautiful church of Santa Bárbara. It is a quiet town to have a good beer, eat in one of its restaurants or stroll through the stalls of the Flea Market.

It is recommended to have some delicious craft beers in one of the bars of the Bogotá Beer Company (BBC) chain that you can find throughout the city and, of course, also in Usaquén.

115.12 Tours in Bogota

It is advisable to take one of the excursions that last one day to one of the wonderful sites that are near the city, such as the Guavita Lagoon, the Salt Cathedral, which is a religious site that is located inside a salt mine. or Villa de Leyva.

Bogotá is a city where you can get unforgettable experiences!

115.13 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

SIX

BRASILIA

Brasilia has been the capital of Brazil since 1960 and has become an important urban landmark, for which it was declared by UNESCO in 1987 as Cultural Heritage of Humanity. The renowned architect Oscar Niemeyer was one of the main artists who collaborated in the design of this city and that is why many buildings bear his stamp. It is a minimalist, modern and elegant city, perfectly planned from the beginning and with much to offer. We will give you a guide to the most important places you should visit if you go to the capital of Brazil.



116.1 Brasilia Cathedral

The impressive Nossa Senhora Aparecida Metropolitan Cathedral is one of the designs of Oscar Niemeyer, who managed to complete this true work of art in 1970. This large hyperboloid structure is built of concrete and its glass roof seems to rise into the open sky. This cathedral is considered one of the architectural wonders of the world and every year receives thousands of travelers from all over the world. Both outside and inside, this cathedral will leave you speechless.



116.2 Planalto Palace

The Planalto Palace is where the executive power of the Brazilian federal government resides. The building was also designed by Oscar Niemeyer and is located in the Square of The Three Powers and this building represents an avant-garde vision of architecture, part of its decoration includes Brazilian furniture in the modernist style of the 60s.

On the first floor you will find a reception area and you will be able to admire some of its exhibitions related to the federal government. The second floor is where the signing of decrees and legislative norms is presided over; on the

third floor is the Presidential Cabinet and the rest of the offices of his senior team, while on the fourth floor are the offices that belong to the high government. This place is completely open to the public on Sundays from 9 am to 2 pm.



116.3 Paranoia Lake

The Paranoia Lake is an immense 80 km artificial lake that was created parallel to the construction of the city and the dammed waters of the Paranoia River were used. On the shore of the lake you can find several restaurants that offer you both local food and international fusion dishes. But it also has artificial beaches such as Piscinão do Lago Norte and Prainha, in addition to being able to bathe in an artificial beach, there are also plenty of activity offers in which you can sign up.

116.4 Juscelino Kubitschek Bridge

This bridge crosses Lake Paranoá and has a length of approximately 720 meters. It has been awarded for its great architectural beauty, obtaining awards for being the most beautiful bridge in the world. It was designed by the architect Alexandre Chan and the structural manager was the engineer Mario Vila and thanks to this work they were world renowned, in addition to a large number of distinctions. The name of the bridge was chosen to honor the former president of Brazil who decided to build Brasilia and make it the capital of this beautiful country.

116.5 Honestino Guimarães National Museum

The Honestino Guimarães National Museum is another magnificent work within this capital, its perfect hemispherical shape, its minimalist expression and a prominent ramp, give this architectural marvel a surreal character, where the architect Oscar Niemeyer once again shows his style in this design. This museum and the Leonel de Moura Brizola National Library are the representation of the largest cultural complex in the country and inside the museum, you can find a large number of excellent art exhibitions where you can admire wonderful works.



116.6 Pantheon Tancredo Neves

The Pantheon of the Fatherland and of Liberty Tancredo Neves pays homage to those Brazilian heroes who fought for freedom and democracy. The pantheon is shaped like a dove, it has an area of 2,105 m^2 and on its exterior you will find a burning flame to represent the independence of the country and the freedom of its inhabitants. Although it is true that the three-story building has the name of pantheon, inside it there is no tomb of the honorees.

116.7 TV Tower

After crossing the Juscelino Kubitschek bridge you will find the Brasilia TV Tower with radio and television broadcasting antennas, it was inaugurated in 1967 and designed by the architect Lúcio Costa, who was inspired by the Eiffel Tower. The recommendation is to visit it on Sundays, since around you can find hundreds of craft vendors and street food stalls, with the Fountain Square and the craft fair being one of its main attractions. You can also have excellent panoramic views from its viewpoint at 75 m high and it is important to see the sculpture "Space Age" made by Alexandre Wakenwith, which is definitely a marvel.

116.8 Square of the Three Powers

Square of the Three Powers is a real visual delight because from an aesthetic point of view it is a very artistic place, all adorned with sculptures. Around it are the headquarters of the Executive Power, Legislative Power, Judicial Power (hence the name of the Square of the Three Powers) and the most significant buildings of Oscar Niemeyer.

116.9 South Lake Jetty

In Pantalán del Lago Sur you can try the best cuisine in Brazil, it has a wide variety of restaurants where you can try the delicious local food. At nightfall, you will be able to witness a beautiful view of Paranoá Lake.

116.10 Sanctuary Don Bosco

The Don Bosco Sanctuary appears on hundreds of postcards as its beauty is unparalleled, it was built between 1963 and 1970 as an initiative between the federal government and the Salesian Congregation. This place was built as a tribute to Saint John Belchior Bosco who is the patron saint of Brasilia and is considered by the International Bureau of Cultural Capitals as one of the seven wonders of Brazil in 2008, so it is an essential place to visit in this city. Brasilia is one of the most modern and planned cities in the world by the best architects and engineers in the country, full of buildings with great architectural beauty and many beautiful places to visit.

116.11 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

SEVEN

BRISBANE

Right this moment while you're just checking out the title of this article and wonder what is it about, I'll take you all over the beautiful modern city of Brisbane in Australia! This specific city holds a great deal to me since my friend John is from there, and he's officially my favorite Australian friend and can't say that will be easy to beat!

A modern, high built and filled with many stuff that you can do, the capital of the state of Queensland, Brisbane, is located in land from Moreton Bay between the Sunshine Coast and the Gold Coast.

Queensland is Australia's Sunshine State and enjoys a subtropical climate with hot, humid summers and warm, sunny winters. In Brisbane, any time of year is a good time for adventurous outdoor activities along the river or coast. Experience the more relaxing side of Brisbane in the parklands, museums and bars.

"Brissie" still has the laid-back country feel that is so iconic for the land Down Under. However, it is Australia's third-largest city, houses over two million people, and is growing fast.

Start your tour of the city on Brisbane's biggest hill. Mount Coot-tha and while you are here, explore the wonders of the Southern Hemisphere in the Planetarium and Brisbane Botanical Gardens… including the laughing kookaburra. Feed lorikeets and see iconic Australian wildlife at the nearby Lone Pine Koala Sanctuary. Meet kangaroos, koalas and wombats and don't miss the animal shows, which demonstrate some real Aussie traditions!

Down river, in the central business district, the Queen Street Mall displays all the country's big retail brands. Visit the nearby Brisbane Museum to learn about the mining boom and other events that shaped this city. Exhibits show how World Expo '88 led to the transformation of the river's southern bank, the city's favorite backyard, which even has its own beach!

Spacious South Bank has many free activities and facilities which attract more than 10 million people every year. Cool off in a lagoon or browse the weekend markets. Join the locals for a beer, or visit one of the many prominent museums and theaters.

The Wheel of Brisbane overlooks the Cultural Forecourt, a collection of Queensland's major museums and theaters. Meet some prehistoric creatures, admire indigenous and European modern art or see a show at the Performing Arts Center. From the piers at South Bank, take the public ferry downstream to Newfarm Park, where the restored Powerhouse has become a real institution among art and music lovers.

On your way back, hop off at Kangaroo point to climb the Story Bridge: One of the best spots to watch the sun set over the city. Book your guided tour for midafternoon, because nightfall comes early in Queensland.

Get an early start and jump on the ferry to Moreton Island for a fun day out on the beach. Join a Segway tour along the shore before surfing down a massive sand dune. On a hot day, snorkel around the Tangalooma wrecks, or if you rather stay high and dry, book a helicopter ride instead. Flying over the bay and the Coral Sea, it is clear that Queensland's natural beauty merely starts in Brisbane.

I myself am a whisky and jazz bar kind of guy so I'd be so happy with places like Cobbler and Gresham.

In 2015, a competition by travel guidebook Rough Guides saw Brisbane elected as one of the top ten most beautiful cities in the world, citing reasons such as "its winning combination of high-rise modern architecture, lush green spaces

and the enormous Brisbane River that snakes its way through the center before emptying itself into the azure Moreton Bay".

In 2019 it was named by travel insurance site InsureMyTrip as one of the world's top three cities to visit as a senior citizen. And I bet it still is!

117.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through UpWork.

CHAPTER

EIGHT

BRUSSELS

Brussels is the capital of Belgium, a laid-back city packed with interesting museums, historic buildings, well-kept parks, and famous for craft beer, waffles, chocolate, and the Grand Place, which is considered one of the most beautiful squares in the world.



If you plan to travel to Brussels, we are going to indicate in this article the most important places in the city that you cannot miss.

118.1 Grand Place

The historic center of Brussels is located around the Grand Place, which was declared a UNESCO World Heritage Site. This square is surrounded by fantastic sites such as the Casa del Rey, where the City Museum is located and was the residence of the kings, the Le Pigeon house where the famous writer Victor Hugo lived, a set of neoclassical sites such as Maison des Ducs de Brabant, the guild headquarters of Le Cornet, Le Renard and Le Roy d'Espagne where it is currently the most famous bar in the square, a perfect place to drink a good Belgian beer while enjoying the view of the square from your terrace. Although the most impressive building is the Hotel de Ville, which dates back to the 15th century, it is currently the Town Hall and stands out for its tower that is more than 96 m high.



118.2 Saint-Hubert Galleries

Legend has it that if you touch the arm of the Everad´t Serclaes statue that is located to the left of the Town Hall, you will have very good luck and then you can go to the Saint Hubert Galleries. This complex is made up of three galleries, the King's Gallery, the Queen's Gallery and the Prince's Gallery, they are the first commercial galleries in all of Europe and the meeting point for artists, where you can see their magnificent glass vaults intermingled with cast iron, which give a unique charm to its 200 meters of extension. Filled with luxury shops, jewelry stores, chocolate shops and their terraces, where you can savor a delicious coffee.

118.3 Manneken Pis

The Manneken Pis is a small statue of a urinating boy made of bronze and is one of the icons of the city, one of the curiosities of this statue is that it is dressed in different costumes and believe it or not, it has a wardrobe of more of 800 garments. Depending on the celebration, they put on a certain clothing and fill the fountain with beer or another type of drink.

118.4 Brussels Cinquantenaire Park

This park occupies more than 30 hectares of the European quarter and is presided over by the Cinquantenaire Palace, which highlights its triumphal arch culminating in a bronze chariot. It is also worth visiting the automobile museum and going up to the viewpoint that is located in the Museum of Military History.



118.5 Atomium

The Atomium is a symbol that represents an atom enlarged 165 million times, with a height of more than 100 meters and in one of its spheres, you will find a restaurant where you can enjoy one of the best panoramic views of the city.



118.6 Palace of Justice

The Palace of Justice is one of the largest buildings in Europe with a height of 104 meters and an area of 26,000 square meters. On its façade you can see neoclassical and neo-baroque elements and inside, it has a very impressive hall with more than 100 m in height.

118.7 Sablon Quarter

In this neighborhood there are several tourist attractions starting with the beautiful garden of Place du Petit Sablon, it is a square surrounded by 48 golden statues and every Sunday the antique market is installed. The other interesting site in this area is the Notre Dame du Sablon Church in the Gothic style and was built in the fifteenth century, you can see its carved wooden pulpit and beautiful stained glass windows. Around the neighborhood you will find exclusive shops, cafes, antique shops and chocolate shops. In this area you can also try typical Belgian dishes such as braised meat and mussels with fries, the recommendation is to go to one of the best restaurants in Brussels called C'est Bon C'est Belge.

118.8 Royal Park of Brussels

This 18th-century French-style park features several ponds, sculptures, small woods, fountains and gardens, to be enjoyed by the Belgians who gather there on weekends. Nearby is the Museum of Musical Instruments, the curious Old England building and the Royal Palace, which was the residence of the Belgian kings for a long time. Inside you can see a large white marble staircase and several interesting rooms such as the Hall of Mirrors, the Goya room and the Throne room.

118.9 Saint Michael and Saint Gudula Cathedral

The Cathedral of Saint Michael and Saint Gudula is the most important Catholic church in Belgium and the scene of coronations and royal weddings. In the Gothic style, its interior has a baroque pulpit carved in wood, a splendid organ and large and impressive stained glass windows.

118.10 Comic book route

Great comic book authors such as Peyo (The Smurfs) and Hergé (Tintin) were born in this city and the comic route that includes this type of museum is one of the great attractions of Brussels. On the route you can see murals of the most famous comics such as Asterix and Óbelix, Lucky Luke, Tintin, among others.

118.11 The European Quarter

The main institutions of the European Union are concentrated in the European Quarter, including the European Parliament, the official headquarters of the European Commission, which is the Belayrmont building, the Justus where the Council of the European Union is located, and a piece of the Berlin wall, you can finish with a nice walk through Leopold Park.



118.12 Mini Europe

This park offers you a miniature Europe, with more than 350 models that represent the most famous monuments in Europe, including Big Ben, the Eiffel Tower, La Grand Place and the Cathedral of Santiago de Compostela, they are made taking care of even the smallest detail at a scale of 1:25, including certain moving elements that increase its realism.

118.13 The Sacred Heart Basilica

This basilica was built in 1905 to commemorate the 75th anniversary of independence from Belgium, it is the fifth largest church on the planet with 89 m high and 167 m long. In the Art Deco style, it has a large green dome and two circular towers, its stained glass windows made by renowned Belgian masters stand out and if you go up to the terrace, you can enjoy one of the best views of the city.

Brussels is an impressive, cosmopolitan capital loaded with impressive places to visit.

118.14 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

NINE

BUCARAMANGA

Bucaramanga is a city in Colombia and the capital of the department of Santander, it has a pleasant climate, warm people, many parks and gardens. We will give you a guide to the best things you can do in Bucaramanga, so you don't miss the most emblematic sites and have a maximum experience in this beautiful city.



119.1 Visit the cathedral

The Sagrada Familia Cathedral is the most important and well-known religious temple in Bucaramanga, it has views of Santander Park, which in turn is immersed in the historic center of the city. On the outside it stands out with its bright white facade, while its interior is beautifully ornate, when illuminated at night it becomes a striking landmark.



119.2 Stroll through the botanical garden

This city is famous for its green spaces, among which is the extensive Eloy Valenzuela Botanical Garden that measures approximately 75,000 m^2, where you can find a beautiful lake, beautiful gardens and forests with well-maintained trails, various animals including iguanas and ducks. To give you an idea, the botanical garden is home to some 3,500 species of native plants including palm trees and orchids, it is the perfect place to escape a little from the city noise.

119.3 The Hill of the Holy

The Hill of the Holy is located in an urban area called Floridablanca that borders Bucaramanga and has a huge statue of Jesus that is approximately 40 meters tall. You can climb to the top by cable car and then ascend to the viewpoint that remains at the head of the statue. From that point the landscape is really special and you will realize that the statue is equally impressive.



119.4 The Total Book House

The Total Book House is a unique cultural center that is located in one of the corners of the García Rovira park, where you can find a whole repository of chronicles and stories about the Santander region, as well as an exhaustive catalog of books in its multiple computers. You can also see conferences, art exhibitions and musical performances, it is worth visiting the stay even if it is to have a hot drink in its extensive outdoor cafe.

119.5 Parks and gardens

Bucaramanga is also known as the beautiful city for its large number of green spaces, parks and gardens. Although it is true that there is a wide range of green spaces in the city, the recommendation is to visit the La Flora Ecological Park located within a long and deep valley, it is a large space full of birds and far from the noise of the city.

119.6 Experience the local dishes in Cabrón

Santander has an interesting culinary history that is different from the rest of the regions of Colombia. There are a large number of restaurants to taste the local gastronomy, but without a doubt the best is Cabrón. There you can eat typical dishes that include aired meat, kid served with entrails and blood rice that is much more appetizing than it seems, among other delicious dishes.

119.7 The House of Bolivar Museum

There is probably no other historical character on the face of the earth who has more museums in the places where he once was than Simón Bolívar and Bucaramanga is no exception. The Liberator of South America lived for a couple of months in this old and beautiful colonial house in 1828 and it is currently a museum dedicated to regional history. There you will also find some Guane indigenous mummies, paintings, weapons and other important historical objects.

119.8 Bucaramanga Water Park

The Bucaramanga Water Park is located in the Metropolitan Aqueduct of Bucaramanga. In this site that measures approximately 3.6 hectares education is combined with fun, you can cross paths decorated with fern gardens where you will find waterfalls, fountains, wells, where turtles and fish live.

Since its inception, the treatment plant known as “Gracias Morrorico” was the center of attraction in the 1930s for the inhabitants of Bucaramanga, since in addition to providing drinking water, the locals used it as a recreational area.

119.9 Museum of Modern Art

The Museum of Modern Art in Bucaramanga has a large collection of prestigious Colombian artists and was opened in 1989. The room has a terrace where workshops are held, two exhibition rooms and a sculpture patio, where you can admire works such as Custodia Mayor Nº2 by Ricardo Gómez Vanegas and Memorias de Machu Pichu by Eduardo Ramírez Villamizar, among many other works by famous artists.

119.10 House Luis Peru de la Croix

House Luis Peru de la Croix also known for a time as the "Casa Mutis", was completed in 1778 by order of Manuel Mutis Bossio and is located on the corner of Parque Custodio García Rovira. It is one of the few buildings preserved in the city from the colonial era and is witness to a large number of events in the history of Bucaramanga.

119.11 Paragliding

Paragliding is usually a very popular tourist activity throughout the department of Santander and of course, it is not very different in Bucaramanga, since the region has the perfect climate for flights throughout the year. The small city of Ruitoque, which is a short drive from Bucaramanga, is one of the perfect places for paragliding flights and offers impressive views of the city.

119.12 Visit the Patrimonial Town of Giron

San Juan de Girón, is located just 9 kilometers from the center of Bucaramanga and is ideal for a day trip and escape from the hustle and bustle of the city. This town of beautiful cobbled streets has almost 15 years of history, the architecture of its houses and the whole town will make you feel that you are in another era.

119.13 Chicamocha Bucaramanga National Park

The Chicamocha Bucaramanga National Park also known as Panachi, is located along the Chicamocha Canyon, which is about 50 km from Bucaramanga. It is a tourist attraction thanks to its spectacular scenery and the large number of outdoor activities offered in this park, such as caving, camping, kayaking, fishing, paragliding, mountaineering, rafting, etc.

It is a paradise both for lovers of extreme sports and for those who just want to enjoy nature and walk along paths with beautiful landscapes. The park has a cable car that crosses the Chicamocha Canyon, but it also offers cultural activities in the Customs Square, the Guane Museum and the Exhibition Hall. You can also have fun in its go-kart circuit, the skating rink, see goats, ostriches and a viewpoint at the highest point of the canyon with a spectacular panoramic view.



Bucaramanga is a city with a great tourist offer that you cannot miss!

119.14 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

BUCHAREST

Bucharest is the capital of Romania and it is a city full of contrasts where you can go from a wide Boulevard with monumental and modern buildings, to a street that could perfectly belong to the Europe of four decades ago. To understand this city you must understand something of its history and that of Romania. It is a very young country with only a century of existence and was the bastion of Europe when it came to avoiding the conquest and spread of the Ottoman Empire, it also suffered from world wars. It currently has incredible tourist potential and in this article we will guide you to discover the most important sites in the Romanian capital.

120.1 Bucharest Patriarchal Cathedral

In this cathedral is the seat where the patriarch of the Orthodox Church resides. The tranquility that it transmits is impressive, unlike many Catholic cathedrals and the place is located a few meters from one of the noisiest and largest avenues in the city. Around the cathedral there are a set of buildings but without taking away the prominence of the temple, yes, the buildings that surround it are all of the same color harmonizing the set and you will be able to observe that both the cathedral, the chapels to pray, the patriarchal palace and all their rites are very different from the Catholic ones. The iconography is totally flat and in the form of a mosaic and the candles in front of the religious images also exist, but outside the cathedral, it is worth living this completely different religious experience.



120.2 Uniri Square

Unirii Square offers you a whole light and sound show at night through a large fountain that is located on the side of the square, being one of the most neuralgic points of the city next to Victoria Street, which is another of the great axes that articulate the city. In this square you can see the lights of large neon signs promoting commercial brands and besides being the largest in Bucharest, it is the intersection point between sectors 1, 2, 3 and 4. You should know that the city is divided in six sectors scattered around the Old town in a clockwise direction and it is the area where most of the bus routes for the entire city leave and it also has a metro stop.

The Old Town is impressive to see both during the day and at night, strolling through its photogenic streets is truly a delight!

120.3 Stravopoleos Monastery

The Stravopoleos Monastery is one of the true jewels of Bucharest, it is also located in the Old Town and is an Orthodox convent for nuns, just as the patriarchal cathedral is a haven of peace adjacent to one of the busiest streets in the center . The church was built in the Brâncovenesc style, which is like the Renaissance style of the Romanian version, but only the church remains of the original building, as the rest have been remodeled throughout history. The complex includes a 20th-century library, but inside the church you can see the beautiful cloister with its inner courtyard and its façade that stands out for its colors and neoclassical Byzantine frescoes.



The community of nuns have a routine worship where they renew old books, priestly clothes and icons and you can see the church choir singing Byzantine music.

120.4 Macca–Vilacrosse Passage

The Macca-Vilacrosse passage has been changing its purpose over time, at first it was the Bucharest Stock Exchange, then it was the National Bank, then it was a hotel and finally it became a place of leisure for tourists. tourists, so that today it is an area of galleries since the mid-nineteenth century, where you can find a spectacular place full of cafes and restaurants, which you can visit both day and night.



120.5 Revolution Square

Revolution Square is the site with the highest concentration of statues and buildings that will help you understand the recent history of Romania. Nicolae Ceaușescu gave his famous speeches from the balcony of the former Palace of Parliament, currently the seat of the Ministry of the Interior. The secret police building is another of the symbols that remain from the communist era and to remember this historical moment, there are two busts where one of them is cut in two and represent the leaders of historical parties that were imprisoned in the communist period . A monument is also erected in this square to remember the victims of the revolts in Romania in 1989.

Other prominent sites in the square include the Orthodox Church, the statue of King Carol I, the Romanian Art Museum, the University Library and the luxurious Athénée Palace hotel.

120.6 Athenaeum

The Bucharest Athenaeum, due to its neoclassical style, is another of the buildings for which many people think that Bucharest is similar to a miniature Paris, although it is a place closed to the public, it is the headquarters of the Philharmonic Orchestra and if the day you decide knowing him they are rehearsing, you will not be able to enter. The recommendation is that you inform yourself beforehand so as not to coincide with the rehearsals and to be able to see its interior. It has a round floor plan, Roman elements, the lobby is made of Carrara marble, an auditorium whose dome is decorated with pictorial works and you can enjoy the beautiful views of the city from its terrace.

120.7 Arch of Triumph

The Arch of Triumph is a replica very similar to the one in Paris, but not only the arch but also the roundabout where it is located, since it is surrounded by large avenues. This arch has smaller dimensions than the one in the French capital, it is 27 meters high compared to the 50 meters of the one in Paris and with fewer statues that represent the battles won. The new and the old Romania are represented by two coats of arms and the arch was inaugurated in 1936.



120.8 Where to eat and go out at night in Bucharest

In the Romanian capital you can find many lively places to dine and have a cocktail, in the old town you will find endless options at reasonable prices, restaurants and bars, among which are the Sky Bar, El Fratelli which is the premium club in Bucharest or enjoy a Spritz where you can see the city from above, the Nomad is divided into several areas with different environments, where you can snack on salads, mini hamburgers, noodles, etc. and combine them with a good cocktail, a wine or a beer, while listening to good music in any of its environments.

Bucharest is a city full of contrasts in every way, with interesting buildings to discover, as well as its parks, cafes and bookstores full of life.

120.9 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

ONE

BUDAPEST

Budapest is the capital of Hungary and is made up of the union of two cities, Buda and Pest, which are separated by the Danube River. Also known as the pearl of the Danube, this city is surrounded by historical monuments and imposing buildings such as the Parliament and the Chain Bridge, as well as well-kept parks, historic cafes and fantastic spas.



We will give you a guide to the most important sites that the city offers you, so that if you visit it, do not miss these experiences.

121.1 Budapest Parliament

The Parliament is one of the emblematic sites of the city that impresses with its neo-Gothic façade, its interior is decorated with marble and gold, its most outstanding sites being the main staircase, the Old Upper Chamber and where the crown of Saint Stephen is kept (his most precious treasure) which is in the Dome Room.



Leaving the parliament you can go to see the monument Shoes on the Danube, which was built in memory of the Jews killed during the Second World War.

121.2 Chain bridge

The Chain Bridge is one of the most beautiful in the world, presided over by two lions and unites the Buda and Pest districts. You can get the best views of the bridge from the bank of the Pest where there is a place with benches to sit, if you go at night you can see the Buda castle and the illuminated bridge, it is quite an experience.



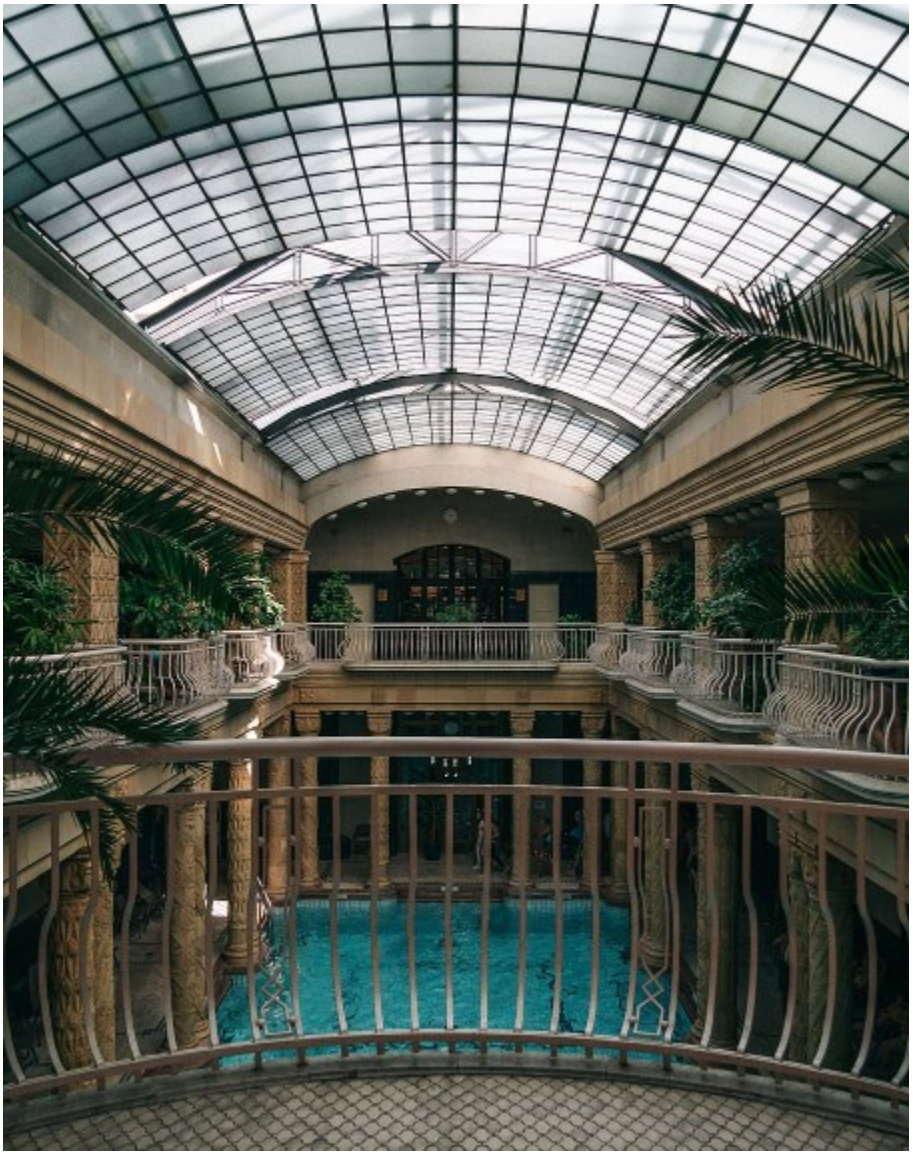
121.3 Vaci Utca

The Vaci Utca pedestrian street is the most popular and commercial in the city, it begins in the beautiful Vorosmarty square where you will always see a good atmosphere and several places to have a drink. You can also buy a cupcake at the famous Gerbeaud Patisserie and browse the shops until you reach the Central Market, which is the largest covered market in Hungary and has plenty of stalls selling fresh local produce.

At sunset you can go to see the sunset on the Liberty Bridge, where you will have one of the best views of the Danube.

121.4 Gellert Spa

Crossing the Liberty Bridge you will arrive at the Gellert Hotel and its spa is considered one of the most beautiful in the world. It is impressive to see its spectacular swimming pool surrounded by statues and marble columns in the classic style. In addition to the pool you can enjoy its thermal baths, saunas and massages.



121.5 Historic cafes

The Café Central was a meeting place for writers, poets and intellectuals and its decoration recalls those golden times at the beginning of the 20th century, where you can order a coffee or a chocolate accompanied by a delicious cake.

Inside the Boscolo Budapest hotel is another of the most beautiful historic cafes called New York Café, although it is true that the cafe is excessively expensive, it is worth going in to see the decoration with large lamps and frescoes that will transport you to the luxury of times past.

121.6 Jewish quarter

The Jewish quarter was the former ghetto where the Jewish community was kept in deplorable conditions during the Nazi occupation. The Great Synagogue of Budapest is the most important site in the neighborhood, being the second largest synagogue in the world, just behind it is the Tree of Life where thousands of leaves hang that contain the names of the Jews killed in World War II.

121.7 Ruins bars

The ruins bars are sites abandoned during the Nazi occupation and these ruins were rented or bought by young people, transforming them with recycled materials and obtaining a completely original decoration.

The Ruin Bar Koleves is one of the best places to taste typical Hungarian dishes such as knuckle, duck or the famous goulash. The other most famous are the Dürer Kert, the Mazel Tov, the Instant and the Szimpla Kert which was a pioneer and is the most famous of the ruin bars.

121.8 St. Stephen's Basilica

The Basilica of Saint Stephen is a huge neoclassical-style temple with a capacity of up to 8,500 people, it is dedicated to the first King of Hungary, Saint Stephen, and inside you can see the right hand of the king that is kept as a relic, numerous works of art and the largest bell in the country. We recommend taking the elevator up to the south tower for excellent views of the city.

121.9 Budapest Opera

The iconic Opera House is housed in a neo-Renaissance building that stands out for its beautiful façade that contains 16 sculptures of the most important composers and musicians in the country. Inside it is decorated with works of art and period furniture. A good option is to buy a ticket and get to see an opera or ballet show, so you can fully enjoy all its magnificence.

121.10 Andrassy Avenue

Andrassy Avenue joins the Heroes' Square with the center and this road of approximately 2 and a half km was declared by UNESCO as a World Heritage Site, for its beautiful facades and its Renaissance palaces, it stands out especially for the Drechsler Palace.

Walking along the avenue you will find luxurious shops and the interesting House of Terror, to finish in the Heroes' Square, with its seven equestrian statues and a column with the statue of the Archangel Gabriel.

121.11 Varosliget Park

Varosliget Park is located at the back of Heroes' Square, being the most important in Budapest. You can take walks through its quiet paths surrounded by nature, skate on the ice rink (only in winter), rent a boat to travel on the lake or visit any of its interesting places such as the Vajdahunyad Castle, the Statue of the Anonymous and the Varosliget Coffee.

121.12 Szechenyi Spa

The Széchenyi Spa is also located in the Varosliget Park and is one of the largest thermal baths in Europe. You can enjoy three huge outdoor swimming pools in this neo-Gothic-style thermal complex and it is very curious in winter, when the cold air mixes with the hot water. Inside there are another 12 swimming pools and massage rooms, where you can spend a relaxing and pleasant time.

121.13 Buddha Castle

You can go up by funicular or on foot to the Buddha Castle, it was built in the 14th century and inside is the Budapest History Museum, the Hungarian National Gallery and the Széchenyi Library. In the event that you go up by funicular,

the recommendation is to go down on foot to enjoy fantastic views of the Chain Bridge, the picturesque alleys and the shops that surround it.

Budapest an interesting city to know and visit!

121.14 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

TWO

BUENOS AIRES

Buenos Aires is a city full of soccer, tango and exquisite meat. It is a city full of emotions and contrasts, where history plays an important role. It is among the 20 largest cities in the world and that is why you cannot get to Buenos Aires without meticulous planning.

The Plaza de Mayo was an important scene of the events that left their mark on the history of Argentina, where every Thursday the “Mothers of the Plaza de Mayo” meet there, who were dispossessed and lost their children during the military dictatorship. The square is full of emblematic buildings such as the metropolitan cathedral, the historic town hall and the famous Casa Rosada, which is where the executive power of Argentina resides and you can visit several of its impressive halls or the beautiful Patio de las Palmeras.



Every Sunday you can see the antiques and browse endless things to buy, going to the San Telmo Flea Market. But you can also enjoy living statues, musical performances, a large number of cafes and restaurants. But if you prefer tango, in the La Boca neighborhood you will find a very popular alley that inspired the famous tango “Caminito”, its colorful houses, its high cultural value and its tango venues make it the best place to live the experience. of the Argentine dance.

Anyone who has read Mafalda will want to take a photo next to the life-size statue of her sitting on a bench in San Telmo.

A perfect place for leisure and weekends is Parque 3 Febrero, which has an area of 40 hectares where you can find three artificial lakes where you can go boating, there is also the Buenos Aires Zoo, the botanical garden, the impressive white bridge of the Rosedal park and the Planetarium.

In the planetarium you will realize that the building is inspired by Saturn, which also has its rings and was built in 1962. There you will find interactive activities that use virtual reality, astronomy projections and travel simulators.



It is essential that you live the passion of Argentines for football, being one of the best options to go to a game in what is owned by the Boca Juniors Club, the Alberto J. Armando Stadium also known as “La bombonera”, there you can see playing renowned soccer players with a long history.

You must see the Obelisk that is located in the Plaza de la República that measures almost 70 m and was built in 1936 in commemoration of the fourth centenary of the founding of Buenos Aires.

If you like to go shopping, it is recommended that you visit the busiest shopping center in the city, the Galerias Pacifico, designed in 1888. Not only will you find international brand stores, but the building has been declared a National Historic Monument, its architecture is special by the dome that is inside where you can admire the frescoes by prestigious artists such as Antonio Berni.

You can get to any point of interest in the city using the six subway lines, it is the cheapest option to get around since each trip costs about 25 cents on the dollar.

If you want to visit the luxurious area of Buenos Aires, you should go to Recoleta, an area well known for its French-style architecture, it is even called the Argentine Paris. Luxury shops are concentrated on Alvear Avenue and there you will find the most select restaurants in the city. On this site you can also see the works of art found in the Recoleta Cemetery, inaugurated in 1822, it is full of mausoleums, pantheons with vaults and sculptures of great artistic value.

If you are a lover of reading you should visit the El Ateneo bookstore where you can lose yourself among thousands of books, it is a magical place built in the old Grand Splendid theater and still preserves all the elements of the magnificent theater, both the original railings, the curtain, the frescoes of the dome and the current cafe was the setting.



If you want to disconnect a bit, we recommend you spend a day in Tigre, which is a town about 30 km from Buenos Aires. There you can do different activities such as sailing on the Paraná River, visiting the Museum of Arts, different types of rowing tours and buying handicrafts on the Puerto de Frutos promenade.

It is a must for every tourist to taste the authentic Argentine barbecue that usually includes strips of churrasco, chorizo, chicken, black pudding, liver and other types of viscera. The meats in Argentina are of unbeatable quality.

Puerto Madero is the most modern place in the city that contrasts with the center of Buenos Aires, it is there where the highest residential towers in Argentina are found, such as the Renoir Towers that are 175 m high, and it is also a very exclusive and frequented by great personalities like Messi.

Another of the places that you cannot miss is the Teatro Colón, which is among the five best in the world both for its size, its trajectory and acoustics. This theater is on the same level as the Scala in Milan or the Vienna State Opera. It is covered by an art deco style dome and in its center hangs a chandelier that weighs just over 1 ton.

Chinatown is like being on the Asian continent but without leaving Buenos Aires and was founded after the arrival of Chinese and Taiwanese immigrants in the last decades of the 20th century. You can see at its entrance a traditional arch decorated with dragons and inside you can find restaurants and all kinds of shops with Asian import products.

It is recommended to visit the University City created in 1822 where you can enjoy the student atmosphere and the imposing columns found in the law school, you can also see that the land behind the pavilions reaches the Río de la Plata.

Finally, be sure to see the works of Frida Kahlo or Diego Rivera, as well as many of the modern Latin American painters, at the Museum of Latin American Art (MALVA). Buenos Aires is definitely a beautiful dream city, which if you have the opportunity to go will leave you with wonderful memories.

122.1 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

THREE

CARTAGENA DE INDIAS

This city is considered the beautiful girl of the Caribbean and the colonial pearl of Colombia, where you can glimpse a very colorful place, full of smells and flavors. The colonial architecture of Cartagena is mixed with authentic works of street art and music and parties filter through every corner of the city, it is the most touristic corner of the country and we are going to show you the best things to see and do in this charming town.

Cartagena was founded by the Spanish in the 16th century and is one of the most beautiful and preserved cities in America, with a history of conquerors and pirates that led it to be a true walled fort.

The recommendation is to stay in the historic center, since there are hotels or inns at a good price and you will find the best of the city in that area. It is important to take into account that the important thing about Cartagena de Indias is not precisely its great museums, monuments, viewpoints or something like that, since the best thing about the city is Cartagena itself, where you will find incomparable colonial architecture everywhere. You can get lost aimlessly through its colorful streets, beautiful perfectly preserved buildings, old churches, balconies with flowers and charming squares. But in the same way we are going to recommend the most emblematic places of the city.



The most important squares to visit are the great Plaza de la Aduana, the Plaza de Santo Domingo which has impressive

sculptures by Botero, the Plaza Bolívar, the Plaza de San Pedro Claver and the Plaza de Santa Teresa.

The Clock Tower is one of the icons of Cartagena that connects the walled city with the Getsemaní neighborhood, it is an impressive construction with a large clock that is bright yellow.



From almost anywhere in the historic center you can see the Cathedral of Cartagena de Indias, which is one of the oldest and most colorful in America, it has a large dome with shades between yellow and salmon, with a marble pulpit and a large wooden altar that it is only compared to the cathedral in Mexico.



The Getsemaní neighborhood offers you one of the most authentic versions of Cartagena where its small brightly colored houses intermingle with incredible quality murals and small art shops, it's like being in an open-air museum. But at night you can go for drinks and dance until dawn.

But if you prefer to visit or stay in a modern and very touristy neighborhood, the best is the Bocagrande neighborhood where you can see high and impressive skyscrapers, travelers stay there for its multiple services and beaches.

It is important that you take a walk along the walls towards sunset where you will find 13 km loaded with canvases, forts and bastions. Although its construction began in the 16th century (after the attacks of the pirate Francis Drake) it is one of the best preserved walls in the world and has the best sunset, you will be able to see the sunset from the terraces of two cafes integrated into the wall or drink some of the cool drinks sold by street vendors.

For a romantic experience you can take a boat ride towards the sunset, on a small cruise with dinner included in the bay of Cartagena, both excursions being very cheap.

Another of the sites that you cannot miss is the Castillo de San Felipe built in the 17th century by the Spaniards who, together with the historic center, were named by UNESCO as World Heritage Sites, and are also the largest fort in America.

Cerro de la Popa is the best place from which to contemplate the city, since it is its highest point and it has a beautiful convent where you will find a cloister worthy of admiration.

If you prefer to enjoy a beach with turquoise waters, we recommend the Barú Peninsula, which is located approximately one hour from the city center and can be reached by land, since the peninsula is linked by a bridge to the mainland. There you will find the famous and very extensive Playa Blanca beach, very frequented by tourists, with restaurants, small hotels and vendors of all kinds.

Within the peninsula there is also the Enchanted Lagoon where you can see the phenomenon of bioluminescent plankton at night, it is an amazing and beautiful experience.

If you want to take a gastronomic tour of Cartagena, it will not be precisely for lack of options, since from the most

humble restaurants, those of street food, to the most luxurious, they offer you the opportunity to try different types of dishes from both Colombia and internationally. international. But if what you prefer is a luxury restaurant, you can go to the Sofitel Legend Santa Clara and even if it's just to enjoy its impressive patio, it's worth going in for a coffee. In the Bohemia restaurant it is for generous pockets, but you can enjoy a romantic evening and live music. However, in Cuba 1940 you can enjoy Cuban music, excellent food and have a mojito to spend a pleasant evening.

If you prefer paradisiacal beaches but without so many tourists, you can take an excursion to the Islas Corales del Rosario, which is the name of an archipelago characterized by small islets with crystal clear waters and coral reefs. Although it is true that it is quite visited, people are spread out among its 28 islands and you will be able to find greater privacy.



The other possibility is to go to the islands of San Bernardo, which, although they are even further away from Cartagena, is precisely what makes them not as crowded as the Barú peninsula and even less populated than the Rosario islands. To get there you must take a transport to Santiago de Tolu and from there the boats leave for the San Bernardo archipelago, whose journey takes approximately one hour, but it is worth the trip to enjoy Eden.

Cartagena de Indias is a place to calmly savor and lose yourself in its picturesque and beautiful alleys, as well as being a more than perfect starting point to enjoy the warm and crystal clear waters of the Caribbean Sea.

123.1 About the Author

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CHAPTER

FOUR

COPENHAGEN

Copenhagen, the capital of Denmark and its most populous city, has one of the highest standards of living in the world, with the bicycle being the most common means of transport. It is a city with streets and canals surrounded by beautiful buildings with colorful facades, palaces and castles from fairy tales, relaxing parks, excellent viewpoints with fantastic views and an emblematic amusement park, which ultimately make it one of the best cities to visit in Europe.



In this article we will give you a selection of what we believe are the essential places that you should know if you visit Copenhagen.

124.1 Nyhavn

The Nyhavn is the most famous canal in the city, it was built in the 17th century for merchants to enter the city from the sea. Although it is true that for many years it was occupied by sailors and prostitutes, it is currently frequented by tourists at all hours who are amazed by the wooden boats and the colorful facades.

The atmosphere on the terraces of the restaurants and cafes in Nyhavn is incredible and cruises depart from there where you can explore a large part of the canals that are in the historic center, an experience that can give you another point of view of Copenhagen.

124.2 The little Mermaid

The sculpture of The Little Mermaid is the icon of the city, created at the beginning of the 20th century by the sculptor Eriksen on behalf of the family that owns the Carlsber brewery. This sculpture donated to the city is made of bronze and measures 1 m in height, despite having suffered several acts of vandalism, The Little Mermaid remains the most popular monument in Denmark. After your visit you can go to the fortress of Kastellet which is located very close and is one of the most preserved in Europe, in the surroundings there is also the beautiful Church of St. Alban and the Gefion fountain, which you should not miss to lose.



124.3 Christiania

The free city of Christiania is considered independent from Denmark because it is an area of Copenhagen that is self-governed by its residents. This place was occupied by several couples to have a space to enjoy with their children and it gradually became a political movement of rupture. Currently it is a commune that has approximately 1000 people and where the consumption of hashish or marijuana is allowed, yes, always with government surveillance.

Christiania is a rather curious place with its alternative atmosphere, the recommendation is to walk its main street Pusher Street where you can buy some original crafts or taste vegetarian food in a place like Morgenstedet.

124.4 Stroget Street

Stroget Street is the longest pedestrian street in Europe that goes from Radhuspladsen Square to Kongens Square, there you can find the sculpture of Hans Christian Andersen, the City Hall and other historical buildings such as the Royal Theater, as well as a large number of stores including Royal Copenhagen porcelain, the LEGO store and the Magasin du Nord shopping center, among many others. This street is also home to several of the best restaurants where you can taste traditional Danish cuisine. It is recommended to stop at the beautiful squares of Hojbro Plats, Nytorv and Grabrodretorv which is located in an adjacent street.

124.5 Rosenborg Castle

Rosenborg Castle was built in the 17th century to be the summer residence of King Christian IV. This former palace has an impressive garden and is surrounded by a water moat, with its Renaissance style this castle looks like a fairy tale.

After visiting the castle you can go to the wonderful botanical garden of Copenhagen that is right next door, it is worth walking through the park until you reach the lake shore where you can see several glass greenhouses.

If you are a lover of castles, you can visit three beautiful buildings that are near the capital, they are the castles of Kronborg, Fredensborg and Frederiksborg, all worth visiting.



124.6 Church of San Salvador

The Church of San Salvador is visible from most places in the city, in the baroque style it stands out for its spiral staircase on the outside and at its top you can get the best views of the city. After its construction, a bell tower was added, which is one of the largest in Europe. Inside, there is a three-story organ from the 17th century and its white marble altar.

124.7 Amalienborg Palace and the Marble Church

Amalienborg Palace was the official winter residence of the royal family and opposite the palace is the Marble Church. The palace is made up of four large buildings arranged around a large square, where the statue of King Frederick V is located. The recommendation is to visit the rococo-style palace around 12 noon, since at that time a Curious changing of the guard.

The Marble Church stands out for its large green dome, it has a baroque style and inside you can find a beautiful altar, baptismal fonts, various pulpits, organs and medieval reliefs.

124.8 Tivoli Gardens

Tivoli Gardens is the name of one of the oldest amusement parks in the world. There you can find roller coasters, fair games, carousels, bumper cars, shooting galleries, among many other amusements for audiences of all ages. This park was inaugurated in 1843 and also has several restaurants such as La Fragata de San Jorge, which is located inside a ship, or El Nimb, located inside an Arab-style palace, an open-air theater, and a Chinese pagoda.

124.9 Slotsholmen

Slotsholmen is a small island located near the old town and is surrounded by a beautiful canal. In addition to strolling around the canal, it is advisable to visit the most important nearby buildings such as the historic Stock Exchange building, the Danish Royal Library and Christiansborg Palace.

The old Copenhagen Stock Exchange building is one of the most beautiful in the city, with its Renaissance style and built in red brick. The element that stands out the most is its spire, which is approximately 55 m high and is made up of dragon tails that are joined in a spiral.



The Royal Danish Library is the largest that exists in the Nordic countries, it is made up of several buildings, among which the one known as Black Diamond stands out, built with black marble and glass, it is a masterpiece, it is also reflected in the water creating the look of a diamond.

Christiansborg Palace is the current seat of parliament and was built in 1928, you can visit some rooms, the most relevant being the Queen's Library.

124.10 Round Tower

The Round Tower was built in the 17th century, it stands out for its architecture and a huge spiral-shaped ramp that is inside (without any steps). From the top you can enjoy the best panoramic views of the city.

Copenhagen a beautiful city to know and visit!

124.11 About the Author

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CHAPTER

FIVE

DHARAMSHALA – AN EXQUISITE SPIRITUAL RETREAT

'**Dharamshala'- a spiritual dwelling**, is a North Indian town perched in the shadow of the Dhauladhar range in the foothills of the Himalayas. Dharamshala has everything for a perfect holiday; a destination with serene beautiful views points, retaining British flavor and colonial lifestyle, heart of Tibetan community as well as Indian spiritual traditions, is very popular hang-out destinations for both national and international tourists.

The best time to visit Dharamshala is from March to July and again from September to November. The months of December through mid-March are the coolest months, with temperature dipping to single digits.

To get to Dharamshala, you can take a domestic flight from Delhi to Ghaggal airport in Kangra. Alternatively, you could board a train that takes you to Pathankot, then hop on a toy train that chugs through a scenic route on the way to Kangra. From Kangra, you can either drive up to Dharamshala in a hired taxi or get in a public bus. You can also board a public or volvo bus and travel directly from Delhi via Chandigarh to Dharamshala.

Once you reach, you can get around Dharamshala by choosing any of the options. Public buses to and from Dharamshala station leave regularly. One can also hire auto-rickshaws and taxis for local sightseeing. Motorcycle rentals can be found in a few of the tourist booking shops in McLeod. If you love to walk, you can also explore some parts of the town on foot also.

125.1 Things to do in Dharamshala:

Spiritual healing & Meditation: Dharamshala - McLeodganj has earned a reputation in recent years, nationally and internationally, as the center for meditation and spiritual healing. There are several ashrams and yoga centers that are run by NGOs and well-known spiritual organizations. Thousands of foreigners and Indians visit Dharamshala every year for spiritual healing.

Sight Seeing: Dharamshala has a lot of attractions and natural scenery to offer; like vibrant monasteries, colorful temples, waterfalls, stunning lakes, vintage forts & museums.

- Dharamshala has magnificent and quaint monasteries that have preserved Buddhist and Tibetan culture. Some monasteries one must visit are **Tsuglagkhang Complex, Namgyal Monastery, Gyuto Monastery, Norbulingka Institute.**
- Dharamshala abodes several temples to immerse you in spirituality. Some of the must-visit temples in Dharamshala are: **Bhagsunag Temple, Kalachakra Temple, Aghanjar Mahadev Temple, Jwala Devi temple, Masroor Temple, Bajreshwari Temple, Kaleshwar Mahadev temple.**
- **Bhagsu waterfall** is one of the most beautiful locations in Dharamshala. It is peaceful, serene place and gives you a nice feel of nature throughout. **Kareri Lake** and **Dal lake** are one of the perfect spots among tourists to rejuvenate and relax; flanked by lush greenery and blooming trees.
- **HPCA Stadium :** One can also visit HPCA Stadium. While the stadium itself is beautiful, the views of snowclad peaks from the stadium galleries makes it more awesome.

Activities: There are a myriad of activities one can indulge in while holidaying in Dharamshala like paragliding, trekking, shopping in local market.

- Among various adventurous activities hosted in the area, **paragliding in Dharamshala** has become a hot favorite among tourists. **Indrunag** is the take off point for paragliding which is 4 km far from Dharamshala Main Market. Landing point is 6 km down from the take off point. The time and duration of the flight depends on actual weather condition but most of paragliding trip takes 5 to 15 minutes to reach the landing point.

  Other paragliding excursions usually take place in **Bir**, widely known as **Paragliding Capital of India**, is a small town surrounded by vast mountains on all sides which is approx. 70 kms from Dharamshala. Billing is the take off point and landing happens at Bir. Recommended to do paragliding here to revel with the silence of nature and get an aerial view of the ambience where India's first ever Paragliding World Cup was hosted in October, 2015.

- The breathtaking terrain of the rugged mountains of Dharamshala provide for a perfect platform for mountaineers, rock climbers and trekkers, who wish for some thrilling action. From easy meandering to muscle straining ascending and descending sections, trekking in Dharamshala is sure to provide you a variety of things to indulge into.

  - **Triund Trek** is one of the most popular treks near Dharamshala. Triund hill is a beautiful mountain in the Dhauladhar ranges of Dharamshala. The height of Triund peak is about 2850 m, and the hill is about a 6 km uphill walk from Upper Dharamkot. Apart from the monsoon seasons of July, August, and the peak winters of January, February, Triund trek can be done around the year.**Kareri Lake Trek** is another famous trek. It's a day's trek from the beautiful village of **Kareri**. Kareri lake is a freshwater lake that is said to have the most gorgeous sceneries. The trek distance is around 26 KM (to and fro). Other treks that can be covered are: Dharamkot or Bhagsu to Dharamshala city, trek to Bhagsu Nag waterfall, Indrahar pass trek.

- Apart from the gorgeous natural beauty, Dharamshala is quite famous for other items as well. You can buy some souvenirs and gifts from the local markets to carry the feeling and memories of Dharamshala to home with you. There are several shops and markets that sell items of Tibetan origins and commodities that are significant to the Himachali culture. Some of the items that can be bought that are unique to the area are: **Singing bowls, Buddha statues, Prayer wheels and Prayer flags, Local Tibetan handicrafts and decorative knickknacks, Jewelry, Woolen handmade clothes, Books(on Tibetan culture and Buddhism),Kangra Tea. Kotwali Bazaar** and **Jogibara Road Bazaar** are among famous markets.

Eateries and Cafes: One can find numerous food options in Dharamshala to savor and excite your taste buds and at the same time for satisfying your hunger in nominal prices. The diverse culture is clearly visible in the street food and the food being served at several cafes and restaurants here viz Tibetan, Asian, Continental cuisines are served at many cafes. One can also try famous Kangri Dham: a range of authentic traditional dishes. Some of the recommended cafes are:

- **Illiterati Café** is a perfect hangout place for book lovers and to find some peace. Inside the cafe a range of books are available. One can pick their favorite and enjoy it while sipping their coffee admiring the scenic view.
- **Bakes 'N' Brews** is a renowned cafe in Dharamshala. It is both a cafe and a bakery known for its coffee and good food. It is also known for its warm and homely feel.
- **Tunna's Café** is a book café where you can sit and enjoy the view of mighty Himalayas, admire the azure blue sky, can sit for hours, and still never be bored, enjoying the beauty of Dharamshala sipping coffee and relish various munching options available.
- **Morgan's place** is on a tiny hilltop with the view of the majestic mountains having both indoor and outdoor seating. They serve Israeli, European, Mexican, Italian and Tibetan cuisine.
- **Shiva Café** The blissful ambiance will take you into a trance, and you will be lost amidst the scenic beauty of the Bhagsu Nag Fall that lies in proximity, feeling relaxed. Enjoy the calmness and tranquility that this place emanates. With great music playing in the backdrop, you will experience a soothing sensation here. Delve onto the delicious Tibetan dishes available to satiate your hunger.

Accommodation: There are several options available for accommodation. One can book hotel rooms, resorts, homestays from any of the hotel booking sites. Several Airbnb options for homestays can also be found for more homely feeling and interaction with the locals.

125.2 About the Author

Akshay Kapoor, a Software Engineer and freelancer on a never-ending learning journey; a tech savvy who loves to travel and trek to get away from the monotony of daily life and fulfil the dearth of adrenaline rush. Apart from travel, having passion for photography to capture the moments to relish and admire them forever. In leisure time, likes to watch comedy movies in the company of brewed beer and some friends.

CHAPTER

SIX

DUBAI

Ever wondered what would it be like to be standing on the highest manmade building in the whole world!

First, Dubai is one of the emirates of the United Arab Emirates, there is also Abu Dhabi, Sharjah, Ajman, Ras Al-Khaimah, Fujairah, and Om Quwain. It's one of the Arab Gulf countries and one of the richest countries in the world.

Dubai - one of the most amazing places you'll ever visit on earth now unless you've been sleeping under a rock for the past ten years or so you've heard of Dubai the giant megacity that has risen from the deserts with some of the most or inspiring attractions that you'll ever visit on earth!

But let me tell you one thing…

Dubai is incredibly massive! it's about 30 miles from end to end and it keeps getting bigger every year, most likely you'll step off your plane at Dubai International airport one of the most lavish airports that you'll ever come across in your entire life! Seriously! the best way to get to your hotel from the airport is to use the metro system all the signs are in Arabic and English and they're pretty easy to figure out.

to travel you'll need a card which is a prepaid card that you can get from any ticket booth, it's that simple the metros themselves are brand new they're modern, efficient, always on time, clean, fast, and the best way of getting around the city of Dubai!

Dubai Filled with tall skyscrapers that are extremely luxurious residences that you can rent or buy filled with cool places and parties is 24/7 non-stop with hundreds of bars and clubs in the city, also restaurants shops. etc. and this place is pretty damn stunning during the day and the night but one of the cool things about Dubai is the beaches! yes, you can sunbathe and do everything else that you can do on a normal holiday right here in Dubai without fear of getting into trouble. While roaming the city, you'll notice that Dubai in general pretty much has everything you could imagine! they even have a real Madrid bar for some reason.

If you're bored for some reason from all the skyscrapers and entertainment places in Dubai and want to explore the authentic side of the city where you just want to be far from all these touristy stuff, you'll need to go to an area called Dara and this is at the north end of the city where you'll find stuff like middle eastern old buildings, ports, lots of old boats which is way closer to normal life in anywhere with the identity of Dubai.

There's a lot of historical things that you could see whilst you're here, and I highly recommend that you take a morning to at least explore all the buildings right next to Dara is Dubai Creek this is a creek that is inhabited on both sides now you can't cross the creek directly by foot so you either gonna have to take the metro or you're going to have to take one of the many incredibly authentic boats. speaking of incredible let me tell you about the best attraction that's near Dara, the Dubai frame! if you're thinking that it's a giant picture frame in the middle of a desert, you'd be right! it is massive and as you can imagine the queues to get in it can be quite lengthy and you might be waiting a while when you get in it, spend some time walking around the perimeter because you just can't believe that this is a giant picture frame that is in the middle of the desert!

Bigger than the most famous building in all of Dubai, the Burj Khalifa; the tallest building in the world! they've got fountains very similar to what you might find at the Bellagio in Las Vegas and as you can imagine you have to get there pretty early because there's a whole crowd of people waiting for the show it goes off every half an hour from about 6 o'clock so if you miss a show, you only have to wait about half an hour for another one to start and when it does start

you get these magical musical fountains that do wonderful things to various Arabic or English music in the shadow of the biggest building in the world!

126.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through UpWork.

CHAPTER

SEVEN

FLORENCE

Florence is the city of the Renaissance in Italy, it is full of great jewels in sculpture, architecture and painting, made by great masters such as Michelangelo and Leonardo da Vinci, among many others. It is a large open-air museum, but in addition to visiting palaces, squares and churches, it also has a delicious gastronomy with elaborate dishes such as paninis, pappardelle al sugo di lepre or charcuterie and cheese boards, which we are sure you will love!



We will give you a list of the best places to visit in Florence, so you don't miss the most interesting things in the capital of Tuscany.

127.1 Florence Cathedral

In the heart of the historic center is the Piazza del Duomo, where you can find the Cathedral of Santa Maria del Fiore. Outside you can enjoy its impressive white and green marble facade full of details, as well as Brunelleschi's famous dome built in 1420, which is considered a masterpiece in the history of architecture.



Inside is the tomb of Filippo Brunelleschi, you will be surprised by the scenes painted on the dome of the final judgment and you can see them more closely if you climb the 463 steps that take you to the top of the dome, where you can also enjoy a excellent panoramic view of the city.

127.2 Giotto's Campanile

Giotto's Campanile was built by Giotto and Talenti between the years 1334 and 1359. The exterior of the tower stands out for its Gothic style of green, white and pink marble. But it also has wonderful bas-reliefs and niches that house preserved statues. It's also worth climbing to the top for a fantastic panoramic view of Brunelleschi's dome and the old town.



127.3 Baptistery of San Giovanni

The other treasure found in the Duomo square is the Battistero di San Giovanni, covered in green and white marble, where its three bronze doors stand out with immense artistic value, especially the Gate of Paradise that was made during 26 years by Lorenzo Ghiberti, made up of 10 panels with reliefs from the Old Testament, although you can only see a copy there, since the originals are kept in the Museo dell'Opera del Duomo (to keep them in optimal conditions).

127.4 New Market

The Mercato Nuovo is an old market built at the end of the 16th century and is currently dedicated to the sale of leather goods, souvenirs and flowers, among other things. Among the curiosities you will see a boar sculpture made of bronze, where the tradition says that if you rub its nose it will bring you luck and the Stone of Scandal, which is a marble circle where defaulters were punished in the Middle Ages, also at an architectural level it is very interesting. But if you want to buy quality Italian products, the recommendation is to go to the Central Market.

127.5 Della Signoria Square

Della Signoria Square is a vast open-air museum, where in medieval times it was the center of political and civil life in Florence. Surrounded by houses from the 13th century, it has several points of interest, starting with the Logia dei Langi, which has statues such as the Rapture of the Sabine Women or Perseus with the head of Medusa. Next to it you will find the impressive Fountain of Neptune, as well as the statue of Hercules and Cacus, as well as a copy of Michelangelo's David, because the original is in the Accademia Gallery.

127.6 Palazzo Vecchio

The Palazzo Vecchio is also located in Piazza della Signoria and was the residence of the Medici family. On the outside it stands out for its 94 m tower and its robustness, giving it the appearance of a castle, however, the real gems are found inside in the Sala del Cinquecento, where you can see beautiful frescoes by Giorgio Vasari that decorate its ceilings and walls, in addition to the sculpture of Michelangelo the Genius of Victory.



127.7 Church of Santa Croce

The beautiful Piazza Santa Croce is surrounded by grand palaces and the Church of Santa Croce. This temple is also called the Pantheon of Italian Glories, because it houses the tombs of such illustrious figures as Galileo Galilei, Michelangelo, Lorenzo Ghiberti, Machiavelli, an empty tomb in honor of Dante Alighieri and a statue of the latter artist.

127.8 Uffizi Gallery

The Uffizi Gallery has one of the most important pictorial collections in the world. The palace that houses the gallery was the residence built by the Medici to move from the Palazzo Veccio, and is currently, together with the Vatican Museums, the busiest in Italy. This is because it contains works such as The Birth of Venus by Botticelli, Bacchus by Caravaggio, The Annunciation by Leonardo Da Vinci, The Holy Family by Michelangelo, the Virgin of the Goldfinch by Raphael and the Venus of Urbino by Titian, among others many others.



127.9 Ponte Vecchio

Ponte Vecchio is one of the most beautiful medieval bridges in the world and is considered to be the oldest in Europe. It is a stone bridge that has hanging houses and well-kept jewelry stores on both sides, with excellent views of the river from its central area and through it the famous Vasarian corridor crosses, which was a passageway used by the Medicis to move without having to go out into the street, from the Palazzo Vecchio to the Pitti Palace.

127.10 Oltrano neighborhood

Crossing the bridge you will find the Oltrarno neighborhood which is characterized by its narrow streets, its low-rise houses, imposing 16th century palaces such as the Bianca Cappello Palace and most of which are located on Maggio street. Other interesting places in the area are the Basilica of Santa Maria del Santo Spirito, which was Brunelleschi's last masterpiece, the former Cenacle of the Convent and in particular the Brancacci Chapel, also known for the quality of its frescoes the Sistine Chapel of the early Renaissance.

127.11 The Pitti Palace and the Boboli Gardens

The Pitti Palace is a large building that houses important collections of paintings, sculptures and other valuables, especially within the Palatine Gallery that is located inside. After visiting the palace, we recommend you take a walk through the gardens and observe its highlights such as the Grotto di Buontalenti, the Grotta Grande, the Kaffeehaus, the Garden of the Knights and the Viottolone, which is full of cypresses and statues that will take you up to the Isolotto.

127.12 Michelangelo Square

In this square, in addition to having the best views of Florence, you will find copies of Michelangelo's David and four of his statues that are in the Medici Chapel. The square was built to honor the great artist Miguel Angel.

127.13 Church of Santa Maria Novella

This temple impresses with its green and white marble façade, the Green Cloister, the Santa María Novella Pharmacy considered the oldest in Europe, founded by Dominican friars in 1221 and inside it has great works such as the Crucifix by Brunelleschi, the frescoes of the Trinity and the Nativity of Mary.

127.14 Academy Gallery

The Gallery of the Academy houses the original work of David by Michelangelo and other unfinished works by the artist such as the 4 prisoners.

127.15 Medici Chapel

In the Medici Chapel are the tombs of the most powerful family in Florence for many years. A large part of the members rest in the Chapel of the Princes built with marble and semi-precious stone. On the other hand, the New Sacristy was designed by Miguel Angel but he was unable to complete it, even so it is worth seeing different sculptures made by this great master.

Florence is a beautiful city and full of masterpieces!

127.16 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes

CHAPTER

EIGHT

FRANKFURT

Frankfurt is one of the most important cities in Germany, being the headquarters of the European Central Bank and the financial center of the country. This city was practically completely destroyed during World War II, however, it has recovered in such a way that it has become another tourist destination to consider. Around Römerberg square revolves its beautiful historic center where you can visit one of its important museums or visit the skyscrapers on the skyline, perhaps relax in any of its well-kept parks or drink a good mug of beer, accompanied by a delicious Frankfurten Würstchen sausage.



We have made a list of the most important places to visit in Frankfurt, so that if you come to the city, make the most of your time.

128.1 Romerberg square

The Römerberg Square is the heart of the historic center, in addition to the main square of the city, it is surrounded by traditional houses built between the 15th and 16th centuries, with their colored facades and their half-timbering. Several of the most important historic buildings in Frankfurt are concentrated in the square, such as the Iglesia Sant Pablo, the Ayuntamiento, the Fuente de la Justicia built in 1543 and the Antigua Iglesia de San Nicolás. The City Hall is based in the Romer building built in the fifteenth century and was the coronation site of the most important emperors and kings of Germany.



Another of the important sites found in this square is the church of Sant Pablo where the first parliament met in 1848, which was democratically elected, a symbol of the city and democracy.

128.2 Goethe's house

Johan Wolfgang von Goethe was born and lived in Frankfurt, one of the great writers of literature and author of famous works such as Faust or The Sorrows of Young Werther. Although it is true that his house was destroyed during World War II, it was restored and a large number of original objects, paintings, family portraits, etc. were recovered. You will be able to visit this three-story house full of memories of the famous author, where you will see his different rooms and the common instances such as the dining room, the kitchen and the library.



128.3 Sachsenhausen district

An Iron Bridge stands between the historic center and the new quarter (Sachsenhausen). On this neo-Gothic style bridge built in steel in 1868, you can enjoy excellent views of the buildings located on the banks of the Main River and the skyline.

Once you are in the Sachsenhausen neighborhood you can go through its oldest area to see its wooden houses, its cobbled streets, numerous fountains and a large number of taverns where you can try the apfelwein, it is a kind of cider and the most traditional drink in the city. The most popular streets where these taverns are located are Paradiesgasse, Rittergasse, Brückenstrasse, Klappergasse and Schweizer Strasse, there you can also taste German cuisine, the oldest being Zum gemalten Haus and Wagner.



128.4 Main Tower

Frankfurt is dotted with large skyscrapers, among which is the Main Tower, which is 200 meters high and its construction was completed in 1999. It is made up of two buildings, one cubic and the other circular, interconnected with each other and in its 56 floors you can find television studios and several bank headquarters, it also has a fantastic terrace where you can watch a beautiful sunset or dine in its revolving restaurant. Main Tower is located within the business area of the city, where the tallest skyscrapers are concentrated, among which the Europaturm (337 meters), the Westendtower (208 meters) and the Commerzbank Tower (259 meters), among others.



128.5 Collegiate Church of Saint Bartholomew

The Frankfurt Cathedral or Collegiate Church of Saint Bartholomew was built between the fourteenth and fifteenth centuries, it is the largest and most important temple in the city and was the coronation site of both kings and emperors between the years 1356 and 1792. This impressive church at the Gothic style stands out for its tower 95 meters high and its red sandstone facade, from the top of the tower you can get excellent views of the historic center. Inside, it stands out for its Gothic altarpiece from the 15th century, the chapel of Santa María and the chapel of the Electorate, where the emperors were elected.

128.6 Stroll along the banks of the Main

On both banks of the Main you will find trails for playing sports or walking, as well as a grassy area for small picnics with impressive views of the skyline. You can also take a cruise on the Main River to see the financial district and the historic center from a different perspective.

128.7 Frankfurt Stock Exchange

Transactions of billions of euros a year are moved on the Frankfurt Stock Exchange, as it is one of the most important stock markets in the world. It has an impressive façade in the neoclassical style and nearby are the structures of the Bull and the Bear that respectively symbolize the ups and downs of the Stock Exchange.

Two other important buildings are located near the Stock Exchange are the Eschenhaimen Turm, an old medieval city gate and the Alte Oper, the old opera house. After viewing these important buildings, the recommendation is to take a walk along Zeil Street where the MyZeil Shopping Center is located with an amazing mirrored facade and the Zeil Gallery with incredible views of the skyline and Hauptwache Square. Finally, you can approach the covered market Kleinmarkthalle where you can give great pleasure to all your senses.

128.8 Palm Garden

The Palm Garden has an area of 22 hectares where you can see different types of plants from around the world such as vegetation from Patagonia, New Zealand, Asia, etc.

The park was inaugurated in 1870 and its most outstanding areas include the rose garden, the bamboo gardens, the rock garden, the tropicarium and the Palmenhaus, where you will feel as if you were inside a tropical jungle.

128.9 Museums to visit in Frankfurt

On the banks of the Main River is the area known as the Museums' Bank, being one of the most important cultural regions in all of Europe and where most of the city's museums are concentrated. The most important are the Städel Museum, with one of the most relevant collections in the world and works ranging from the 15th century to the present day. The Liebieghaus Museum with a wonderful collection of Greek, Egyptian and Roman sculptures. The last recommendation is the Giersch Museum with its excellent temporary exhibitions.

128.10 Jewish cemetery

In the Jewish cemetery you will see a wall that contains more than 11,000 plaques with the inscribed names of the Jewish citizens of Frankfurt who died in the concentration camps, victims of the Holocaust. Frankfurt is a modern city with great skyscrapers, interesting historical sites and beautiful tourist attractions to see.

128.11 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

NINE

GIJON

Gijon is a city in Spain located on the shores of the Cantabrian Sea and is part of the Principality of Asturias. Gijon is surrounded by a wonderful natural environment, its beautiful urban beach of San Lorenzo, the fantastic port, the fishing district of Cimadevilla, its viewpoints with beautiful views of the rugged coast, its delicious cuisine and above all, the good character of its inhabitants.

At night you can enjoy an excellent atmosphere that begins at sunset on the terraces of the traditional cider house, where you can taste its famous cider at its best.

We are going to guide you through the essential places that you must visit if you decide to visit Gijon

129.1 San Lorenzo Beach

This one and a half kilometer beach is located between the mouth of the Piles River and the Church of San Pedro, it has all the services to spend a comfortable and fun day. The beach has rough waves, making it perfect if you want to get started in the world of surfing. In addition, parallel to the beach you can walk along the shore of the Paseo del Muro de San Lorenzo, a path of more than 2 km where you can reach other beaches such as Peñarrubia or Rinconín, including a beautiful staircase called the Escalerona that It allows you access to the beach and on its slender pillar you can see a barometer, a thermometer and a tide gauge.



129.2 The Labor of Gijon

The Labor of Gijon is the largest building in all of Spain with an area of 270,000 m^2 and was built between 1946 and 1956 to be the headquarters of the Labor University of Gijon. It is currently the City of Culture and houses several faculties, art and research centers and higher schools. Among its main buildings stands out the church whose elliptical plan is the largest in the world, a tower 130 meters high and the Theater with dimensions equivalent to those of the Parthenon. On the other hand, near the complex is the Atlantic Botanical Garden with its 25 hectares that houses plant species from different parts of the world.



129.3 Cimadevilla neighborhood of Gijon

Cimadevilla is the oldest neighborhood in the city, it is located on the hill of Santa Catalina, which in turn is on a small peninsula. You can walk through cobbled and narrow streets, its charming corners such as the Plaza Mayor, the Clock Tower, the Plaza del Periodista Arturo Arias, the Revillagigedo Palace, the Plazuela del Marqués, the Jovellanos Birthplace, the Plaza de la Soledad where the famous Casa del Chino and the remains of the ancient Roman Wall are located.

Although it is true that visiting each of these places is essential, one of the best pleasures that this old fishing neighborhood offers you is to enjoy a good atmosphere drinking cider in any of the terraces that are located on the Cuesta del Cholo, In addition to trying the delicious local cuisine such as fabada, scorpion fish cake, chachopo or chorizo in one of the best restaurants in the area such as La Sidrería Galana, Farragua, Tomate Bistro or Gigia tavern.

129.4 Visit the Port

At the foot of Cimadevilla is the port that still preserves the seafaring essence of yesteryear. When walking through this port you will see a large number of small boats that make up a sea of masts, in addition to the sculpture of the Tree of Cider that was made with the bottles of this famous drink, to later reach the famous red letters of Gijón where tourists usually take a photo with the port in the background and finally arrive at Poniente Beach. In the area you can also book a boat tour, rent a kayak, a paddle surf board or a jet ski, also practice flyboarding or wakeboarding.



129.5 Hill Park

Once you have toured the historic center, the recommendation is to walk up to the Parque del Cerro where you can see the emblematic sculpture “Praised the horizon” made of concrete by the Basque-born sculptor Eduardo Chillida and better known as “King’s toilet”. Kong”. On the other hand, from the lawn of the park that is located on the highest point of Cimadevilla you can have excellent views of the Cantabrian Coast and the city. There is also an old military complex known as Old Fort built in the 17th century to defend the peninsula from pirate attacks.

129.6 Marquis Square

In the Marquis Square located next to the Paseo del Puerto, several buildings and historical monuments are concentrated, such as the Don Pelayo Monument, which is one of the icons of the city and pays homage to the first king of Asturias. In front of this statue you will see a perfect example of 18th century Asturian architecture embodied in the Revillagigedo Palace and the Collegiate Church of San Juan, both in the Baroque style.

The Clock Tower is located behind the palace and was built in 1572, where in addition to visiting it and getting great views of Gijón, you can see a museum that contains archaeological documentation from different excavations.

129.7 The Church of San Pedro Apostol in Gijon

On the hill of Santa Catalina, the Church of San Pedro Apostol stands out, which was built between 1945 and 1955 and destroyed during the Civil War, you can also see one of the few remains of the Roman period in the Roman Baths of Campo Valdés, which were built in the first century and the walls, which are still very well preserved.



129.8 Gijon Main Square

The Plaza Mayor is presided over by the City Council and is located in the heart of the Cimadevilla neighborhood. This square was built in 1852 in a rectangular shape and with a paved floor, it is surrounded by two-storey buildings in the classic style that house souvenir shops and cider houses.

129.9 Poniente Beach

Poniente Beach goes from the marina to the old shipyards, it is an artificial beach and was built in the mid-90s, it is currently one of the most popular beaches in Gijón. After bathing in its cold waters, you can go to the Asturias Railway Museum located in the old North Station. This museum is considered one of the most important of its kind in Europe.

Another of the museums worth seeing is that of Pueblo Asturiano, where you can see bread baskets and ovens from the 18th and 19th centuries, as well as traditional constructions, including the houses of the Campesina, the González de la Vega, the de los Valdés and a mansion that houses a collection of bagpipes that was built in 1757.

129.10 Begoña walk

Begoña walk is a wide street with an area of gardens and important buildings such as Café Dindurra, the oldest in the city, and Jovellanos Theatre. This street is perfect for shopping, as are La Merced and Corrida streets.

Gijon is a city with many tourist attractions to offer!

129.11 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

HAWAII

Hawaii is a state (number 50) of the United States, with Honolulu being its capital located on the island of Oahu and its most populous city. Although it is true that Hawaii belongs to the United States, they are not even on the same continent since this archipelago belongs to Polynesia, which is part of Oceania, however, it is closer to America than to Australia, which is the territory closest to Hawaii of the main landmass of Oceania. The Hawaiian archipelago is made up of eight main islands, the largest being Hawaii or also called the Big Island, Oahu, Molokai, Maui, Kauai, Lanai, Niihau and Kahoolawe. The state of Hawaii offers you beautiful white sand beaches and a wide range of cultural and tourist attractions. On Oahu you can view World War II ships or swim in the famous white shores of Waikiki Beach. On the Big Island you will find green sand beaches, even black. This article is intended to guide you through the most emblematic places in Hawaii, so you do not miss the most important places in the archipelago.

130.1 Hawaii Volcanoes National Park

On the Big Island is Hawaii Volcanoes National Park where you can see the Klauea volcano, which is one of the most active in the world, as well as Mauna Loa, which is the largest volcano on the planet. This park has great meaning for the Hawaiian people because it is considered the home of the Goddess Pelé. The best way to access stunning images of a large crater is to go to the Kilauea Visitor Center where there is an observation deck and if you are lucky, you will be able to witness the molten earth boiling into the sea. You can also walk along the Crater Rim Road for stunning views, and the last tip is to explore the interior of the Thurston Lava Tube. We are sure that the experience in this park will remain etched in your memory forever.



130.2 Waimea Canyon

Waimea Canyon is located on the island of Kauai and is called by many the Grand Canyon of the Pacific. This is one of the most amazing places you can see in Hawaii and due to its amazing size it can be compared to the Grand Canyon, even more beautiful for having a greater abundance of vegetation that mixes with the desert landscape. In general, the mornings are clearer of clouds and you will be able to have a greater visibility of the landscape. The best way to explore the Grand Canyon of the Pacific is by walking through the Koke'e State Park, where it is possible to camp if you want to enjoy the sunrise in this glorious place.



130.3 Honolulu

Honolulu is the largest city in the entire archipelago, the state capital is a busy, bustling and exciting city to explore. It has many activities to do, the culminating site being Waikiki beach, which is actually several beaches that are interconnected. The most popular option is Duke Kahanamoku beach where both local surfers and tourists go and to enjoy one of the most impressive views of the city, the recommendation is to climb to the highest part of the Diamond Head crater.



Another of the essential sites is to visit Pearl Harbor, where the most prominent site is the USS Arizona Memorial, there you can get a historical view of the events of the Japanese attack and its subsequent consequences in World War II.

130.4 Molokai

Molokai is one of the least developed islands in the archipelago, but one of the most picturesque in the state. It is known by many as the Friendly Island and its most famous attraction is the Kalaupapa National Historical Park, at one time this park served as a leper colony, but today most visitors to Molokai approach the island for its great unaltered and original beauty. You can swim at Papohaku beach where you will find very few families around you or if you prefer hiking, you can head to Pala'au State Park.

130.5 Hapuna Beach

You can find a lot of magnificent beaches on the Big Island of Hawaii, but one of the best for its large stretch of fine white sand is Hapuna Beach. It is also within walking distance of popular hotel destinations such as Kona and Waikoloa. Due to its size it is very easy to find a place away from the other bathers and if you prefer you can snorkel near the reefs or practice body boarding.

130.6 Haleakala National Park

Haleakala is a volcano that occupies half of the island of Maui and is over 3,000 meters high. Haleakala National Park revolves around its massive crater, which many consider comparable to a lunar landscape, with hiking being the most common way to explore the park. If you go on an excursion to the Pipiwai Trail you will come across 120-meter waterfalls and several pools, where you can cool off and enjoy the day.

130.7 Na Pali Coast

Na Pali Coast is located on the island of Kauai and along the coast you will see cliffs covered in lush vegetation, at their base you will find secluded and private beaches. You will observe a landscape completely different from anything you have seen before, if you prefer, you can hike between the cliffs and the locals will be able to show you where to jump into the water safely.

130.8 Oahu's North Shore

While it's true that most visitors to Oahu head to Honolulu, the north shore of the island also offers some really great beaches. But for surf lovers this area has the best waves in the world. You can watch the world class surfers on the Banzai Pipeline and maybe see international championships, it's quite a contrast to the more touristy spots on the island.



130.9 Lanikai Beach

On the east coast of Oahu and just a half hour drive from Honolulu is Lanikai Beach, a true paradise on earth. You can swim in this half-mile beach of white sand, shaded by palm trees and turquoise waters.

130.10 Kaanapali Beach

Kaanapali Beach is located on the west coast of Maui just outside of the tourist center of Lahaina, stretching from Back Rock to Canoe Beach. This beautiful beach has a number of rock monuments that have religious or historical significance to Hawaiians, the best known being Black Rock. You can also rent a boardwalk where you can admire the impressive views of the Pacific Ocean.

Hawaii a state full of beautiful beaches, volcanoes, paradisiacal sites and dream places!

130.11 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

ONE

HEIDELBERG

Heidelberg, is one of the most touristic and romantic cities in Germany, it is located in the Neckar river valley. This city is home to the oldest university in Germany, founded in 1386. Being a university city, it is extremely lively and has a wide variety of restaurants, shops and breweries to serve the student population.

Heidelberg is located in one of the warmest areas of Germany, so you can find in some of its gardens, rare species in these latitudes such as fig trees, almond trees, vines and even olive trees.

We are now going to inform you about the most important places in this city, so that if you decide to visit it you can get to know the best of Heidelberg.



131.1 Altstadt or Old Town

Altstadt is the oldest site in the city and is located below the castle. A succession of narrow streets stretches along the river and there you will find baroque buildings, restaurants, shops and the most famous attractions of the city. Altstadt was practically destroyed in the 1690s by French troops and was rebuilt during the 18th century. Unlike most

German cities, however, it was almost undamaged in World War II, as it became the American seat of military command. Marktplatz or the Market Square is the meeting point since the Middle Ages, so there is always activity, as well as being a market that still survives on Wednesday and Saturday mornings, where you can find fresh produce, fish, flowers, etc.



In the center of the square you can see the Hercules Fountain built between 1706 and 1709 in order to commemorate the efforts to rebuild the city. Right there you can see the Town Hall and the Church of the Holy Spirit built in the fifteenth century. You will also be able to see one of its most unique buildings which is the Casa del Caballero built in 1592, it is one of the few that remain after the destruction of the city and is currently a hotel and restaurant.

The Marktplatz is a perfect place to stroll, full of restaurants and cafes where you can enjoy an excellent beer on any of its terraces. But if you prefer to know the most important religious place in the city, there is also the Church of the Holy Spirit built between 1398 and 1544, in the Gothic style and with a Baroque bell tower that was added in 1709. This Church was used by Protestants and Catholic at the same time, with a wall that separated them for more than 200 years and you can enjoy a beautiful view of the city if you climb the 208 steps of the tower.

Hauptstrasse or Main Street is the one that crosses the historic center from where a large number of alleys leave where you can see old churches, medieval architecture, galleries, boutiques, cafes, restaurants and breweries full of people at any time of the day, being the favorites of students and locals. In the surroundings of the Main Street you can find outstanding historical sites such as the Providence Church, the Giant's House built in the 18th century, the Morass Palace, which is a majestic baroque palace where the Palatinate Museum is located with a large collection of sculptures, Applied Arts, a cast of the lower jaw of Homo heidelbergensis dating back 500,000 years, but the original jaw is in the Geological Museum of the University of Heidelberg (in case you want to stop by to see it).

131.2 Karlsplatz or Charles Square

Karlsplatz square was built in 1805 and has a fountain in the center commemorating cosmographer Sebastian Münster and is also home to the Palais Boisserée and the Heidelberg Academy of Sciences, alongside them are several student fraternities including the historic Mittermaierhaus , the Zum Roten Ochsen inn built in 1703 and the Zum Seppl inn built in 1634, which were boarding houses where several generations of students stayed, are now restaurants.

131.3 Charles Theodore Bridge

This is one of the most visited bridges in the city and one of its icons, it crosses the Neckar River and was built in the 1780s. In the old area there is a beautiful medieval gate that is part of the city's fortifications and has with two twin towers, being next to it is the sculpture of the Bridge Monkey, which contains a mirror where legend has it that if you touch it it will bring you riches and if you touch the monkey's fingers one day you will return to Heidelberg.



131.4 Philosopher's Walk

Crossing the Carlos Teodoro Bridge and going up a cobbled staircase, you reach the Paseo de los Filósfos, which is a path of approximately 4 km where the philosophers of the University walk looking for inspiration. Here you can find wonderful views of the Neckar River and Heidelberg Castle.

131.5 The King's Chair

On Mount Silla del Rey is the famous Heidelberg Castle where you can go up by funicular, bus or bicycle. The funicular is one of the most modern in Germany and is taken from a station behind Kornmarkt, its first stop being Heidelberg Castle and then continuing up to Molkenkur where you can find a hotel and a restaurant.

From there you can change funiculars to get to the top of Königstuhl and this second line is from a funicular dating back to 1890, with its historic carriages. The top of the Königstuhl is a magical place to see the stars and there you will find the Heidelberg State Observatory which was built in 1898.

131.6 Heidelberg Castle

This castle was built in red sandstone and its ruins are the result of two lightning strikes, one in 1573 and the other in 1764, as well as the destruction of the French who devastated the Palatinate in the 17th century. The castle features German Renaissance architecture and although it is in ruins, some rooms have been restored as has the interior of the King's Hall and is now used for seasonal festivals and other events. You can enjoy the Gothic courtyard and the views over Heidelberg from the terrace, visit the German Pharmacy Museum, walk through the gardens that were considered the Eighth Wonder of the World and admire the largest wine barrel on the planet that holds 22,000 liters of wine.



131.7 Old University of Heidelberg

It is one of the oldest universities in Europe founded in 1386 where you can admire the Plaza de la Universidad and the building of the old University dating from the 18th century where the Rectory and the University Museum are located. The University Church dates from the 12th century and the library was built in 1421. Behind the old University building is the old student prison where students were incarcerated for minor behavior such as drunkenness, fighting or theft. The students had to spend several days or weeks in jail but continued to attend classes.

Heidelberg is a vibrant student city steeped in historical legends, beautiful old buildings and wonderful sites.

131.8 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

TWO

HONG KONG

Hong Kong is located on the southern coast of The Peoples Republic of China. The former British colony consists of three main areas; The New Territories, The Kowloon Peninsula, and Hong Kong Island.

Hong Kong is one of the most densely populated places on the planet. It's dramatic cityscape cling to the hillsides and the edges of its spectacular harbor.

Hong Kong is the embodiment of yin and yang, the Chinese concept of balance. It is filled with neighborhoods that resonate with Chinese and colonial tradition, while its soaring skylines look boldly towards the future.

For visitors, Hong Kong offers some of the world's most intense shopping, sightseeing and dining experiences, yet moments of stillness await at every turn. Faith is an integral part of local life. Everywhere you go you'll smell the scent of incense wafting from shrines.

Hong Kong has over 600 places of worship, from small neighborhood temples, to hilltop complexes like the Ten Thousand Buddhas Monastery. In Hong Kong, shopping is almost a religion too! From malls like Pacific Place to the bustling markets of Temple Street and Ladies Street, tax-free Hong Kong is heaven bargain hunters.

The promenade is home to some of the territory's premier arts institutions, like the Museum of Art and the Hong Kong Cultural Centre. From the promenade, hop aboard an historic Star Ferry for the short crossing to Hong Kong Island.

Explore the malls and futuristic architecture of Hong Kong's main business district, Central.Then take tram to the island's highest mountain, Victoria Peak.

At the Peak Tower, meet some of the giants of history, politics, and popular culture at Madam Tussauds. Then head up to the observation deck for the best views in Hong Kong. Looking down upon the skyscrapers and apartment towers, you might wonder how so many people can live in such a tightly packed area.

Yet Hong Kong offers plenty of green spaces too. Take a stroll around Lugard Road to experience the Peak's dense woodlands. While closer to earth, Hong Kong's urban centers feature pockets of peace everywhere.

There are the wide-open spaces of Victoria Garden, the hillside tranquility of Hong Kong Garden, and the birdsong of the Po Lin Street Bird Garden.

Kowloon's Walled City Park is a gateway into the world of classic Qing Dynasty design, and features statues of the twelve animals of the Chinese zodiac. Outside the urban areas, visitors are often surprised to learn that over forty percent of the Hong Kong's territory has been designated as national parkThanks to Hong Kong's excellent public transport system, quiet beaches, lightly populated islands and wild places are never more than short ride away.

Heading to Lamma Island and spend the day swimming, exploring villages, and hiking its many trails. Lantau is the largest of Hong Kong's 250 Islands.

Take the 25-minute car ride to the mountain-top village of Ngong Ping. Here you'll find the Po Lin Monastery, and one of Hong Kong's biggest attractions, the Tian Tan Buddha. After paying your respects at the Big Buddha seek a little enlightenment along the Wisdom Path a trail dedicated to the centuries-old Buddhist scripture, the Heart Sutra. Down on Lantau's western coast, lose yourself in the narrow lane ways of Tai O.

This village has been home to fishing families for generations. The ramshackle stilt houses are a favorite with photographers, and its dried seafood is highly prized by cooks from all over Hong Kong. In Hong Kong, no matter how far you roam, you're never more than an hour from your hotel room, which is pretty cool I would say.

Gotta visit this awesome city soon!

132.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through UpWork.

CHAPTER

THREE

HONG KONG

Hong Kong is one of the cities in China that is not indifferent to anyone, its vertiginous skyscrapers, all those neon lights, its street food, its amusement parks, traditional houses, urban tribes, among many other things, make of this city an incredible place to know and visit. We will give you a list of the places that we consider to be the most important to see in Hong Kong.



133.1 Avenue of stars

The Avenue of Stars is like being on the Walk of Fame in Hollywood, but of course, this street pays homage to the great Chinese artists, you can see the footprints of Jackie Chan or take a photo next to the statue by Bruce Lee.

133.2 Symphony of light

Symphony of the light is a light and sound show that takes place every night at 8 pm and lasts approximately 10 minutes, in which the entire city participates, you will be pleasantly impressed by this display of music and lights.

133.3 Nathan Road

Nathan Road is the main commercial artery of Kowloon and it is an area that never sleeps, the recommendation is to walk along this street and observe everything that you find around it.

133.4 Lai Kwai Fong

The Lai Kwai Fong area is perfect for a cocktail or beer before or after dinner.

133.5 Eat dim sum

It is impossible to go to Hong Kong and not eat one of its specialties, "dim sum", you can try them all over the city, however, some of the best places to eat them are at One Dim Sum Chinese.

133.6 Kowloon Park

It is likely that at some point during your visit to this city you prefer something to relax and the best place to unwind than Kowloon Park, where you can walk through this great lung of Hong Kong and watch the old people practice tai chi or perhaps have a bath to cool off in its public pool. As a curiosity we tell you that until 1987 the old neighborhood of Kowloon was in this area, at that time it was one of the most dangerous places on the planet, where not even the police dared to enter, but today it is the opposite and far from worrying about passing through this area, you will be filled with a lot of tranquility.

133.7 Hong Kong Beaches

If you want to go to the beach, of course there are several to visit since you are on an island, the most recommended are Stanley Beach or South Bay, however, we do not believe that it is one of the essential activities to do in Hong Kong.

133.8 Eat at Tim Ho Wan

This city has a very interesting food scene and trying some of its dishes like the pork and prawn dumplings or maybe its bbq pork stuffed buns at a restaurant called Tim Ho Wan is one of the best things you can do in this city town. To give you an idea, this is one of the cheapest restaurants in the world and it has a Michelin star, a generous dinner for two costs less than €20, and its food is truly spectacular.

133.9 Hong Kong temples

If you are a lover of Chinese temples, you cannot miss the Wong Tai Sin Temple, which is definitely one of the most important in Hong Kong.



Photo taken by Daniel Lee

The other recommendation is to visit the Man Mo Temple, as it is one of the oldest in the city.

133.10 Climb Victoria Peak

You can see the sunset from the top of Victoria Peak in front of thousands of high skyscrapers, to get there you just have to take the funicular that will take you to the top of this mountain.

133.11 Choi Hung Estate

A few years ago this building was quite unknown, but thanks to someone who believed that this colorful building would look great in his gallery and on instagram, today it is one of the most photographed and visited places in the city.

133.12 Monster Building

The same situation that we described in the previous item happened to the Yik Cheong Building (Monster Building), it is a building absolutely full of small apartments that became famous when it appeared in the movie Ghost in the Shell, it is worth taking a picture in this building that is so popular today.

133.13 Ladies Market

Ladies Market is currently the most frequented market in Hong Kong and there you can find exactly everything you can imagine, from fish soups to designer bags, do not forget to haggle.

133.14 Temple Street Market

Temple Street is the other highly recommended market, although it is true that it is usually very crowded, it is also full of character.

133.15 Victoria Bay Cruise

A cruise through Victoria Bay is one of the best activities you can do towards sunset, it is the moment when the lights of the city are reflected in the water with its thousands of colors.

133.16 Longest escalator in the world

The longest escalator on the planet is located in Hong Kong, it measures approximately 800 meters, it is located between the Mid Levels and Central. Although it is true that it is not a single staircase, since it is rather a stretch of different stairs, it is still worth traveling this route that lasts about 20 minutes.

133.17 Double-decker trams

One of the most original ways to visit Hong Kong is on one of its 2-story trams. The recommendation is to go upstairs, specifically in the first row to get the best views.



133.18 Nan Lian Garden

The Nan Lian Garden is one of the most beautiful and peaceful places in the city, where there is also a group of Buddhist temples in the Chi Lin Monastery, which will abstract you from the traffic and hustle and bustle of the city.

133.19 The Soho neighborhood

Although this neighborhood is full of stairs and slopes, visiting it is really charming. It is full of restaurants and bars, within a cosmopolitan and very interesting atmosphere.

133.20 Mong Kok neighborhood

The Mong Kok neighborhood is another recommendation to visit, being the most commercial part of Hong Kong, you will be surrounded by shopping malls, neon lights and many people.



133.21 Big Tian Tian Buddha

The Tian Tian Big Buddha is located on Lantau Island and you can reach it via the Ngong Ping 360 cable car where you will get a lot of sublime views. In addition to the option of taking a normal cable car, you can also opt for one with a glass floor.

133.22 Disneyland Hong Kong

If you're on the island you can't miss Disneyland Hong Kong



133.23 Macau Island Tour

You can take an excursion to visit the island of Macao or as many call it “the casino island”. It is a very strange and curious place since it is a mixture between Portugal, China and Las Vegas, this strange place seems to us to be a very interesting place to visit. Hong Kong is an island with many tourist activities to do and impressive sites that are worth visiting.

133.24 About the Author

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CHAPTER

FOUR

IBIZA

Ibiza, Catalan Eivissa, island, Balearic Islands provincia (province) and comunidad autónoma (autonomous community), Spain. Ibiza is the third largest of the Balearic Islands. It lies in the western Mediterranean 50 miles (80 km) southwest of Majorca.

The island was a strategic point of great importance in ancient times and was inhabited by the Phoenicians and Carthaginians.

It has some notable archaeological sites, relics from which are housed in the Archaeological Museum at Ibiza city also called La Vila. The island's hilly relief, culminating in La Atalaya (1,558 feet [475 meters]), is truncated in the central northern coast to form a costa brava (rugged coast) with cliffs exceeding 800 feet (240 meters) and penetrated by calas (small coves).

There are several irrigated lowlands, and the hillsides are intensively terraced. Agriculture is mainly of a subsistence nature, but almonds, dried figs, and apricots are exported. Salt produced by the evaporation of seawater has been the main export for centuries. Fish and charcoal surplus to local needs are also sent to the mainland.

Usually known for its lively nightlife. This island has plenty of history and culture as well as beautiful sandy beaches!

Ibiza is a beautiful island known for its gorgeous sunsets and awesome parties, it is a popular destination for all ages and there are a few things to be aware of when planning a holiday here.

great deals to Ibiza only tend to happen in the off-season so if you are visiting during peak season you are likely to save money by booking your flight hotel and transport separately.

now let's talk about the best time to travel to Ibiza!

June and August is the perfect time for parties and clubs, the weather is warm and the DJs are all in town

May, June, and September are warm but cheaper times to visit as they are outside the school holidays however, you won't always get to see the big DJ if you visit before august.

so, like we've said already Ibiza is known for its DJs but there is more to the island than that so here are just a few things to do in Ibiza

firstly, the old town is also known as dalton villa Ibiza's old town is now an interesting UNESCO heritage site, walk through the picturesque narrow cobblestone streets and visit the charming restaurants, cafes and gorgeous cathedral.

also, spend some time at the many beaches, many offer gorgeous viewpoints and you can even find secluded clear waters in some of the quieter areas on the island also don't forget to check out the hippie market. the market runs every Saturday from 10 a.m. to 8 p.m.

let's talk about getting around Ibiza.

now getting the bus in Ibiza is the cheapest way to get around the island, another way to get around Ibiza is by getting a bike you can rent mopeds and scooters for as little as 15 euros a day ideal for taking some day trips you can also catch the aqua bus ferry boat you can get this from Ibiza town to some of the many beaches around the island.

Never underestimate the wonders of renting a holiday villa in Ibiza, you can choose from a selection of different villas and apartments on various websites! of course, this is much more expensive than having a hotel in Ibiza but it is a great way to spend your vacation.

note that it is illegal to drink alcohol on the streets so be sensible when walking from bar to bar also another thing to note is that Ibiza is expensive, so you will want to take advantage of the happy hours each bar offers and when you are heading to those bars and clubs you don't really need to think about the dress code unlike other major party destinations in the world Ibiza really doesn't tend to have much of a dress code

anything really does go!

- https://www.youtube.com/watch?v=I-R2B0-SeX0

134.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

FIVE

ISTANBUL

Istanbul, even though some still prefer to call it Constantinople, is the name of this city since 1930 when its name was officially changed to Istanbul. The word "Istanbul" is derived from the Greek phrase " " which means "to the city". Even though the city was called "Der Saadet" meaning the "gate to prosperity" in Ottoman Turkish, the name Istanbul was preferred as it was used since the 17th century.

Istanbul, a historical city thanks to being the capital of several empires including Byzantium and Ottoman Empire, with its population of over 16 million people, is the most populous city of the Republic of Turkey (and also of Europe), or with its widely known name, Turkey. As it is the most populous city of Turkey, the city is thought to be the capital of Turkey, but the capital of Turkey is Ankara.

Istanbul is the country's economic, cultural, and historic center. Turkey owes 31% of its total GDP to Istanbul. (according to 2019 reports) Moreover, the city's economy is bigger than that of 130 countries, 25 of which is located in Europe. When it comes to the culture, much of Turkey's cultural richness had its roots in Istanbul. It is culturally such an important city that in 2010, it was named as European Capital of Culture. If we need to speak about the history of the city, we can not tell it by words. So, we will not discuss its history besides one really and maybe the most important event in the city's history: The Conquest of Istanbul. This was such a huge event that according to some historians, the early modern period of history begins with this event. This is because, after the fall of Constantinople, the feudalism system in Europe ended.

The historical importance of Istanbul is mainly due to its geographical location. It is located in north-western Turkey and it is divided into two by the Bosporus, which is the only way to go to the Black Sea from the Mediterranean Sea. So, historically it has been ideally located for trade and defense. Its defensive importance continues thanks to the Montreux Convention Regarding the Regime of the Straits. Thanks to that, the USA cannot send its warships to the Black Sea on which Russia has a border. As we have mentioned before, the city connects Asia and Europe, and it is not difficult to say Istanbul is also a cultural bridge between Asia and Europe just like its bridges that connect the two continents.

World Heritage Sites are areas or landmarks with legal protection by an international convention administered by UNESCO and 8 of these sites are located in Istanbul. This must affect tourists because Istanbul is also Turkey's most visited city. In 2018, over 13.4 million foreign visitors visited the city, and this makes the city the world's fifth-most popular tourist destination.

Istanbul is primarily known for its Byzantine and Ottoman architecture. Even though it is a Turkish city since 1453, the city still contains both Christian and ancient monuments.

The city has 39 districts that have their councils and mayors, but these districts are administered by the Istanbul Metropolitan Municipality. This system was brought from France by republicans known as young Turks. This system is now applied in all the cities of Turkey.

As Istanbul passed into other hands, it has been a cosmopolitan city throughout history. It continues to have that characteristic of its, but it has become more homogenized since the Ottoman era. There are more than 2 million Arabs, from 2 to 4 million Kurds, 3,000 Greeks, 123,363 Armenians, and 25,000 Jews in Istanbul.

The city is also important for domestic policy. The current president of Turkey was the mayor of Istanbul. A political party's performance in Istanbul is seen as an example of its governance. The current mayor of Istanbul, Ekrem Imamoğlu, is wanted to be a presidential candidate by the opponents of the current government.

When it comes to the city's other features, sports have an important part. Turkey's oldest club, Beşiktaş JK, was established in 1903 in Istanbul. Also, the other two most important sport clubs of the country, Galatasaray and Fenerbahçe were established in Istanbul. Beyond that, Istanbul owns many sports facilities and many of them have been built or upgraded since 2000. Istanbul hosted 2005 and 2020 UEFA Champions League Finals, 2009 and 2019 UEFA Super Cup Finals, 2001 EuroBasket finals, 2010 FIBA World Championship Final as well as the 2011 - 2012 and 2016 - 2017 Euro League Final Fours.

The oldest public high school, which was established in 1481, and the oldest university, which was established in 1453, in Turkey are located in Istanbul. Istanbul has more than 93 universities with 400,000 students. (according to 2016 reports)

After giving all the information we have given, it is important to say the city's biggest problem is traffic. If you want to go from the easternmost district to the westernmost district of the city, it may take 3 hours via car. You guess the public transport.

135.1 RESOURCES – You can see these websites for further reading about Istanbul

- https://en.wikipedia.org/wiki/Istanbul
- https://istanbeautiful.com/about-istanbul/

CHAPTER

SIX

JAKARTA

Jakarta is the capital of Indonesia and its most populous city, it is located on the island of Java, Jabodetabek being the metropolitan area where the industrial, political and financial center of the country is concentrated, Named for the mixture of names Jakarta, Bogor, Depok, Tangerang and Bekasi.



Jakarta attracts a large number of foreign tourists as the economic and political capital of Indonesia, as well as being the fourth most populous city in the world. It is a very cosmopolitan city with a diversity of cultures, since a large part of the city's immigrants come from different parts of the island of Java and this leads to a mixture of dialects between the Sundanese and Javanese languages, in addition to their own types of food and typical customs. 86% of the inhabitants are Muslims almost all of the Sunni side and practice a particular form of Islam called Abangan.

In Jakarta there is no way to get bored and we are going to show you the most emblematic places in the city that you cannot miss.

136.1 Kota Kua

Kota Kua is the old part of the city where the Dutch settlers were the ones who settled in the area, so you can find a lot of colonial-style buildings. The History Museum is a perfect example of this type of architecture, it used to be the Dutch East India Company and Jakarta City Hall. It is located in Fatahillah Square, which is one of the places with the most atmosphere in the city, it has bicycles for rent and in this way you can take a walk around the area.

136.2 Batavian Coffee

This cafeteria was built at the beginning of the 19th century and is one of the icons of the city. There you will feel that you are in the middle of the colonial era since it preserves its original style and although it is one of the most touristic places, its prices are quite affordable and you will be able to enjoy a delicious and fresh Bintang, which is the local beer.

136.3 The Great Istiqlal Mosque

Indonesia is known for being the country with the largest number of Muslims in the world, so it is likely that on your trip, more than one night you will be woken up by the sound of a nearby mosque with its call to prayer. One of the most important temples in the world for Muslims is the Great Istiqlal Mosque and of course, it is the most important mosque in the country, being visited by approximately 120,000 people each year and where it is filled with faithful to pray when the day ends Ramadan.

If you do not practice religion, you can access the second floor in order to see the faithful, without interfering with the prayer.



136.4 Jakarta Cathedral

Leaving the Istiqlal Grand Mosque you can find yourself right in front of the Jakarta cathedral and this is precisely a reflection that despite being in a country that is mainly Muslim, several religions also coexist. As you move to the east of the country, there will be more Catholics, for example on the island of Flores, while in Bali you will see that the majority of the population practices Balinese Hinduism. Jakarta Cathedral was built during Dutch rule.

136.5 The Indonesian National Monument

The Indonesian National Monument also called Monas was created to celebrate the independence of the country. It is located in the center of a huge square and is a pillar that is 132 meters high, in this tower you can climb to its viewpoint to contemplate the best views of the city and in front of the Monas, is the National Museum of Indonesia that It is the most important in the capital.



136.6 The Sky Bar

In the BCA Tower, specifically on the 56th floor, is the Skye Bar and although it is true that consuming something in this place is much more expensive than in any other establishment, the view that it offers is worth it. It is advisable to go up at night to see the city illuminated and the immense number of skyscrapers, they are quite a spectacle.

136.7 Anloc a beach to watch the sunset

Although Anloc is not a recommended beach to take a bath, it is to enjoy a beautiful sunset. It is located in an area where there are several restaurants, cafes and an excellent leisure environment that is formed especially for sunset. On the other hand, there is a quite complete amusement park whose name is Ancol Dream Park where you can spend a pleasant and entertaining time.

136.8 Go to a shopping center

Shopping malls abound in any city in Southeast Asia and Jakarta is no exception. In addition, the city is not exactly made for walking, since the distances are very long and the traffic is abundant. So shopping malls are designed for eating, walking, hanging out with friends, having a drink or going to the movies. The most famous mall in the city is the Grand Indonesia Mall, but if you are interested in a luxury mall you can head to The Park Plaza. Both these shopping centers and others are perfect in case it is very hot and you can entertain yourself with endless activities, since these shopping centers really have everything!

136.9 Chinatown

Jakarta not only has a Chinatown like any big city worth its salt, but it has several and they are all located to the north of the city. There you will find food markets, Buddhist temples, medicines and a large number of characteristic Chinese products. The most popular Chinatown is the Glodok which is near Kota Tua.

136.10 Gastronomy in Indonesia

For lovers of gastronomy, Jakarta offers you a whole range of traditional dishes, among which are: fried noodles (mie goreng), fried rice (nasi goreng), pichitos that are known as satay and chicken soup (soto ayam). In order to find this type of traditional food, you must go to a warung, which is a typical local food restaurant. Prices range between one

and two euros, the portions being quite abundant and depending on the island you are on, both the dishes and the ingredients will vary. For example, on those islands where the majority of the population is Muslim, as in this case, it is very difficult to find dishes that include pork. But if you head to Bali or Flores (where most of the people are Catholic), you will be able to find a delicious pork dish more often.

Jakarta is an excellent option to get to know a different culture and offers you a wide range of interesting places to visit.

136.11 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

SEVEN

JOHANNESBURG

Johannesburg is the largest and most populous city in the country with just under 8 million inhabitants, being one of the regions with the highest purchasing power in Africa. Its development began at the end of the 19th century with the discovery of gold in the area and many people came looking for work in the mines. This city is very important for the politics, history and culture of the country, since Nelson Mandela fought part of his struggle and lived in Johannesburg for many years.



We will leave you a list with those essential places to visit in Johannesburg

137.1 Constitution Hill

For those who do not know, Gandhi lived in South Africa and was also imprisoned in the same prison where Nelson Mandela was imprisoned years later, it is currently the Constitutional Court of South Africa and can be visited. There you can first see Old Ford, which is where the prison buildings, its rooms, the patio, the bathrooms and several exhibition rooms are located, in one of them the history of both icons that were there in the 20th century is shown. . Later you will be able to see the Court, where you will realize that curiously it was built with the bricks of the old prison, its structure was incredibly well thought out, to the point that so that the politicians cannot be higher than the town, the room is located in the basement.

The Court was inaugurated in 2004 and it is incredible to think what happened within those same walls compared to what it is today, a symbol of the struggle waged in South Africa against its cruel and recent past.

137.2 Go up to the Carlton Center

The Carlton Center is the tallest building in all of Africa, it was inaugurated in the 70s and from the top of the building (on its 50th floor) you can enjoy fabulous panoramic views of the entire city.

137.3 Apartheid Museum

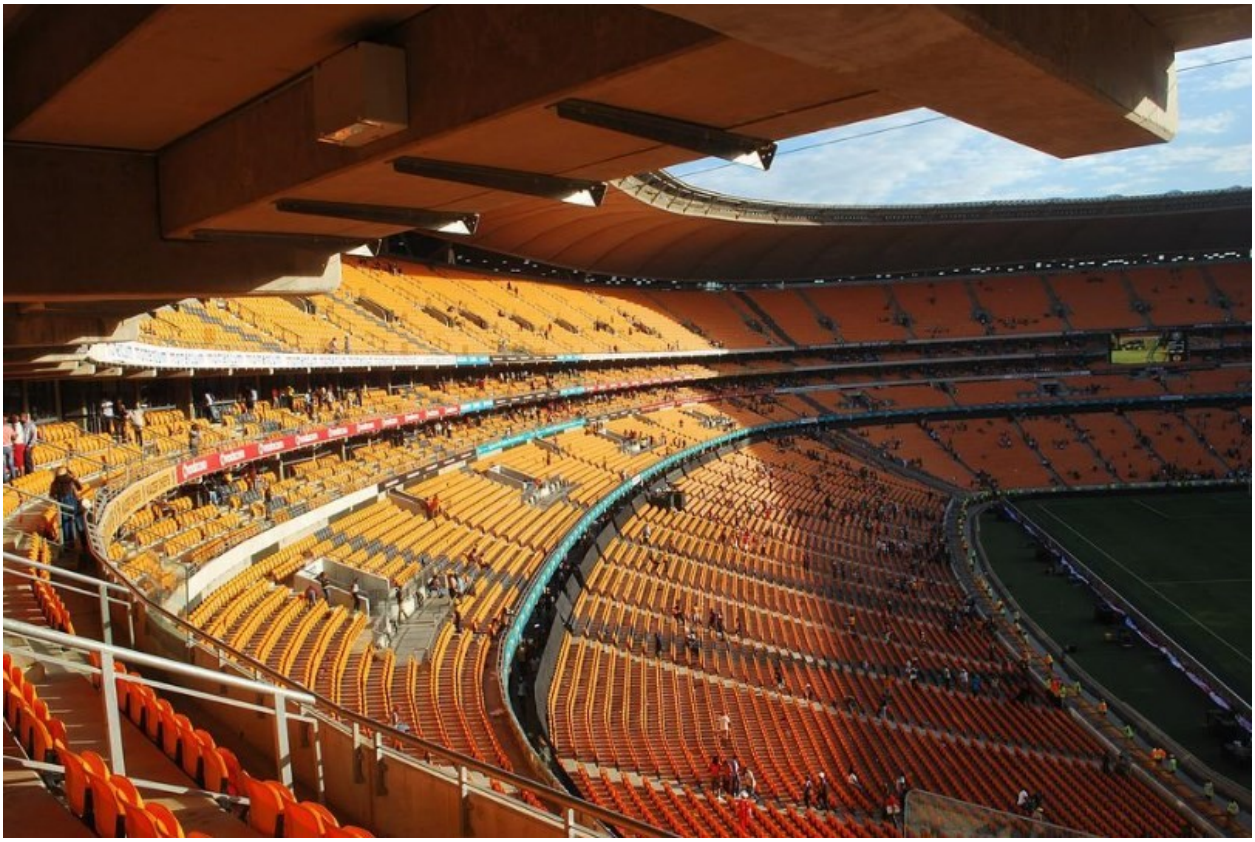
The Apartheid Museum has a very interesting theme and is one of the best organized and most complete museums that exist. From the beginning you will be able to realize how special this museum is, when you enter they give you a random ticket that can say "white" or "black", depending on the one you get you will enter through a different door, each one with different corridors that meet again, the objective is to represent the difference that existed between human beings depending on their skin color during Apartheid.

Once inside you will be able to see information panels, objects of the time, reproductions of places, testimonies and a lot of audiovisual material, which can move you when you observe so much barbarism, in addition to thinking that these circumstances officially ended in 1994, that is, atrocities that lasted too long until just a few years ago.

There is also a shop with a fairly good selection of books and a restaurant if you want to eat something during your visit.

137.4 Soccer City Stadium

Soccer City Stadium also known as FNB Stadium was opened in 1989 and is the most famous in Africa. The national soccer and rugby teams and the Soweto team play there. It was remodeled to celebrate the 2010 World Cup and we all remember the final match between Spain and the Netherlands with Iniesta's goal, which was simply heart-stopping. This stadium was where Nelson Mandela gave his first rally, once he was released in 1990, and also where his funeral was held in December 2013.



137.5 Visit Soweto

Soweto is an acronym for the "South Western Townships" which was separate from Johannesburg from the 1970s to 1994, as blacks could not live in the city during Apartheid. The township of Soweto was the place that housed both Nelson Mandela and his friend Desmond Tutu (Nobel Prize). You can even visit the homes where they both lived, they are very close to each other and the inhabitants of Soweto are proud, for having the street that has the most Nobel prizes in the world.



In this area there is also the Regina Mundi Catholic Church, which was always the meeting place during Apartheid for the people of the neighborhood. It was there where there were several clashes between police and protesters, you can still see the bullet marks that are on the walls of the temple. You can also see incredible stained glass windows that tell the history of the country, Regina Mundi remains today the heart of cultural and social life in Soweto, the Church has a capacity for just over 5000 people.

There is another museum named Héctor Pieterson that was specially dedicated to commemorating the role of students during Apartheid. It tells the story of the shots fired by the police at Héctor and his companions (all minors) during the riots of 1976.

Another of the places you can visit in Sweto are the Orlando Towers, an old power station that is currently completely decorated with graffiti and if you like extreme sports, you can also do bungee jumping.

137.6 Liliesleaf farm

This farm on the outskirts of the city was converted into the Liliesleaf Farm Museum, as it was the hideout for Mandela's party called the African National Congress (ANC) during Apartheid. It is a very interesting museum where you will find audiovisual content, information panels and its rooms are practically the same since that time. Although it is true that this farm is located in the Rivonia neighborhood about 20 minutes from Sandton (the financial area of the city), it is really worth visiting.

Sandton is located on the outskirts of Johannesburg and is where the best hotels are located, a very popular area for tourists. There is also Nelson Mandela Square where you will find a large statue of the South African leader over 6 meters, as well as the Sandton City shopping center which is one of the largest shopping places in the southern hemisphere. There you will find endless shops, luxury restaurants and five-star hotels.



Johannesburg is a city full of history and where all human rights were violated, it is important to visit it to learn about the events that must not be repeated.

137.7 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

EIGHT

KYOTO

In the central area of the island of Honshu is Kyoto, an important city in Japan that has managed to harmonize its oldest traditions with modernity. There are still neighborhoods that preserve their traditional wooden buildings with hundreds of sanctuaries and incredible temples, large palaces, beautiful gardens and are also visited by maikos and geishas.

Its delicious cuisine is another of its great attractions, so you can try dishes such as sushi, tempura, sashimi, ramen, okonomiyaki, miso soup, Kobe beef, gyozas, etc. to fully enjoy your palate.

If you plan to get to know this incredible city, we will give you a list of the essential places that you cannot miss.

138.1 Fushimi Inari Taisha

Fushimi Inari-taisha is a shrine to honor the goddess of rice built in the 8th century, famous for its many orange or red torii winding a 4 km long walkway up the Inari Mountain path.

The sanctuary can be reached on foot to enjoy the beautiful view offered by the toriis. However, it can also be reached by train from Kyoto Station.



138.2 Kinkaku-ji

Kinkaku-ji or also called the Golden Pavilion, is a temple that stands out for its pavilion that is covered with pure gold leaves, built in 1397 and rebuilt in 1955, since it was burned down by a monk with poor mental faculties in 1950 In the temple you can see a Japanese garden, with a beautiful pond known by all as the Water Mirror and that is really worth seeing.



138.3 Gion District

Gion, is famous for being the neighborhood of the geishas and take a walk towards sunset through its narrow streets with its Japanese-style wooden houses, where you can see the occasional maiko or geisha on the way to the tea house, you will provide an unforgettable experience.

It is advisable to pay attention to Hanamikoji Street or Pontocho Street near the Gion neighborhood, as both are full of teahouses and restaurants where geishas go when they go to work between 5:00 p.m. and 7:00 p.m. or at the time They leave work between 8:00 p.m. and 10:00 p.m.



138.4 Kiyomizu-dera

Kiyomizu-dera is one of the most touristic temples in Japan, located on a hill on the eastern side of Kyoto and built in the year 778. It stands out for the magnificent views of the city, the pavilions, the pagodas, the doors and the exuberant surrounding nature.

138.5 Arashiyama Bamboo Forest

You will be able to walk through more than 50 varieties of bamboo that are perfectly aligned, while listening to their sway produced by the wind. In this bamboo forest you can find specimens that measure just over 20 m in height, it is a unique experience that we are sure you will remember from your trip to Japan. But the Arashiyama area, in addition to the bamboo forest, has other places that are worth visiting, such as several temples, among which is the Tenryu-Ji and the Togetsuky bridge.



138.6 Ginkaku-ji

Ginkaku-ji or also called the Temple of the Silver Pavilion is a Buddhist temple that somewhat mimics the Temple of the Golden Pavilion, only covered with silver panels. Although it is true that this temple was not completed as a result of a civil war, in no way does this circumstance detract from the beauty of the temple. You can find beautiful gardens in the Japanese style, the most relevant being the moss garden with ponds and streams or the dry white sand garden, where you can see that they are one of the wonders of Kyoto.

138.7 Path of Philosophy

One of the best walks is definitely the Kyoto Philosophy Path or Philosopher's Walk, especially in spring because you can see the cherry blossoms. Its name is due to the Japanese philosopher Nishida Kitaro, who meditated while walking through this place to go teach at Kyoto University. This route of approximately 2.5 km runs parallel to the Shishigatani canal, but it is also very close to numerous shrines, temples, cafes and charming craft shops, where you can make several interesting stops. The most prominent temples are Otoyojinja, Reikanji, Nyakuojijinja, Mirokuin, Honen-in, Ginkaku-ji and the closest ones are Nanzenji and Eikando.

138.8 Ryoanji

Ryoan-ji is a Zen temple with the most famous mysterious dry garden in Japan. Although it is true that this type of Zen garden has few decorative elements, the monks use it for meditation. The garden has a distribution of its elements such as moss, sand, gravel, rocks and the shape of raking that although it is quite subjective, most people notice a relaxing effect when observing it. You can also walk around the temple area where you can see several beautiful gardens and ponds with a variety of vegetation.

138.9 Sannenzaka and Ninenzaka streets

In the Higashiyama neighborhood you can find the essence of a more magical and traditional Kyoto in its Ninenzaka and Sannenzaka streets. These two streets that will take you back to ancient times with their typical wooden houses and the recommendation is to walk them towards sunset, since it has a special light at this time of day. But if you want to enter one of the souvenir shops, it is best to go in the morning. Although legend has it that if you fall on Ninenzaka street you will die in two years and if you fall on Sannenzaka street you will die in three years, so be careful where you walk.

138.10 Heian Jingu and Sanjusangendo

Heian Jingū Shrine is notable for its huge red torii that stands at the entrance to the temple. Although the main building and the red torii are very relevant, the area of its gardens is no less so, which are truly impressive.

Another of the most important temples to see in Kyoto is Sanjusangendo, where you can delight yourself by observing the 1001 statues of the Buddha goddess of mercy "Kannon". Each of these wooden statues are handmade and covered with gold leaf, they are also housed in the longest wooden hall in all of Japan and although they do not allow taking photos inside, the visit is still worth it.

Kyoto is a city steeped in ancient history and is the land of geishas, an interesting place to visit.

138.11 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

NINE

LAS VEGAS

Situated in the United States in the western state of Nevada. Rising like an oasis from the Mojave Desert, this city of over 1,000,000 people enjoys 300 days of sunshine a year.

If ever there was a city that shouldn't be, it's Las Vegas. Starting life as a windswept watering hole on the Pioneer Trail, this is a city that continually beat the odds. Over the decades, Las Vegas grew into a kinda neon Camelot, whose casinos and Rat Pack style has become almost legendary; but if your ideas about Las Vegas look like an old Super 8 movie, prepare to be blown away.

And I mean really blown away.

This is not just a city. The Las Vegas of the 21st century is like visiting another planet - A Pleasure Planet!

It's a total escapist fantasy. Everyone is here for a good time, from Grandma Joe to movie stars!

Whatever you want, you can have it here.

Looking for a taste of classic Vegas, Daddy O? Head Downtown to Fremont Street and into a world of old school cocktail lounges, piano bars and classic casinos.

Okay. Now it's time to hit The Strip.

If everything's big in Vegas, it's a hundred times bigger here. We're not talking casinos anymore, we're talkin' mythical cities - whole worlds geared around you having the time of your life.

Whatever mood floats your boat, you'll find it here. Fancy three days of unbelievable indulgence?

Say "buongiorno" to the Bellagio and her incredible dancing fountains. Step back in time at the Luxor or Caesars Palace. This is what Ancient Egypt and Rome might have been like if they'd discovered electricity and cocktails (or happy hours) a little sooner.

Feeling more tropically inclined? Kick off those heels and feel the sand between your toes at The Mirage and Mandalay Bay resorts. The resorts on the Strip are so vast and self-contained, it's possible to land in one and not step outside again for the rest of your stay.

But you will step out and explore the unique themes of at least a few others, sampling the incredible shows, dining, and shopping experiences each one has to offer.

If this neon paradise still ain't enough for you, Mother Nature has a few surprises of her own.

That is, if you can find your way out!

The Valley of Fire is just 50 miles out of town, and the Grand Canyon is a half-a-day drive away.

But as nighttime descends, Vegas calls like an incredible cluster of neon jewels under the desert sky.

Las Vegas dazzles like no other city.

She's here to remind us that we're here on Earth, not for a long time, but for a good time!

And Las Vegas will be the best time you ever had. Take a tour here:

- https://www.youtube.com/watch?v=y_f6i0LynXg

139.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

LIMA

Lima is the capital of Peru and is located in a privileged position towards the shores of the Pacific Ocean. In this city, colonial architecture is mixed with the most modern buildings and Peruvian cuisine is among the best in the world. We will give you a guide with the most iconic sites that the Peruvian capital has.



140.1 Main Square

The Square Weapons is located in the heart of the historic center and it was there that Francisco Pizarro founded the city in 1535, it is surrounded by important buildings such as the Cathedral, the Archbishop's Palace, the Government Palace and the Sagrario Church. This spacious square is a meeting point for locals and tourists who gather around a beautiful fountain. In the surroundings you can find endless restaurants where you can try a delicious ceviche (fresh fish marinated in lemon juice), perhaps a seafood soup called Parihuela or other dishes based on fish and shellfish, which are the main base of Peruvian cuisine.



140.2 Love Park

The Parque del Amor is located in the neighborhood of Miraflores, it was inaugurated in 1993 on Valentine's Day in honor of lovers. In a perfect place to walk and you will be able to observe its benches made with colored mosaics, which in some way evoke Park Güell in Barcelona. You can also read different phrases written by famous poets dedicated to love, see the sculpture "El beso" by the famous Peruvian Victor Delfin and a heart-shaped garden made with flowers.

140.3 Huaca Pullcana

Huaca Pullcana is an archaeological zone where a pre-Inca civilization existed between 200 and 700 AD, it was abandoned for centuries and was not recovered until 1967, after years of restoration it is currently one of the city's greatest tourist attractions.

This archaeological complex has a pyramid shape and reaches a height of 25 meters, it is made up of a set of patios, squares and structures that belonged to this culture. The recommendation is to go up to the highest part of the pyramid on the seventh floor, from where you can see curious views of the ruins with modern buildings around them.



140.4 Barranco neighborhood

Barranco neighborhood is an old fishing village that is currently the bohemian neighborhood of the city, it is worth walking along San Martín avenue with its residential buildings, hotels, art galleries and the beautiful Barranco square, you will also see a series of murals that they are a reflection of his urban art. The other recommendation is to go to the boardwalk to have fantastic views of the sea.

140.5 Cathedral Basilica of Lima

On one of the sides of the Plaza de Armas is the Basilica Cathedral of Lima and it is the most important temple in the country. On the outside you can see several intermingled styles, since its facade with its plateresque details is Renaissance, its towers are neoclassical, while inside you can see the ceiling recreated from a starry sky with baroque, neoclassical and Renaissance styles in its decoration, you can also see 13 beautiful chapels full of details, the beautiful Choir Stairs and the Crypt of the founder of Lima Francisco Pizarro.

140.6 Miraflores

Bordering the Miraflores boardwalk is a 5-kilometer promenade that sits on a cliff above the famous Costa Verde, with excellent views of the Pacific Ocean. In the northern section of the pier you can see a lighthouse and a marina, where you can get the best perspectives, and then continue along the walk stopping at its beautiful parks until you reach the most famous shopping center in the city called Larcomar. Some locals in the surrounding area offer you a paragliding flight to skirt the coast of Lima and also a bike tour that includes a guide in Spanish.



140.7 Saint Francis Monastery

Located near the Plaza de Armas is the San Francisco Monastery, famous for its incredible library, where you can see thousands of ancient texts including some that are from the time of the Spanish conquest. The monastery has a basilica and a high altar in the neoclassical style, a beautiful sacristy, a cloister and a chapter house. It is also well known for its immense catacombs, where approximately 70,000 corpses rest.

140.8 Magical Water Circuit

The Magic Water Circuit also called Reserve Park is located in the southern part of the old town and has 13 fountains whose water jets are completely synchronized with lights of different colors, for obvious reasons, the recommendation is to go at night to enjoy the beautiful show.

140.9 San Martin Square

As you walk through the old town, you will surely at some point pass through San Martín Square, which is definitely one of the most atmospheric places in the city. Several historic buildings are concentrated in this square, such as the Gran Hotel Bolívar, the Giacoletti building, the Colón Theater and in the center of the square there is a statue erected in honor of General San Martín, who was the manager of the independence of Peru. Nearby is also Jirón de la Unión street that leaves the Plaza de Armas, this is considered one of the most commercial streets in the city, where you can find a whole range of items to buy. In the surroundings of the square you can have a few drinks and taste Peruvian cuisine until the wee hours of the morning.

Lima is one of the most beautiful capitals in South America, full of history and interesting places to show.

140.10 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

ONE

LISBON

Lisbon in the capital of Portugal and one of the most beautiful cities in Europe, being a mixture between a traditional city but at the same time cosmopolitan, which gives this metropolis a special attraction.



This city has one of the oldest histories on the European continent since it was founded 3000 years ago and after Athens, it is the oldest capital in the entire European Union, being built 400 years before Rome.

The Tagus River flows into Lisbon, which is the longest in the Iberian Peninsula, thanks to its strategic position, in its port the ships that traded between the Mediterranean and the North Sea were replenished. Also because it is located in the southwestern corner of Europe, it was an important point for trade routes with America and Africa.

To get to know Lisbon, there are countless tours that can show you the city, but if you prefer to travel on your own, we are going to give you some tourist tips that can be very useful for you in the brand new capital.

The first thing is that the airport is in the same city, so it is a very good option to take a taxi from the airport to the center of Lisbon.

One of the most emblematic attractions is the Castle of San Jorge, a large fortification that stands on one of the city's hills. This castle originated after the Arab invasion and later became the Royal Palace, after the reconquest of King Alfonso I for Christianity. The castle was destroyed after the Lisbon earthquake in 1755, but even so it is one of the main monuments that you must visit, also from there you will have the best views of the Tagus Estuary and the city, being

the great viewpoint over Lisbon. But if you want different panoramic views, you can go to the Santa Lucía viewpoint that is located over the popular Alfama neighborhood, whose view is more oriented towards the inner part of the Tagus estuary. Even if you walk around the surroundings you can see the church of Santa Lucía built in the 18th century and reach the Puerta del Sol viewpoint, where you can see the perspective of the eastern part of the city.



Going down you will see the neighborhood of Alfama, one of the most authentic in Lisbon, where you will find small houses with colored facades and several traditional restaurants where you can enjoy the musical expression of Fado and arriving in the city along the same route, you will find with the Sé de Lisboa Cathedral that was built from the year 1147 and is the oldest church in the city, in a romantic style, next to which a Gothic-style convent was later built, where archaeological excavations are currently being carried out.



One of the most typical events is to get on one of the old trams, one of its most popular lines among tourists being tram 28, which runs from the Baixa neighborhood to the Castle hill.

Most of Lisbon's commercial life takes place in the Baixa neighborhood and you can take the Santa Justa elevator from the lower area of the neighborhood to the upper area, where the Alto and Chiado neighborhoods meet. One of the attractions is precisely getting on this elevator built in 1902 and this metal structure is more than 45 m high, from its top you will have the best panoramic views of the city.

The Chiado neighborhood is one of the most luxurious areas of the city where you can find modern shops, restaurants and cafes. The Barrio Alto stands out for being a space to enjoy nightlife, full of bars, restaurants and terraces where you can drink until dawn and you can also get there from the Santa Gloria elevator, which is a rack tram that takes you You can go up from the Plaza de Restauradores.

The nerve center of the city is the Rossio Square that extends to the Restauradores Square, in its center is the monument to Don Pedro IV who was the first emperor of independent Brazil.



If you like Portuguese tiles, you should visit the Tile Museum located in the old convent of the Madre de Dios, where in addition to seeing the vision of Lisbon made in a spectacular set of tiles, you can see the interesting corners of the Church. This artistic gem made of tiles demonstrates Lisbon at the beginning of the 18th century, before the earthquake leveled the old Royal Palace and the Baixa district.

Your visit to Lisbon will not be complete until you go to the Belem neighborhood where you can see some of the most emblematic monuments of the city, such as the Torre de Belem, the Jerónimos Monastery or the Monument to the Discoveries.



The Jerónimos monastery is the best example that exists in Portugal of the Manueline style in architecture, founded at the beginning of the 16th century and you can walk through its beautiful cloister and other outstanding rooms such as the church of Santa María, which is from the same period and gothic style. While the tower of Belem located in front of the monastery is also from the 16th century and was built to defend the city from attacks by corsairs or other enemies. During your visit you will be able to visit all the floors of the Manueline-style tower and when you reach the terrace you will have the best panoramic view of the monastery.

But if you have a passion for sweets, you should visit the establishment where the popular Belén cakes are made. These sweets that are so famous in Lisbon have been produced in this historic factory since 1837 and today, it has numerous rooms where you can taste these delicious cream cakes.

This beautiful city is made up of seven hills and uses an elevator and three funiculars to transport the population to the highest parts of Lisbon. Lisbon is full of history and can offer you a warm stay, as well as a large number of interesting places to discover.

141.1 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

TWO

LONDON

London is a city with an excellent cultural offer, with museums with incalculable collections, impeccable green spaces, street markets to get lost in, charming neighborhoods and endless activities that you will not have the opportunity to get bored at any time. In addition to all its tourist attractions, you can go shopping in some of its commercial streets and enjoy the gastronomy of every part of the world.

You can spend an entertaining morning in Cadem Town where you will find the largest market in the city, with more than 1000 stalls and shops to go shopping or eat at any of its street stalls, you can also listen to live music.

In the Palace of Webminster you can find both the British Parliament and Big Ben, which is one of the icons par excellence in London. This tower, built in 1858 in the Gothic style and which is over 100 m high, stands out because one of its four clocks is on each of its faces. While it is true that when we talk about Big Ben, everyone usually refers to the Clock Tower, it is actually a gigantic bell weighing 14 tons that you find inside the tower and next to Webminter's Palace (with its gothic style). Victorian) located on the banks of the Thames and are considered a World Heritage Site.



The most famous bridge in London is the Tower Bridge built over the River Thames in 1894. It is a stone drawbridge and a steam engine is responsible for raising it, you can see the mechanism and climb to the top to find the glass walkway,

where you can enjoy the spectacular views of the city, the recommendation is to approach the bridge both day and night and view it from both banks.



Walking through the parks of London is one of the best activities you can do for free. The most famous and largest park in the city is Hyde Park where you can find several monuments, a huge lake, a rose garden and Kensington Palace. However, there are other very beautiful parks within London, the most important to visit being: St James's Park, Regent's Park, Kew Gardens and Primrose Hill.

Another of the most relevant attractions is the oldest religious temple in London, which is Westminster Abbey. It is there that almost all the coronations of kings, monarchs, princes' weddings and their funerals have been held since the year 1066. The Abbey has a beautiful Gothic-style interior and you can find the tombs of illustrious people and kings such as Charles Darwin, Charles Dickens, Isaac Newton and Laurence Olivier.

On the other hand, the most popular meeting point between locals and tourists is a small square called Piccadilly Circus, where you can see neon advertising signs, giant video screens, a famous fountain that contains the sculpture of Eros and you can enjoy performances live, street musicians and a lively atmosphere.



One of the best places to visit in the city is the British Museum, which is one of the most important in the world. Inaugurated in 1759, it has an extensive collection of important works such as the Rosetta Stone, a Moai from Easter Island and the marbles from the Parthenon in Athens, among many other pieces.

The favorite neighborhood for most tourists is Notting Hill, which stands out for its beautiful colored houses and the famous Portobello market. The best day to visit is Saturday morning, since that is when the market reaches its greatest splendor. There is also one of the best restaurants called Duke of Wellington, where you can try traditional food.

There are also other neighborhoods that offer you the most authentic atmosphere in the city such as Soho, Chinatown, Covent Garden which is where the theaters where the great musicals are performed, Marylebone with beautiful Victorian architecture and the exclusive neighborhood of Mayfair, in where the wealthy people live with their expensive restaurants and luxury shops.

The Tower of London is a castle built in the year 1078 that is a place worth visiting and once you cross the walls that surround the castle you can visit the Medieval Palace, the White Tower, the Royal Chapel and the site where they are located. the Crown Jewels, considered one of the most valuable treasures in the world.

You cannot miss Buckingham Palace, which is the residence of Queen Elizabeth II and where a large part of the historical moments of the United Kingdom have occurred, it is important to observe the changing of the guard that takes place in front of the palace, since it is everything a show.



It is impressive to be able to see the immense dome of Saint Paul's Cathedral and the second largest cathedral on the planet and inside you can see beautiful works of art. Going up to the dome guarantees great views of central London or you can go down to the crypt where the remains of the Duke of Wellington and Nelson are kept.

One of the most famous squares is Trafalgar Square, where Nelson's column stands out with its 50 meters high and on one of its sides is the National Gallery where one of the most important art collections in the world is found. However, this city has other impressive museums such as Madame Tussauds, which is the most important wax museum in the world, the Science Museum that houses the Foucault pendulum, the Earl of Rosse telescope, the Apollo X module, among other important inventions. In the Natural History Museum you can see the blue whale skeleton and reproductions of dinosaurs that will leave you in awe. Finally, the National Gallery that contains an immense collection of paintings by artists such as Rembrandt, Michelangelo, Van Gogh, Goya, Velázquez and other great geniuses.

The best viewpoints in the city are The Shars building with more than 300 meters high, the London Eye where you can see the city from huge glass cabins or the Sky Garden, which in addition to being an excellent viewpoint has a beautiful botanical garden in its interior.

For lovers of local cuisine, we recommend the best markets in the city, where you can buy all kinds of items and taste the food of Londoners, among the most important are Brick Lane, Ladenhall, Borough, Maltby Street and Broadway.

London is full of wonders to discover, it is a city full of history, technological advances, cultural and artistic elements, which will make your visit an unforgettable experience.

142.1 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

THREE

MADRID

Madrid is a fascinating city, it is perfect for visiting museums, shopping, tasting its excellent gastronomy and it stands out for being the city that never sleeps, you can party in its liveliest neighborhoods or try delicious dishes in its most Famous.

Although it is true that the city offers endless experiences, we are going to show you the most emblematic places so that you know the most important things about this incredible city. So we have made a list of what we consider to be those essential places that you must see in Madrid.

143.1 1 - The Gate of the Sun

In this square you can find several points of interest such as the symbol of Madrid, which is the statue of the Bear and the Strawberry Tree, but perhaps the most emblematic place is the Casa de Correos where you will find a small plaque that marks the kilometer zero of Spain, also you will see the equestrian statue of Carlos III.

143.2 2 - Main Square

This square is surrounded by important buildings such as the Arco de Cuchilleros, the Casa de la Panadería and in the Bar la Campana you can eat its traditional squid sandwich.



143.3 3 - The San Miguel Market

This is the largest meeting point with gastronomy and one of the most important markets in Madrid, it is characterized by its wonderful iron architecture and has more than 30 places where you can enjoy typical Spanish dishes.



143.4 4 - The Town Square

This square is one of the few places that still retains its medieval appearance, its buildings evoke that time as the House and Tower of Lujanes and the House of the Villa.

143.5 5 - Almudena Cathedral

This cathedral was built on an old mosque in the most important religious building in Madrid, it stands out for its huge dome and its stained glass windows that create a magical atmosphere. You can go up to the dome that has a platform where you can get a wonderful view of the surroundings.

143.6 6 - The Royal Palace

It was the residence of the kings of Spain being the largest palace in Western Europe, it is currently used for tourist visits and certain state ceremonies, from the Sabatini gardens you can take excellent photos of the palace and once inside you can see the royal rooms , its luxurious halls, the Royal Pharmacy and the impressive Royal Armory that has one of the most important collections in the world.



143.7 7 - The Temple of Debod

This ancient Egyptian temple is more than 2200 years old, it is a beautiful place that Egypt gave to Spain where you can contemplate the best sunsets and from its viewpoint you can glimpse the Royal Palace, the Casa de Campo and the Almudena Cathedral .

143.8 8 - The Plaza España

This square is loaded with monuments and historic buildings such as the Casa Gallardo, the Cervantes monument, the Tower of Madrid with its 142 meters high, the building of the Asturian Mining Company and the imposing Spain Building, on its roof there is the Hotel Riu Plaza España and where you will have stunning 360° panoramic views of all of Madrid.

143.9 9 - The Great Way

It is the most famous street in Madrid where the largest shopping centers are located, it is also famous for its theaters where you will find the best musicals and works of the moment.

143.10 10 - Cibeles Square

There you will find the beautiful Cibeles fountain where the Real Madrid titles are held, you can see the car pulled by the lions of the goddess Cibeles, there are also the Buenavista Palace and the imposing Cibeles Palace where the town hall is housed .

143.11 About the Author

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CHAPTER

FOUR

MALAGA

Malaga is a city in Spain and is the capital of a province with the same name, it is bathed by the shores of the Mediterranean Sea and is surrounded by mountains that protect it from the cold. The sea acts as a thermal regulator and characterizes this city for its mild temperatures that range between 22.8 °C and 13 °C throughout the year.



Malaga has a great environmental wealth at the mouth of the Guadalhorce River, which has become a place of passage to house hundreds of migratory species with great ecological value. On the other hand, the Malaga Natural Park is the habitat of more than 160 vertebrate animals and 230 plant species.

This city was founded by the Phoenicians during the 8th century BC. C. on the Costa del Sol and in its historic center there is a great architectural and cultural heritage, interesting museums, hundreds of bars, restaurants and extensive beaches to enjoy to the fullest.

We are going to mention the essential places you must visit to get to know the best of this city.

144.1 The Alcazaba of Malaga

The Alcazaba is the most popular tourist attraction in Malaga, this palace was built by the Arabs in the 11th century, with a fortress to protect the home of the Muslim rulers from the attacks carried out by the Catholics. Inside you can see beautiful patios, gardens and sumptuous fountains.



The sites that stand out the most are the Plaza de Armas, the Puerta de los Arcos, the Torre del Homenaje and the Cuartos de Granada where the kings lived, who are the jewel of the palace and you will fall in love with their meticulous Nasrid-style decoration that you can see in its royal rooms and patios.



The palace was built on a hill that offers you a beautiful view over the port and the sea. There is also a small archaeological museum where Moorish pottery and ceramics are exhibited.

144.2 Larios Street

Calle Larios is the most famous in Malaga, it is one of the most luxurious and elegant shopping streets in all of Spain, it was opened in 1891 and financed by the wealthy Larios family from Malaga. It is a wide street surrounded by imposing buildings and packed with locals and tourists who love shopping or who prefer to have a drink in any of its many bars.

This street begins in the Plaza de la Constitución where you can see the Café Central (one of the emblematic sites of Malaga) and the beautiful Fuente de Génova.

144.3 Malaga Cathedral

This cathedral is one of the impressive Renaissance architectural works of Andalusia, it is located in front of the Plaza del Obispo and its construction was carried out between 1525 and 1782, not only did it last for so many years but due to financing problems there are still several elements such as the roof, the second tower and the sacristy, which are

unfinished. However, despite the setbacks, it is worth seeing its impressive baroque façade, the set of seats of the Pedro de Mena Choir and the High Altar, which in themselves are a masterpiece.

144.4 Gibralfaro Castle

Gibralfaro Castle can be found by going up a path from Alcanzada or by taking the 35 bus from the Paseo del Parque. This monumental work is an Arab fortress built in the 14th century where you can tour its wall and its eight towers, among which is the Torre Mayor with its 17 meters high and from there you can enjoy one of the best views of the city. town.

144.5 The Picasso Museum

The Picasso Museum is located in the Palacio de Buenavista and is the most important museum in Malaga, where you can see 285 works by this genius of painting in a 16th-century Renaissance building. Picasso is one of the great masters in the history of art and contributed cubism as a revolutionary technique.

If you are an art lover, the other two most important museums are the Thyssen in Malaga and the Pompidou Center, where important pictorial works by renowned Spanish artists are housed.

144.6 The Roman Theater

This theater was built by order of Emperor Augustus in the 1st century and is the main monument in the city since Roman times. On the free visit you will be able to see several marble plaques found in the orchestra area, the beautiful pulpit and a large part of the original stands. After the visit you can take a walk through the streets near the theater to go to the Plaza de la Merced where the birthplace of Picasso is, a large stone obelisk and a sculpture of the painter.

If you are tempted to taste typical Malaga dishes, in the area you will find places that are cataloged as the best traditional food restaurants in the city, such as Casa Lola, El Pimpi and Cortijo de Pepe.

144.7 Stroll through the Port

Strolling through the port at sunset is another of the best activities you can do in Malaga. You will be able to see cruise ships, fishing boats, luxurious yachts and approach the commercial part of Pier 1 where they offer you a wide range of shopping, restaurants and leisure. You can also walk through the area that reaches the Farola, so you can see the emblematic lighthouse of Malaga and if you do the tour during the day, you can finish with a dip in the famous Malagueta beach.

144.8 Soho Neighborhood

It is the neighborhood of the arts where you will find impressive graffiti by renowned urban artists, the most important are around the CAC and in Casas de Campo, Barroso and Trinidad Grund streets. You can also enjoy cultural centers such as the Teatro del Soho, art galleries, the CAC Málaga, design venues and alternative shops.

144.9 Malaga Park

In this park you can enjoy Baroque and Renaissance style gardens, tropical trees, beautiful fountains, tiled benches and sculptures of famous people. At the end of the walk you can go to the Puerta Oscura Gardens and the Pedro Luis Alonso Garden, both with stunning views of the Alcazaba.

144.10 Atarazanas Market

The Atarazanas Market was a naval workshop of Nasrid origin and stands out for its large horseshoe arch and its iron structure, as well as stalls where they sell high-quality products and numerous places where you can enjoy traditional food. If you go for breakfast you can go to Casa Aranda to try their delicious churros with chocolate or if you prefer a stronger dish, you can eat at La Bella Julieta.



Atarazanas Market photo taken by David Pinter

Malaga a spectacular city to visit and enjoy in a big way!

144.11 About the Author

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CHAPTER

FIVE

MELBOURNE

The city of Melbourne is situated in the southern Australian state of Victoria. Opening out like a fan from the shores of Port Phillip Bay, Melbourne is home to over 4 million residents and regularly features in the top rankings of 'world's most livable cities.

Founded on the banks of the Yarra River in 1835, the discovery of gold transformed this faraway settlement into one of the wealthiest cities in the world.

Decades of prosperity created a metropolis filled with grand civic buildings, cathedrals, theaters, and parks. Wander down the wide avenues of Collins and Burke streets for old-school architecture that'll make your eyes pop.

Then hop on a tram -Melbourne has the most extensive streetcar network in the world.

No other space in the city says Melbourne like Federation Square. Overlooked by Flinders Street Station and St Paul's Cathedral, 'Fed Square' does what Melbourne does best, artfully blending the elegance of yesteryear with edgy, modern design.

While you're at 'Fed Square', grab a ticket to one of Melbourne's hippest museums, The Australian Center of the Moving Image.

At ACMI, discover the rich history of Aussie cinema and explore the interactive possibilities of tomorrow.

And don't forget to head underground to the Melbourne Visitor Center, for the low-down on what's up, in Melbourne. Just across the Yarra is Southbank.

Check out the public art, shopping and dining, or just hang out with locals and watch the river, slide on by. While you're at Southbank, ride the elevator to the 88th floor of the Eureka Tower, named after the famous 18th-century miners' rebellion.

The city's great paintings are not confined to its galleries. Melbourne rates with New York and Berlin as one of the world capitals of street art.

Wander the inner city lane-ways with street art lovers from all over the world. You may even catch an artist at work. If Melbourne has a fragrance, it's the aroma of roasting coffee beans. In this city, great coffee, food, and fashion are not luxuries, but the essentials for daily life.

Spend a morning exploring the hundreds of stalls at Queen Victoria Market. Sample the region's finest and freshest produce, and witness first-hand just how seriously Melbournians take their food. Melbourne can thank its immigrants for developing the city's taste buds.

Peek into the lives of the newcomers who helped shape Melbourne's culture at the Immigration Museum. Then taste the cuisines they introduced to Australia in famous food strips like Lygon Street and Acland Street.

Just a short roll from the pâtisseries of Acland Street is Luna Park, the bayside fun-fair that's been putting a smile on Melbourne since 1912. Take a ride on one of the world's oldest roller coasters, but be sure to let those pastries settle first!

From St Kilda, follow the boardwalk south to where the true giants of Melbourne architecture await -the Bathing Boxes of Brighton Beach.

This row of heritage listed boxes is one of the most photographed spots Downunder. When it comes to presentation, Melbourne has the Midas Touch, whether it be in the sharp lookin' displays of The Melbourne Museum, the breathtaking exhibits of the city's aquarium, or just life's simpler pleasures.

Welcome to Melbourne, where everything is done with style, passion, and a whole-lotta-cool.

145.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

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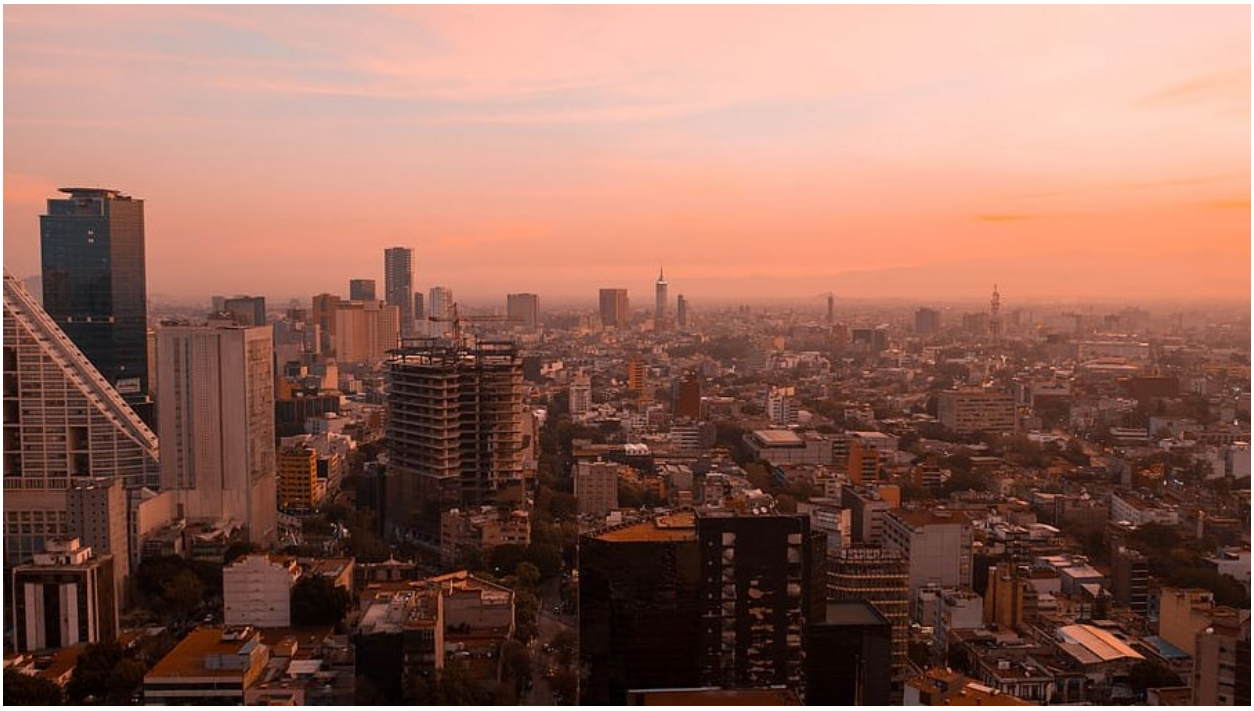
CHAPTER

SIX

MEXICO CITY

It is the capital of Mexico and one of the largest cities in the world with more than 20 million inhabitants, it is located above sea level at more than 2000 meters. Mexico City has a beautiful historic center, with the Zócalo square being the meeting point for tourists and locals. This city is full of incredible museums, ruins of ancient civilizations, charming neighborhoods, huge green areas and squares animated by mariachis, which make it a vibrant place and a paradise for tourists who visit it.



We will guide you through this article through the most important sites that you cannot miss if you visit this great city.

146.1 The Zocalo

The Zocalo or also called "Plaza de la Constitución" impresses with its size as well as the frenetic activity and social life. It is one of the largest squares in the world and has at least 5 centuries of history, being the point of celebration of any number of cultural activities, parties, concerts and other manifestations; It was declared a World Heritage Site and there you can find the Metropolitan Cathedral and the National Palace.

The Cathedral took almost 250 years to finish, inside you can find emblematic jewels such as the Crypt of the Archbishops, the altarpiece of the Kings, the Choir and the Royal Chapel.

Regarding the National Palace, you can marvel at the works of Diego Rivera, one of the most important muralists in the history of art.

146.2 Palace of Fine Arts

The Palace of Fine Arts is located in the Alameda Central Park, in this lyrical theater important opera stars such as Luciano Pavarotti, María Callas or Plácido Domingo have passed. The palace is a mix of Art Deco and Art Nouveau styles, featuring a huge bronze dome, a Carrara marble façade and precious sculptures that adorn its exterior. Inside you can see 17 murals made by seven national artists and in its Main Hall, an opalescent glass curtain.

For its part, the Alameda Central park also offers you a perfect place to walk among sculptures, trees and fountains, it is considered the oldest public garden in America and it is worth taking a walk to see it.



146.3 Main temple

The Main Temple is the ruins of the center of religious and political life of the ancient Mexican civilization, it is located near the Zocalo in Tenochtitlan, which was the ancient Aztec capital, this temple was buried when the Spanish colonization of 1521 built on it a new town. However, different archaeologists throughout the 20th century gradually discovered parts of the ancient temple and today you can visit the ruins in which several buildings and the remains of a double pyramid stand out. On the other hand, the best pieces found in the great temple are in a museum located on the sides of the complex and one of the jewels that stands out is the great stone relief offered to the lunar goddess Coyolxauhqui, there are also other treasures such as the figures of Tlaloc or Mictlantecuhtli, the sphinx of the god of fire or the impressive monument of Tlaltecuhtli.

146.4 Coyoacan neighborhood

This is the bohemian neighborhood, located to the south of the city and is the benchmark of artistic and cultural life in Mexico City, for a long time it has been the residence of several renowned artists, established in large colonial houses. It has several markets, museums and bookstores. In this neighborhood you can visit the famous Casa Azul where Frida Kahlo lived with Diego Rivera until the day of her death, today it is a museum with a large collection of paintings and various personal objects of Frida Kahlo, they will help you to understand the history of this controversial artist.

Other interesting places to see in Coyoacán are the Municipal House, the San Juan Bautista parish, the León Trotsky House Museum, the Centennial Garden, the Plaza de la Conchita, the House of Hernán Cortés and the Mercado de Antojitos Mexicanos, are places that will show you one of the most charming areas in the city.

146.5 Francisco I. Madero Street

Francisco I. Madero Street is packed with restaurants, shops and street artists that blend with its great architectural heritage. Among the buildings that stand out is La Casa de los Azulejos, which is a colonial palace whose facade is covered by tiles and a beautiful interior. This street also concentrates other important buildings such as La Casa Borda, the Iturbide Palace, the Guardiola Building, the "La Mexicana" Building, the Templo de la Profesa and the Torre Latinoamericana, where you can enjoy one of the best views of Ciudad de Mexico when climbing to its 204 m height.

146.6 The forest of Chapultepec

This forest is the green lung of the city and in addition to offering pleasant walks either along its trails or on a boat in its artificial lake, you will also find a great cultural offer such as the National Museum of Anthropology. This museum is one of the most important in the entire continent and has the largest collection of pre-Hispanic art on the planet and among its most important objects is the tomb of Pakal, La Piedra del Sol, the Teotihuacan Sculptures, the Tlaloc Monolith, among many others.

146.7 Visit the pyramids of Teotihuacán

Teotihuacán is located less than 50 km from Mexico City and in ancient times it was one of the largest pre-Hispanic cities in America. You will be able to see one of the largest pyramids in the world, which is the Pyramid of the Sun, and then go through La Calzada de los Muertos and finally, visit the Pyramid of the Moon, where you will have spectacular panoramic views of the entire archaeological complex.



146.8 San Angel neighborhood

In this old colonial town the buildings are still preserved thanks to the money of many wealthy families who chose this space to rebuild their large mansions. Currently it is a place to stroll through beautiful squares and buy the best handcrafted souvenirs of Mexico City. The recommendation is to go on a Saturday when the markets are set up in Plaza del Carmen and Plaza San Jacinto where you can find paintings, antiques, ceramics and regional dolls, among many other things.

In this neighborhood there are also other interesting places such as the Plaza de los Arcángeles, the Plaza de los Licenciados or the Casa Estudio de Diego Rivera, you can also try the local cuisine such as fresh waters and delicious quesadillas in the restaurants of the area or the street stalls.

146.9 Basilica of Saint Mary of Guadalupe

This basilica is the most visited religious site dedicated to the Virgin in the world and this large complex made up of several buildings is of great historical value, the Capilla del Cerrito stands out, where you will see several frescoes that recall the appearance of the Virgin. You can also see the Tepeyac Cemetery, which is the oldest in Mexico, the old Convent of Las Capuchinas, both the old and the new Basilica de la Guadalupe and the Capilla del Pocito, to complete the wonders of this site.

146.10 Xochimilco

Xochimilco means “land of flowers” and was declared a World Heritage Site, it is one of the most picturesque sites in the city. You can stroll through the different canals with a traditional boat adorned with flowers and painted in colors, where you can see parties with mariachis walking on the boats with an excellent atmosphere.



Mexico City offers you a wide range of history, culture, warm people and endless interesting places to visit.

146.11 About the Author

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CHAPTER

SEVEN

MONTEVIDEO

Montevideo in the capital of Uruguay and is one of the most welcoming and quiet cities in South America, there are almost no traffic jams and you can walk calmly through the city, in addition to its bookstores and markets that give it a very special touch.



Montevideo is a city that is very well located geographically, since it is halfway to the main tourist attractions in Uruguay. If you decide to get to know this city, we will guide you through its main tourist attractions and the best things you can do and see in this beautiful capital.

147.1 Intendancy viewpoint

If you want to have a panoramic view of Montevideo, one of the best places for it is the Mirador de la Intendencia, since not only is there a 22nd floor but it is also totally free.

147.2 July 18 Avenue

It is the main avenue of the city and the best places to visit are near Avenida 18 de Julio. Although it is true that this road is somewhat gray, you can find many restaurants and shops.

147.3 Independence Square

Around this square are most of the tourist sites of Montevideo and separates Avenida 18 de Julio from the historic center of the city. In the center there is a statue of the liberator of Uruguay José Gervasio Artigas and below the monument is the mausoleum built in his honor.



147.4 Palace Saved

This palace is the emblem of Montevideo and is one of the best visits you can make in this capital. Although it is true that it was designed to be a hotel, this business could never materialize and currently they are spectacular apartments where you can stay.



147.5 Rambla of Montevideo

La Rambla de Montevideo is a maritime promenade of approximately 20 km long, which borders the coast that goes from Ciudad Vieja to Carrasco. It is a quite pleasant walk where you can glimpse several beaches and parks, among which is the Parque Rodó.

147.6 Beaches in Montevideo

The busiest beaches in Montevideo are between Ciudad Vieja and Carrasco, the main ones are: Playa Ramírez, Playa de los Pocitos, Playa Buceo, Playa Brava, Playa Malvin, Playa Honda, Playa Verde, Playa de los Ingleses, Playa Carrasco and Playa the mulatto Although it is true that these beaches have a brown color, it does not mean that they are polluted, but rather that Montevideo is very close to where the Río de la Plata empties and drags some land.

147.7 Parque Rodó and the Summer Theater

Parque Rodó is on the Rambla very close to Playa Ramírez and is a fairly large park where you will find a pond, as well as the Summer Theater. If you travel to Montevideo between the months of December and February, the recommendation is to find out if there is any performance in this theater, since it is one of the best things to see in the city.

147.8 Legislative Palace

The Parliament of Uruguay has its headquarters in the Legislative Palace and the recommendation is to visit it at 7:00 p.m. since that is when the flag is lowered, you will be able to see a group of soldiers in a ceremonial act where they take the flag, fold it and they take it away If you have the opportunity to take a guided tour, it is the best way to get the historical details of each of the rooms of the Palace. Then you can visit the Montevideo Agricultural Market which is located about 10 minutes from the Legislative Palace.

147.9 Dr. Tristán Navaja Market

This is one of the most famous markets in Montevideo and takes place every Sunday on Dr. Tristán Navaja street in the Cordón neighborhood. There you can find everything you can't imagine, from vegetables to books, through furniture, antiques, animals, music, clothes and more.

147.10 Where to eat in Montevideo

Uruguayans are specialists in good food and drink, they have the most refined culinary taste. To have a Madrid sandwich and some delicious churros with chocolate for breakfast, the most recommended is the Facal cafeteria on Avenida 18 de Julio or have breakfast at a well-known hotel chain called La Pasiva, where you can find very complete breakfasts at a very low price. .

We advise you to try the authentic Uruguayan asado in the Mercado del Puerto, which, although the prices are a little higher than average because it is very tourist-oriented, is really worth it. You can also have lunch or dinner at Mercado Ferrando, where there is an old furniture factory that today is a gastronomic market. There you can eat from Hawaiian food, through authentic Mexican tacos to taste Basque pintxos.

In Ciudad Vieja in Plaza Constitución there is a restaurant called Aperitivo en La Corte, which is an ideal place to enjoy a good Uruguayan wine with a table of simply delicious cheeses and sausages.

In the Old City itself, we recommend you have a coffee at La Farmacia, which although it is currently a cafeteria, it was a pharmacy between 1890 and 2007, but it still retains the aesthetics of a pharmacy in its old days.

Bookstores that are also coffee shops are a peculiarity of Uruguay, so specifically in the Escaramuza bookstore it is highly recommended to have a coffee.

If you want to have a snack, the recommendation is to try the pastries of a cafeteria located in the Carrasco neighborhood, which is a place with a very pleasant, cozy garden and sweets from another world.

147.11 The places to visit in Montevideo at night

Although it is true that this city does not have an impressive nightlife, you can have some spectacular craft beers at the Mercado Agrícola de Montevideo or at Mala Fama. You can also have dinner at Chivipizza, which is an artistic, modern and cozy space in the Carrasco neighborhood, which is characterized as the most luxurious neighborhood in the city.

The other recommended place is to have dinner at La Pulpería where you can enjoy a delicious Uruguayan barbecue in this small tavern, far from the tourist crowd.

Remember that one of the best recommendations for going out at night is to see a show at the fabulous Summer Theater.

Uruguay is a city to live and enjoy, its pleasant atmosphere, dishes are delicious and Uruguayans are wonderful people.

147.12 About the Author

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CHAPTER

EIGHT

MOSCOW

Prepare the Vodka cause we're about to dive in to Mother Russia!

The first stop in the former Soviet Union. It is the U point up on Sparrow Hill, overlooking all the city of Moscow. Never take the wrong Metro station to get there because you'll be more than lost and probably never seen again! Just kidding!

Welcome to the Red Square here in Moscow! Now, the Red Square is the main central square, with festivals, demonstrations, parades, you name it.

It has become more of a central gatherings place for all Mosconians… Moscownians, Musconites, Moscanites? I don't know, "the people who live in Moscow!".

It's actually home to the Kremlin, that is where the government of Russia is, the president. It's also home to St. Basil's Cathedral, that magnificent building of The State Museum, which has the history of Russia.

about visiting Russia, one thing you really have to say is: don't prejudge Russia. Whatever you hear in the news, and all these kinds of stuff. There're so many people and media out there saying bad stuff about Russia. Don't believe and judge for yourself!

It is a wonderful place to visit so don't be influenced by that stuff. Come explore for yourself.

You really want to go and explore this beautiful country, Moscow to be precise!

Also, another thing you should be careful about is: do not lose - don't lose! - your registration card. When you come into Russia, they're going to give you like an immigration card they'll fill out. You need that when you leave. If you don't have that it can cause some trouble. So, make sure you don't forget it. Don't think "Oh, it's just a piece of paper, whatever!" Don't forget it, okay!

Moscow is expensive. Whether it's the visas, the hotels, restaurants, stuff like that, you will spend a lot as a foreigner here. And kind-of going along with that is: don't get upset if you see two different prices and you as the traveler have to pay a higher price, because some museums in places actually have two set of prices, one for locals and one for foreigners. So don't get upset by it, but just realize that sometimes you are going to pay more and don't try to weasel your way out of it, coz they know if you're a local or not. Don't f@#k with the cops or any kind of the government officials when you are in Moscow. don't stare at the cops, don't take pictures of the cops, don't ask them things because they have to help you, you don't want to give them a reason to ask for your documents and stuff like that, okay, so just don't mess with the police when you are there.

Visit All the Churches! Churches? Oh well… its churches, whatever!" Man, come into the Russian Orthodox churches with the icons, the gold, the silver, and everything, it just blows your mind, whether you're going to Saint Basil's or the "spilled blood" church here, I mean, there's so many amazing churches throughout the country. Don't skip those, but also don't wear a hat when you're there. But if you are a woman: do cover your head, because, it's an orthodox country, they're conservative, so you want to show respect for that.

Russians are badass cold-hearted people who drink Vodka and eat bears! Don't assume the Russians are cold-hearted kind of people. If you get to know Russians, they really warm up to you. I mean, I can't tell you how many times I

heard from friends how “Babushkas” have taken them in and made them their cabbage rolls, don’t be scared of that language as well.

Learn some of their culture and even their superstitions! it really opens up the people, don’t shake hands over the threshold, don’t give flowers in even numbers, just so, you know, it makes things a little bit better.

Weird, I know. But this is Russia!

148.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel’s whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through UpWork.

CHAPTER

NINE

NEWCASTLE

The second-largest city in New South Wales and the sixth-largest in Australia. It is located at the mouth of the Hunter River. It is known, quite reasonably, as the 'gateway to the Hunter Valley' and certainly is the commercial, administrative and industrial center of the region.

It has numerous beaches, a rich heritage of Victorian architecture, a fascinating early convict history and a substantial number of excellent restaurants and upmarket accommodation options.

Historically a coal and steel town (exploiting the excellent harbor at the mouth of the Hunter River and the vast deposits of coal under the Hunter Valley) it has had to reinvent itself in the past two decades.

Today it is a modern city with an elegant and updated harbor foreshore (lots of chic restaurants and pleasant boardwalks) and enough attractions to keep an interested visitor involved for at least a week.

Australia's second oldest city, 'Newie' as it is affectionately known, is just a two-hour drive north from Sydney in the eastern state of New South Wales.

Like Sydney, Newcastle is bound by a harbor and glorious beaches, but its population of just under 300,000 makes it a quieter option for a weekend getaway or holiday. It is also the gateway to the Hunter Valley, one of Australia's major wine regions.

The best way to explore the stunning Newcastle coastline is to take the Bathers Way, a scenic walk from historic Nobbys Head Lighthouse to Glenrock State Conservation Area. Stop for a swim at the art deco Newcastle Ocean Baths and the Bogey Hole, a rock pool built by convicts in 1819. I love adventure, specially ziplining! soar on zip-lines at the Treetop Adventure Park or learn to surf at the Newcastle Surf School.

Wildlife experiences include meeting koalas the cutest thing ever! at Blackbutt Reserve, or whale watching with CoastXP and Nova Cruises during the migration season from May to November.

Newcastle is a city of fabulous events too. The sporting calendar is jam-packed, from the biggest surfing festival in Australia, Surfest, in February to the Newcastle 500 supercars in November.

Music lovers also have regular concerts and the Newcastle Jazz Festival in August.

Do as the locals do and wander down to the nearest markets on a weekend. Held at Newcastle showground, the Newcastle City Farmers Markets is a meeting point for artisans. There are blacksmiths and jewelry makers, painters, photographers and toy makers. You'll also find a vast selection of organic and conventionally grown foods including lamb, beef, pork, goat, trout, oysters, charcuterie and cured meats. Also check out the Hunt and Gather markets, a boutique designer hub where stall keepers offer antique and pre-loved designer clothes, jewelry, art and food.

149.1 About the Author

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NICE

Nice belongs to the Provence region, specifically to the Alpes-Maritimes department of the Côte d'Azur in France. It is located next to the Mediterranean Sea a few kilometers from Monaco and Italy, being one of the most frequented tourist destinations both by the French and by travelers from all over the world. Nice seduces for its privileged location, beaches with crystal clear turquoise waters, for its climate, its art galleries, museums and its beautiful historic center.



Through this article we will guide you through the most important tourist sites in Nice.

150.1 Vielle Ville

One of the best activities to do in this city is to lose yourself in the streets of the Old City, surrounded by historic buildings with their wooden shutters in yellow and ocher colors, its curved and narrow streets, terraces full of people, shops from all over the life, old churches and markets that will enchant you at first sight. In addition to finding a large number of charming corners, the recommendation is to go to Maison Auer, opened in 1820, to try its delicious chocolate, the ice creams from Fenocchio or Azzurro and the socca from Chez Pipo. In this area there are also two of the best restaurants in the city: Les Amoureux and Le Millésime.



150.2 Promenade des Anglais

The Promenade des Anglais is an avenue adjacent to the beach of Bahía de los Ángeles with about 7 kilometers, the name comes from the first tourists (mostly British) who took long walks along this avenue. It is worth walking this long street to see the beautiful facades of the buildings in the Belle Epoque style, take a photo in the popular blue chairs, which are a symbol of the city and see the exclusive Negresco hotel. It is also a place for lovers of sports that are practiced outdoors and especially for roller skaters. You can even access any of its public beaches to take a swim in the beautiful turquoise blue waters that characterize the Costa Azul.



150.3 Saint Nicholas Cathedral

The Cathedral of Saint Nicholas is similar to the Saint Basil's Cathedral that remains in Moscow, it was built in 1912 to honor Tsar Nicholas II of Russia by the immense community of Russians who stayed to live and fell in love with this city, It is also the largest Russian Orthodox cathedral outside of Russia and is really worth visiting.



Photo taken by Steve Cadman

150.4 Castle Hill

Castle Hill is the best vantage point in Nice and you can walk or take a lift up from the end of the Promenade des Anglais (promenade of the English). At the top you can see some remains of a medieval fortress, a large artificial waterfall and a botanical garden, but without a doubt the best thing is the wonderful views of the orange roofs of the Old Town, the Walk of the English and Lympia Harbour.

150.5 Lascaris Palace and Matisse Museum

The Baroque-style Lascaris Palace is located in the Old City and was built in the 12th century. The palace stands out for an exterior façade similar to that of Italian palaces and a rather ornate interior, where collections on the history of the city are permanently exhibited.

Another of the emblematic sites of Nice is the Matisse Museum dedicated to the famous French painter Henri Matisse,

since he lived in Nice for more than 30 years. The museum is located in the Villa des Arenes built in the 17th century, where you can enjoy an extensive tour of many of the paintings by this renowned artist, in which the use of intense colors predominates.

150.6 Flower Market

The Flower Market or Marché aux Fleurs de Cours Saleya is located in the heart of the old town, being the most beautiful and famous market to see in the city. In this market you can find all kinds of flowers, vegetables, food, spices and some souvenirs. It opens every day (except Monday) from six in the morning and closes at six in the afternoon, with the square full of parasols and several terraces that invite you to enjoy the atmosphere.

150.7 Nice churches

Among the most important churches in the city are:

The Cathedral of Santa Reparata: this church was built between 1650 and 1699, being one of the best examples to see in the city of the Roman Baroque style.

Church of St-Jacques (Gesù): it has a Corinthian façade, as well as a bell tower that is 42 m high and is another example of Baroque architecture in Nice.

Basilica of Notre Dame: this church has a style similar to that of Notre Dame in Paris and inside you can see its eight side chapels.

150.8 Lympia Harbor

This port is one of the oldest on the Côte d'Azur, it was built in the 18th century and is located at the foot of the ancient citadel of Lympia. This beautiful rock-cut port is surrounded by historic buildings with their facades painted in the typical colors of the city, and has numerous pleasure boats and yachts. From there you can book one of the excursions offered by boat and which are very popular among tourists who visit the city, such as the exclusion that runs along the coast of Nice and Monaco or the one that will take you to Cap Ferrat.

150.9 Nice squares

The city has beautiful squares, among which is the Rossetti, the Palace of Justice and especially the Garibaldi and Massena squares.

The Plaza Massena is surrounded by old buildings, full of picturesque cafes, restaurant terraces and we consider it to be the most beautiful in the city. It also has one of the most important works of art in Nice, which is a sculpture with seven people kneeling on a pole representing the seven continents.



Images George Rex

Garibaldi Square is another of the most famous and around it are elegant buildings whose facades are ocher yellow and with green shutters.

150.10 Excursions from Nice

You will be able to get to know the Côte d'Azur by taking day trips to the most beautiful towns and cities that are within walking distance. Among the excursions most valued by travelers are:

- The Excursion to Monaco and Eze
- The Excursion along the Côte d'Azur
- The Excursion to San Remo and Menton
- The tour of Antibes, Annes and Saint Paul de Vence
- The Excursion through the towns of Provence

Nice is one of the most spectacular cities in France and if you have the opportunity to visit it, you will take back beautiful memories.

150.11 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

ONE

PARIS

We know, COVID-19 had us locked up in homes, so I'd like to take you in a virtual trip to Paris since it's the main sites people are missing on visiting during these terrible times.

Paris is located in the northern part of France, on the river Seine, let's start with the Eiffel Tower. North of the Eiffel Tower you will find Arc de Triomphe, and the famous shopping street Champs-Élysées.

Les Invalides, containing museums and monuments related to the history of France as well as Napoleon's tomb is located east of the Eiffel Tower. The two most famous museums in Paris, the Louvre Museum and the Musée d'Orsay, are located close to each other, on opposite sides of the Seine.

If you go south of Place Georges Pompidou, you'll find Île de la Cité, where the Notre-Dame Cathedral is located. South of Notre-Dame you will find the Luxembourg Gardens, Montparnasse, which offers an amazing view of the city,

Normally, you will arrive at one of the following airports: Charles de Gaulle Airport the city's main international airport, Orly airport, or Beauvais-Tillé and smaller Châlons Vatry airport which are mostly used for low-budget airlines.

There are seven major train stations in Paris, one of which is Gare du Nord, the hub for arrival in and departure from the city via local rail systems and Eurostar.

Paris has an Oceanic climate with cold winters and hot summers. Rain is frequent all year round. Although temperatures typically range between 37° and 50 °F or 3° and 10 °C, it can be snowy in the winter. Because Paris is located in northern Europe, the days get shorter in late October and November. Plan accordingly to enjoy your day trip or outdoor activities as much as possible. The weather in the spring is unpredictable, and Summers are humid, with possible thunderstorms during the day.

The best time to visit Paris is in the spring from April to June, or in the fall from October to early November. At these times of the year, the weather is mild, and the tourist crowds are relatively small. Early December, January, and February are the cheapest months to visit Paris. Probably, the least convenient time to visit Paris is August, when there are crowds everywhere. But don't worry, since Paris is one of the most beautiful cities in the world, you'll have a great time regardless of the season. And how can you figure out the best days and hours to see the attractions? Just check Google to see how crowded a specific location is.

Many travelers stay in Paris for three days and try to see the highlights of this beautiful city in this short period. While you can visit most major attractions in three days, if you don't want to be in a hurry, we recommend staying at least one or two extra days.

Paris is generally a safe destination, but there are some neighborhoods to avoid, especially at night. And typical for all major cities around the world, beware of pickpockets, especially around major attractions.

A great way to discover Paris, is to join a walking tour, organized by professional guides who know a great deal about the city's rich history. Some providers even offer free walking tours. However, at the end of the tour it is recommended to make a donation.

Paris offers "The Paris Pass", which allows you to save money if you plan to visit several museums and other attractions and want to skip the line at some sites.

You can enjoy amazing views of Paris from one of the following places: Sacré-Cœur, Eiffel Tower, Montparnasse, Arc de Triomphe, Galeries Lafayette. Everyone knows the Eiffel Tower or the famous shopping avenue Champs-Élysées. But the city of lights is also full of interesting hidden gems.

Did you know that Paris has its own Statue of Liberty, looking exactly like the one in New York City? Except, it's smaller. In fact, it is a quarter-scale replica of Liberty Enlightening the World, commonly known as the Statue of Liberty.

The one in Paris is located on Île aux Cygnes, and if you still want to see more Statues of Liberty in Paris, there are others, like the one in Musée d'Orsay and its copy at Jardin Luxembourg. Or the one at Musée des Arts et Métiers. Or if you just want to see the flame, there's one known as Flame of Liberty Paris.

And did you know that there is a small secret apartment at the top of the Eiffel Tower? It was built by Gustaf Eiffel to entertain the science elite like Eiffel's friend Thomas Edison, and some say also to make some Parisians jealous.You can see Eiffel's cozy apartment if you take the tour to the top of the Eiffel tower.

Paris is famous for good food, sweet pastries, and interesting and unusual bars. You can visit Lavomatic, where you literally enter through the washing machine. Try Ice Kube Bar where you can order a cocktail from an ice bar in an iced glass.

You are going to have a blast once you actually visit the city!

151.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through UpWork.

CHAPTER

TWO

PATTAYA

is a city on the East Coast of the Gulf of Thailand about 100 kilometers south-east of Bangkok, It is a place that has beautiful temples, stunning beaches and so many activities to get involved in, making it a great place to visit.

A quiet fishing village as recently as the 1960s, this city has it all, whether you love shopping, culture, history, entertainment, dining or the bar scene, there's something for everybody.

Here are some of the best sites to visit if you're into good old tourism where you like stuff such as ancient sites, beaches, and other activities normal tourists do, cause you know, this is Pattaya after all, and if you no nothing about what it's famous for, you gonna wait till the end of this article to figure it out!

- The Sanctuary of Truth

is located in the Naklua area of Pattaya, a small way out of town on a spectacular piece of coastline with a great view. Built entirely of wood, the detail and craftsmanship that has gone into the temple is simply breathtaking.

Ornate carvings and sculptures are based on traditional Buddhist and Hindu symbols, and the high peak of the building reaches an impressive 105 meters.

- Coral Island

Nicknamed Coral Island, this small island is officially named Ko Lan and is situated 7.5 kilometers off the coast of Pattaya.This is a place that you could happily spend a day, relaxing on the beach, swimming in the clear waters or enjoying all the fun water-based activities that are available. There's a selection of different beaches to choose from and a quaint little town with local restaurants and shops. Getting to Coral Island is easy and cheap from Pattaya and ferries depart and return regularly throughout the day.

- The Big Buddha

The Big Buddha at Wat Khao Phra Bat temple is one of Pattaya's most striking landmarks. Located just south of Pattaya, the enormous golden coloured statue is 18 meters high and was constructed in 1977.

The Buddha sits at the top of a grand set of shallow steps and is the focal point of the small temple situated on the top of the hill. The location provides some of the best views in Pattaya, with a panorama over practically the entire city and the scenic crescent-shaped bay.

It's also rich with bars and clubs where you can party all day and night!

But, the main thing Thailand and specifically Pattaya known for is:

Sex tourism! It remains a sizeable chunk of Thailand's overall tourism trade, and there's thought to be tens of thousands of sex workers operating in Pattaya alone, which has led to it being dubbed the sex capital of the world by various publications.

The red-light district is covered in various go-go bars, each featuring dancers in varying stages of undress performing for the crowd. After sitting down at a bar, it's typical for women to join you and ask for "lady drinks", though this isn't something you're obliged to get involved in and it's fine to tell them no. Baccara A Go Go is one of the most popular bars on the strip, along with Airport Club, where guests can enjoy regular shows by dancers on their stages. Alcatraz

is also a popular bar and, in keeping with its name and the atmosphere of the city, features prison cells and handcuffs that can really get pulses racing.



All along walking street, you'll meet hundreds of people enticing you into their venues, whether it's for harmless fun, transgender shows or bars, or with something a little smuttier in mind. Much like on Khaosan Road in Bangkok, you'll meet people offering to take you to all manner of shows, such as the infamous "pingpong show", which can get irritating but it's to be expected in such a place. Many massage shops are also quick to offer the "happy endings" that are often joked about at home.

You may be surprised to learn that, given the reputation of Pattaya and the open nature with which sex is sold on the street, sex work is illegal in Thailand. Nevertheless, that doesn't stop it from happening – though it's not just as simple as picking someone up and leaving. "Bar fines" are paid to the bar to take an employee out of work, which are kept by the bar, and then a price for whatever services one might want to purchase is negotiated between the people involved. Many workers earn low salaries and depend on customers to help make ends meet – whether it's through sex work or the selling of "lady drinks"; drinks that are bought for an employee, of which they keep half of the price of the drink for themselves.

The most famous prostitute road in Pattaya is Beach Front also known as Promenade.

You can find hookers 24/7 here, but the best time to visit is after sunset. They are standing on the side road waiting for customers, usually playing with their phones.

If you like a girl, don't hesitate, just say "hi" and start a conversation. Then ask what is the price for either a short time or all night. Usually, the prostitutes in Beach Road prefer to go for a short time, but that doesn't mean you can't find hookers for the whole night.

Be aware of the many ladyboys in Beach Front, easy to spot because they are very aggressive in trying to "boom boom" you. The typical prices are less than 1.000 baht for short time and 1.500 baht for all night.

152.1 About the Author

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CHAPTER

THREE

PORTO

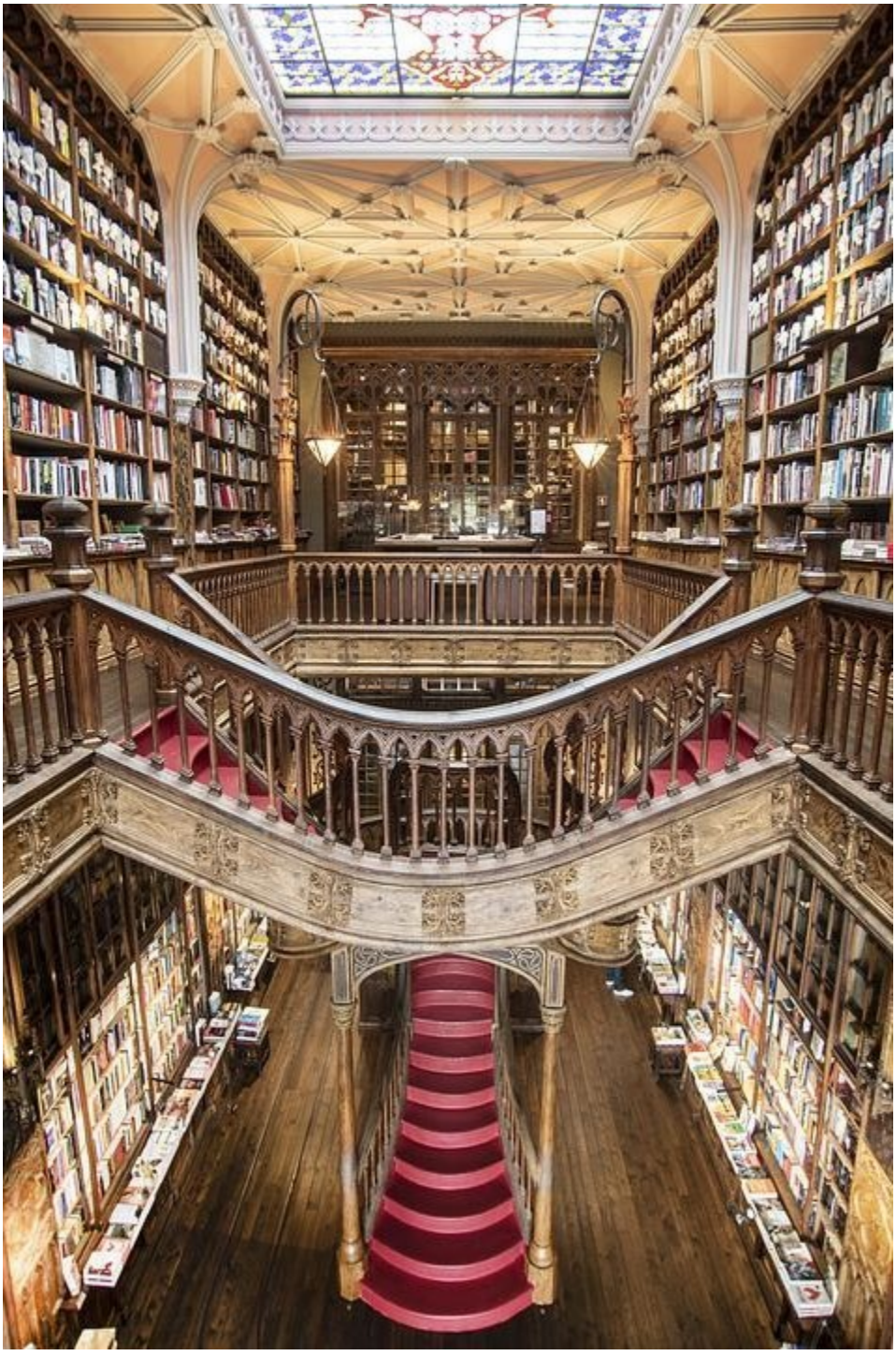
Porto is one of the most surprising and charming cities in Portugal, known for its famous wine and for the bridges that pass over the Douro River. It offers you a large number of tourist activities such as strolling through the Ribeira towards sunset, visiting the Bolhao Market, climbing to the top of the Clérigos Tower, watching the sunset over the Luis I bridge, tasting a Bacalhau a Brás or a francesinha or drink a glass of wine in any of the Vila Nova de Gaia wineries, are just some of the many activities you can do in Porto.



We will provide you with a guide to the most emblematic places that you should know if you visit this beautiful city.

153.1 Lello and Irmão Bookstore

This bookstore is located in a neo-Gothic building built in 1906 and is considered one of the most beautiful in the country. It stands out for its impressive wooden staircase and the natural light that passes through the stained glass window located on the ceiling, inside you can enjoy a large number of modernist and neo-Gothic details.



153.2 Clerigos Church and Tower

The Clérigos Church was built between 1735 and 1748 on the Cerro de los ahorcados where the executions were carried out, it has a 76 m high tower and when you climb its 240 steps you can see its 49 bells. Although it is true that it requires a good physical effort, it is worth going up for the privileged views that you will get of the city.



153.3 Ribeira

The walk known as Cais de Ribeira is one of the busiest and most famous places in the city, where you can see buildings with colorful facades and terraces full of people who gather, either to have a glass of good Port wine. or eat excellent cod with views of Vila Nova de Gaia and the Duero.

During the walk you will see several rabelos, which are the traditional Portuguese boats, which are in charge of carrying the wine barrels from the vineyards to the cellars that are in Vila Nova de Gaia. You can also book a Douro river cruise that goes under the 6 main bridges of the city and once you get off the boat, you will be very close to the Casa do Infante, built in 1325 and the birthplace of the discoverer Enrique el Navigator.

153.4 The Porto Cathedral

The Porto Cathedral located in the Batalha neighborhood, is the most important religious temple in the city. This church built in the 12th century has a sober exterior, but inside you will be surprised by its beautiful cloister decorated with 14th century tiles in the Gothic style, where religious scenes are shown and you can access the Casa do Cabildo, where you can find objects religious that are considered as the treasure of the cathedral.



In the Plaza de la Catedral you can see a column that was used in the past to execute criminals, as well as a fabulous terrace where you can get magnificent views of the city. Another of the important churches is San Lorenzo dos Grilos, located near the cathedral. It was built between the 16th and 18th centuries and stands out for housing the Museum of Sacred Art and Archeology.

153.5 Do Barredo neighborhood

This neighborhood is located between the cathedral and the banks of the Duero River, where you can find the true essence of the city. In this area, the Torre do Barredo, the Ruas Das Largas, the Miradouro da Rua das Aldas, Largo da Pena Ventosa and the Escadas do Barredo stand out.

153.6 Street of the Flowers

Rua das Flores is one of the most beautiful streets in Porto, lined with historic buildings, cafes and iconic shops such as Mercearia das Flores which specializes in Portuguese products. At the end of the street is Miradouro da Vitoria, which is an excellent viewpoint of the city. In this street you can try the delicious local cuisine such as Bacalhau a Brás or Francesinha in Petisqueira Voltaria, you can also eat at the restaurant O Buraquinho da Sé its famous Octopus al Lagareiro.

153.7 Bolhao Market

Mercado do Bolhão opened its doors in 1914 and reopened in 2020 after an excellent restoration. There you can find all kinds of stalls to buy quality products such as meat, fruits, vegetables, fish and even flowers, there are also stalls where you can try the local food.

153.8 Rua Santa Catarina

Santa Catarina street is located near the Bolhao market starting from Praça do Marquês de Pombal until you reach the Majestic café. This is the commercial street in the center of Porto where you will find several shops, restaurants, a shopping center and several tiled churches, such as the beautiful Chapel of Souls or the Church of Santo Ildefonso, as well as the beautiful facade of A Perola do Bolhao where they sell sausages and the impressive building of the Sao Joao National Theater.

153.9 Stock Exchange Palace

The Palacio de la Bolsa was declared a National Monument and this neoclassical-style building has a large central patio inside, protected by a glass structure where natural light passes through. If you go up to the second floor through its marble and granite staircase you will find several beautifully decorated rooms such as the Golden Room, the General Assembly Room, the Renaissance-style Court Room and the Arab Room that was inspired by the Alhambra.

153.10 Church of San Francisco

The Church of San Francisco built in 1245 is located next to the Palacio de la Bolsa. Inside you will find three baroque-style naves covered with golden carvings, for which they had to use about 300 kg of gold dust, you will also find the sculpture of the Tree of Jesse and finally, the catacombs.

153.11 Vila Nova de Gaia

In Vila Nova de Gaia there are the Port wine cellars, where you can learn about its production process. Among the best known wineries are Croft, Cálem, Sandeman, Ferreira and Graham's, at the end of the guided tour in any of these wineries they will give you to taste some of their wonderful wines. At the end of the visit you can take the cable car at the Dom Luis I bridge station and go up to Jardim do Morro, to enjoy excellent views of Porto.

153.12 San Bento Station

Even if you don't have to travel by train, it's worth visiting this station built at the beginning of the 9th century and decorated with more than 20,000 tiles that reflect the country's history.

153.13 Porto Walls

The old medieval wall that surrounds Porto is also known as the Fernandina Wall, it has some very well preserved sections such as the one between the Luis I bridge and the Santa Clara Convent, the other interesting piece is in the Escadas de Caminho Novo where you will have a beautiful panoramic view. Another wall is the Primitive one that surrounds the area of the cathedral, it was built in the 3rd century and also has a well-preserved section.

153.14 Crystal Palace Gardens

This Romanesque-style park has many interesting sites such as the Emílio David Garden, the Castaños and Tilos avenues, several thematic gardens such as Medicinal Plants, Aromatics, Feelings, Roses, among others.

The city of Porto is much more than the wine it produces, it has endless interesting things to discover.

153.15 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

FOUR

PRESCOTT (PRONOUNCED “PRESKIT” OR “PRESKUT”BY THE LOCALS)

Prescott became the first territorial capital of Arizona Territory in 1864, succeeding the temporary capital at Ft. Whipple just north of Chino Valley. Over the next few years, the capital moved from Prescott to Tucson, to Prescott and then finally to Phoenix in 1899. The moves were according to the vagaries of Arizona politics. Prescott was, and is, a genuine “old west” town full of all the usual stories, characters (cowboys, miners, prostitutes, gamblers, drunkards), and ambiance of the historic American west. It is the county seat of Yavapai County, AZ.

Prescott Frontier Days, the world’s oldest rodeo, was first held on July 4th, 1888 and has been a major event every year since. The list of notable people from Prescott is lengthy (see the link at the end of this article) for a small city, and residents included Virgil Earp (Wyatt’s brother) and Doc Holiday who both spent time in Prescott. Prescott also includes part of the Yavapai Prescott Indian Tribe reservation. One block of Montezuma Street, downtown, known as Whiskey Row, contains the oldest bar and restaurant in Arizona, The Palace, which opened in 1877 and is the oldest continuously operating business in the state. Whiskey Row was near the red light district. It is on one side of the central courthouse plaza, a beautiful park-like centerpiece to the city, known for it’s extraordinary Christmas lighting display. The Arizona Pioneer’s Home, a continuing care retirement home, is located in Prescott and is funded by the state of Arizona. There are a number of old mining towns within a short distance as well.

As of 2021, the population of Prescott is a little over 46,000 and it is surrounded by other small towns, bringing the estimated population of the metropolitan area to about 221,000. Located near the center of Arizona, there are mountain ranges running north/south on the east and west of the city. This results in a climate that is quite variable and somewhat unpredictable. Prescott has a Monsoon Season that is generally recognized to be from mid July to mid September, during which some very heavy rain storms can be expected. However, isolated very heavy rains are sometimes seen at other times of the year, but average yearly precipitation is only about 17-18 inches. The variable nature of the weather was exemplified in 2020 when the monsoon season yielded so little rain that I called it the “nonsoon season”.

In addition to the distinctly western culture, Prescott boasts quite an array of music and other festivals, such as Bluegrass, Earth Day, Cinco de Mayo (a Mexican holiday), a Navajo Rug Auction, and a number of sporting events. Yes, there is even an opera house. Arizona’s first Elks Lodge (BPOE) is in Prescott. There are three colleges in town: Prescott College, Yavapai College and Embry-Riddle Aeronautical University, Prescott. Transportation is easily available via multiple highways, an airport and a shuttle service. There are many outdoor recreation opportunities, including fascinating geographical features (huge rock formations), lakes and hiking trails galore. As I mentioned in one of my other articles, there are also many off-road trails to challenge the best 4x4 monsters. There are hundreds of buildings that are on The National Register of Historic Places (many Victorian structures). Prescott IS HISTORY!

I guess one can tell that I find Prescott to be a fairly interesting place (understatement, duh). Here are some links to further resources touting Prescott and its varied attractions and statistics:

- https://en.wikipedia.org/wiki/Prescott,_Arizona
- https://www.prescott.com/
- https://www.prescott-az.gov/
- https://en.wikipedia.org/wiki/List_of_people_from_Prescott,_Arizona

- https://www.bestplaces.net/people/metro/arizona/prescott
- https://www.visit-prescott.com/
- https://www.tripadvisor.com/Tourism-g31323-Prescott_Arizona-Vacations.html

154.1 Logo



154.2 About the Author

Harley Armentrout is a happy husband and father, former silversmith, aerospace electronics prototype assembler, test, calibration & repair technician, also writing test procedures at BallAerospace. Then 21 years in the gaming industry, in a range of positions, culminated as a Gaming Inspector, observing and reporting on rules violations, safety issues and

criminal activities for the Yavapai Prescott Indian Tribe. After "retiring" Harley taught himself a few graphic design skills, and he works as a freelance designer.

CHAPTER

FIVE

RIO DE JANEIRO

Rio de Janeiro is one of the most colorful cities in Brazil, famous for its tremendous carnivals and is a destination as diverse as it is fascinating. It is the second city with the largest population and the most touristic in the country, known throughout the world for its cultural and sports icons, its landscapes and its passion for life.



If you want to enjoy Rio de Janeiro to the fullest, we are going to guide you through this article so that you do not miss the most emblematic places of this wonderful city. From the beaches to the most authentic neighborhoods and from the forests to the hills.

155.1 Ipanema and Leblon Beach

Although it is true that Ipanema is a place better known for its beach, its neighborhood is one of the most exclusive in the city and is full of great joints and fashion stores. You can enjoy its spectacular beach or if you prefer to surf, the recommendation is that you go to Leblon beach. However, one of the best panoramic views of Rio de Janeiro is at the Leblon viewpoint, where you can appreciate the entire coastline and drink some cocktails at dusk.



155.2 Rodrigo de Freitas Lagoon

This lagoon is located near Ipanema and is one of the most beautiful natural sites to see in Rio de Janeiro. It is a huge mirror of water where the soul of the city is reflected and is surrounded by more than 7 km of a route that you can travel by bicycle or on foot, you will also find many beach bars where you can have a caipirinha or any other cocktail.

155.3 Copacabana

This beach has 6 km long to swim where the locals call the Princess of the Sea, being one of the most touristic and charming places in the city. You can also walk the bohemian streets of the neighborhood to taste Brazilian cuisine and learn about the customs of the Cariocas.

155.4 Lake Park

Park Lake is a delight for nature lovers, as well as being a site adored by its local inhabitants. There you can find small lakes, English-style gardens and a beautiful mansion that houses the School of Visual Arts where you can enjoy performances and free art exhibitions. In addition to observing the landscape, you will be able to see toucans and monkeys among the foliage.

155.5 Corcovado and Christ the Redeemer

The most emblematic place in Rio de Janeiro is located at a height of 709 meters above sea level, where Christ the Redeemer is located at the top of Mount Corcovado. It is a 30 m high Christ with its arms open to receive the thousands

of tourists who go up to see it every day next to the viewpoint that is at its foot, where you can have a 360 ° view of Rio de Janeiro. You can go up by taxi, but there is also a funicular that leaves every 30 minutes from Cosme Velho.



155.6 Bread of Sugar

The "Bread of Sugar" is a 338 m high rock that is located in the Guanabara Bay, surrounded by nature and can be seen from anywhere in the city. The best way to go up is using the cable car that you can take every 20 minutes. You will travel 1400 meters between the hills of Babilonia and Urca, to find yourself with one of the most impressive views of Rio de Janeiro and the Bay.

155.7 Santa Teresa neighborhood

Barrio Santa Teresa is a colonial area where you can get on the electric train or try delicious traditional food in Largo de los Guimaraes. Its beautiful colonial streets at the top of a hill, together with an artistic atmosphere in the Parque das Ruinas, offer you an unforgettable experience. It is important that you get to the neighborhood of Lapa where you will find the Selarón stairs, there are 250 colorful steps that will give you the feeling of having a work of art on your feet.

155.8 Maracana

The Maracana is one of the most iconic football stadiums in the history of this sport and one of the most important places to visit in this city. It is advisable to see a game between the teams from São Paulo and Rio, in addition to the fact that around it there is a walk of fame offered to the greatest soccer players in history.



155.9 Museum of Modern Art (MAM)

The MAM is the cultural reference of the city and probably of all of Brazil, there you will be able to see an endless number of artistic creations from both established local painters and promises of Brazilian art. The construction of the building was designed by the architect Alfonso Eduardo Reidy and is a true work of art.

155.10 Tijuca Forest National Park

This national park has 28 km^2 of extension that includes the mountains and coastal hills of Rio de Janeiro and is considered the largest urban jungle on the planet. Inside there are rock formations such as Pedra de Gávea or Corcovado, with an exceptional panoramic view and it is also home to countless species of both animals and plants, it has a large number of natural fountains and waterfalls that will leave you breathless.

155.11 Museum of Contemporary Art of Niterói

The Niterói Museum of Contemporary Art is located in a futuristic building designed by the genius Oscar Niemeyer, located on a cliff of Guanabara Bay. This construction of sinuous forms invites you to see some of the most creative and innovative exhibitions in Brazil, a magical and wonderful place.

155.12 Botanical Garden

This garden is an oasis of tranquility built at the beginning of the 19th century in order to store plants and seeds to acclimatize them to the tropics, with an impressive avenue of palm trees you can see toucans, hummingbirds and poised falcons. It also has an Orchid Garden with more than 1,000 different types of tropical orchids and the largest water lily in the world.

155.13 National Museum of Fine Arts

This museum houses the most complete collection of Brazilian art in the country, it has more than 20,000 works ranging from classical art to the Brazilian avant-garde and you will be able to see the history of Brazil through the eyes of its most outstanding artists, where you will understand the idiosyncrasy of the Brazilian people.

155.14 Sao Bento Monastery

This monastery is a reflection of the Brazilian baroque and represents the work of various local artists for 70 years, you will be able to see vaults, paintings and columns to consecrate the Virgin of Montserrat.

155.15 Favelas

The favelas are the other face of this city where you can see the life in the commune of the traditional cariocas, the most important are the Santa Marta favela, the Cantalago favela for its excellent views, in the Tavares favela you can find live music and in Vidigal there are pensions, restaurants and bars for tourists.

Rio de Janeiro, an exotic city to enjoy!!!

155.16 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes

CHAPTER

SIX

SAN FRANCISCO

San Francisco is a city in the United States capable of falling in love at first sight with its Victorian-style houses and its geographical location around the bay. This city is far from the chaotic and noisy big American cities, San Francisco also has delicious cuisine and a mild climate.



We are going to guide you through this article through the main tourist attractions of the city.

156.1 The Golden Gate

The Golden Gate Bridge is the quintessential symbol of San Francisco and was built in 1937, it measures almost 3 km wide and 227 m high, it is on the list of the most beautiful bridges in the world and to enjoy it is advisable to access one of the viewpoints that are around the bridge, one of the favorites is Battery Spencer or any of the others that are on the side of Conzelman Road, where you can get fantastic views of the Golden Gate, the city and the bay background.



156.2 The Presidio Park

In this huge park, families gather to enjoy a quiet day or relax on Crissy Field beach, but if you are looking for a beach with a better view of the bridge or something quieter, you can go to Baker beach, and then finish visiting the Walt Disney museum located inside the park and learning about the history of this celebrity.

156.3 Fisherman's Wharf

Fisherman's Wharf is the fishermen's quarter and the old port that has been restored until it has become a beautiful tourist site. You can start the route through the different piers from Ghirardelli Square, such as seeing the historic ships at Hyde Street Pier or the USS Pampanito submarine along with the SS Jeremiah O'Brien, both from World War II, at Pier 35. You can also visit the Musée Mecanique where you will find hundreds of old arcade machines and finally, go to the famous Pier 39 that has an open-air shopping center, an impressive colony of underwater lions that you can see them lying in the sun and try the clam chowder that is one of the typical dishes of the city, consists of a round homemade bread with clam chowder served inside the bread.

156.4 Alcatraz Island

This island was a military fort before becoming one of the most famous prisons in the world known as The Rock. This prison operated from 1934 to 1963 and is currently one of the best visits and experiences to do in San Francisco. To get to the island you must board one of the boats that are taken at Pier 33 and when you arrive at Alcatraz you will be able to see the cells and the different rooms of the prison, such as the one where Al Capone was.



156.5 Castro neighborhood

The Castro neighbourhood is known for being one of the places where the current rights of the LGBTI community and the acceptance of sexual diversity were fought the most. Among the most outstanding sites is the former home of Harvey Milk, who was one of the great representatives of this community, the theater, the Victorian houses in the colorful streets located around number 18 and some of the best restaurants such as the Bar & Seafood Market or the Anchor Oyster and a famous bakery like the Hot Cookie.

156.6 Haight-Ashbury

Haight-Ashbury is the place where the hippie movement was born in the 60s where you can see Jimmy Hendrix's house, the Victorian houses that are on Waller Street, second-hand hippie-style stores such as Buffalo Exchange, a store for buy vinyl and places to listen to live music.

156.7 Painted Ladies

The Painted Ladies are Victorian-style houses that are painted in different pastel colors located on Steiner Street between 710 and 722. While it is true that the city had more than 50,000 houses before the 1906 earthquake in this same style, they still exist many very well preserved and scattered throughout the city, although these are the best known.



156.8 Twin Peaks

Go up the Twin Peaks hill to get one of the best panoramic views of the entire city, these twin hills are almost 300 m high that will allow you to see Alcatraz or the Golden Gate on a clear day. It is advisable to see the fabulous sunset towards sunset.

156.9 Golden Gate Park

The Golden Gate Park is a large green expanse that measures 5 km long by 1 km wide and there you can visit streets such as Shakespeare's Garden, the Japanese Garden, the Rose Garden, Stow Lake and the Great Dutch Mill, among many others. During the walk you will be surrounded by trees and plants from half the world and in its meadows live a whole community of American buffalo and coyotes. The other essential site to visit in the park is the Museum of the California Academy of Sciences, it is considered one of the best museums in the world where you can see skeletons of a great blue whale or tyrannosaurus rex. At the end of the park you can find an extensive beach bathed by strong currents from the Pacific Ocean, it is perfect for surf lovers but somewhat dangerous for swimmers in general.

156.10 Chinatown

Chinatown in San Francisco is the oldest Chinatown in the United States and the largest outside of Asia. Inside you will find a world of red lanterns, theaters, temples such as the Tin How and tea houses around Grant Avenue and enjoy the typical atmosphere of the locals in Portsmouth Square and Stockton Street, where you can see people playing games of table and tai chi.

156.11 Little Italy

The Little Italy neighborhood is a quaint neighborhood where you can sample delicious Italian food at restaurants like Golden Boy Pizza, Piccolo Forno, and Molinari Delicatessen. You can also visit the San Pedro y San Pablo church which was where Marilyn Monroe married Joe Di Maggio.

156.12 Japantown

Japantown is the largest and oldest Japanese neighborhood in the United States where you can see several tourist attractions such as the Japan Center, the Peace Square, a five-story pagoda and a shopping center with Japanese restaurants and shops.

San Francisco is one of the most beautiful cities in the United States and if you have the chance, just don't miss it!!!

156.13 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

SEVEN

SANTIAGO DE CHILE

Santiago de Chile is a city that offers you a host of charming places and a lot of experiences. It is the capital of Chile and its buildings are preserved from the Spanish colonial era, you can see the city from the viewpoints, enjoy the most bohemian neighborhoods and relax in any of its parks.



This article will take you by the hand to recommend the essential places you should visit if you want to get to know this wonderful city.

157.1 Main Square

The most iconic buildings in the city are concentrated in the main square, being the meeting point between locals and tourists. This plaza was built during the colonial era and is located in the heart of the historic center. There you can find emblematic buildings of the city such as the Post Office, the building of the Municipality of Santiago, the National Historical Museum and the Metropolitan Cathedral. However, in addition to visiting each of these points of interest, you can also enjoy the particular atmosphere of this square by seeing the locals playing chess, artists performing plays and street musicians.

157.2 The Coin Palace

The Coin Palace is the seat of the President of the Republic and where President Salvador Allende barricaded himself on September 11, 1973, to face the coup d'état commanded by the military Pinochet and ended up committing suicide. His death led to a period of just over 20 years of darkness in which the dictator Pinochet committed endless torture, murder and human rights violations.

Today you can visit the interior of the old Casa de la Moneda, which still preserves some shots from the coup plotters on its facades. You can visit the "Patio de los Cañones", the patio of the Naranjos and the Canelo.



157.3 The San Cristobal hill

One of the best activities you should do in the city is to go up the cable car or funicular to the San Cristóbal hill, for this you must take it in the Plaza Caupolicá and once up, you can enjoy the beautiful views of Santiago and the imposing Cordillera de The Andes.

157.4 The Metropolitan Park

This park is located in the beautiful Bellavista neighborhood and is the largest urban park in the country, it has approximately 700 hectares where you can find hiking trails, a Sanctuary and the viewpoint of the Virgin.

157.5 Santa Lucia Hill

You can climb the small Santa Lucia Hill walking its 69 m height located in the heart of the city. There is the Hidalgo Castle with its different terraces, where you will find a French-style park that has the Vicuña Mackenna Hermitage and the beautiful Neptune Fountain. On the other hand, this hill was where the conqueror Pedro de Valdivia founded the city in 1541 and there is a stone with an extract of the letter written by Valdivia to Carlos V of Spain.



Castillo Hidalgo photo taken by Carolina Sanchez

157.6 The Bellavista neighborhood

Bellavista is the most charming and bohemian neighborhood to visit in the city. You can find picturesque buildings with their colorful facades, restaurants, art galleries and several emblematic buildings such as Lehuedá Castle, La Chascona or Casa Roja. Around the patio of Bellavista are the famous and recommended places to taste Chilean cuisine such as "Krossbar", "Como Agua para Chocolate", "Uncle Fletch" and "Ciudad Vieja".

157.7 The Chascona

The Chascona is one of the houses where the famous poet Pablo Neruda lived. The writer bought this land and began construction in 1953, to live with Matilde Urrutia (his lover) who was nicknamed La Chascona for having long red hair. After separating from his old partner, he stayed living with his mistress until his death in 1973. There you can see 11 rooms and learn a little about the history of this famous writer.

157.8 Lastarria neighborhood

This is an old neighborhood of artists and intellectuals and it is there where most of the city's leisure and cultural offerings are concentrated. You can find numerous museums, cafes, cultural centers, quality restaurants, original shops and excellent places to have a drink to have fun with your loved ones.

The recommendation is to access Merced Street and visit the most emblematic sites such as the National Museum of Fine Arts, the Church of Veracruz, the Bruna Palace, the Gabriela Mistral Cultural Center and see a large number of buildings built at the beginning of the 20th century. Each of these places has a particular structure to show, you will surely find some history and relevant things that will especially call your attention as you will not regret having visited them.

157.9 Central Market

In the Central Market we recommend you try traditional Chilean dishes such as crab cake, fried conger eel, paila marina, empanadas in the "Emporio Zunino" and spider crab. You can also find excellent souvenirs or crafts to give as gifts. The other market that you can visit is El Mercado de la Vega, which although it is less touristy can be more authentic than the Central. There you can find meats, fruits, spices, vegetables and international products from neighboring Latin American countries and also from Asia.

157.10 Paris London neighborhood

This neighborhood is characterized by having a European architectural style with its narrow cobblestone streets. The most important site is the Church of San Francisco, which is the oldest temple in the country built in colonial times, the other places of historical importance are the local Londres 38, which was the center of extermination and/or repression between the years 1973 and 1975, in addition to the O'Higginian Institute.

157.11 Museum of Memory and Human Rights

In this museum you can feel what happened during the military dictatorship of Augusto Pinochet. You will be able to see videos, photographs, testimonies of the tortured survivors and the tragic history of all the victims of the dictatorship. This is to prevent the past from repeating itself. Then you can go to the Plaza de la Memoria, where you can see the Universal Declaration of Human Rights inscribed on one of its walls.

Santiago de Chile is a capital loaded with memory, it is a very interesting city to know and visit.

157.12 About the Author

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CHAPTER

EIGHT

SANTIAGO DE COMPOSTELA

Santiago de Compostela is a city that is located in the northwest of Spain and is one of the main places of pilgrimage of Christianity. This city falls in love at first sight with the beautiful streets of the old town, declared a World Heritage Site, for its monumental Cathedral and its prestigious university that is more than 500 years old.



In Santiago de Compostela you can taste excellent cuisine where seafood and fish predominate, such as Galician octopus, scallops, Galician empanada, barnacles or the famous Santiago cake.

We have made a list of the essential places that you must visit if you go to Santiago de Compostela, so that you do not miss the most important things.

158.1 The Cathedral of Santiago of Compostela

The Cathedral was built between 1075 and 1211 with baroque and gothic elements mixed with the romantic style, in order to house the tomb of the Apostle Santiago. Its façade is impressive and you can enter its interior through the Puerta de Platerías to visit its 16 chapels. In the back of the High Altar of the Cathedral is the image of the apostle Santiago, where many believers stop to embrace it.



The jewel of this temple is the Pórtico de la Gloria, which has numerous religious figures and you can also be surprised by the huge 50-kilo censer, set in motion to swing it during religious celebrations.

158.2 Obradoiro Square

The Square Obradoiro, in addition to the cathedral, has several interesting places to see such as the Pazo de Raxoi, which is the current seat of the town hall, the old episcopal palace, the Pazo de Xelmirez, and the old college of the city, the Colexio de Saint Xerome. However, the building preferred by most is the hospital of the Catholic Monarchs, which was built in 1501 to give shelter to pilgrims on the Camino de Santiago, today it is a hotel known as the Parador de Santiago and its interior is a true wonder.



158.3 Historic helmet

Around the Plaza de Obradoiro is the Historic Quarter that was declared a World Heritage Site, full of cobbled streets, squares, stately homes, palaces, fountains and churches that take you back to medieval times. Among the most outstanding sites are the Plaza de las Platerías, de la Quintana, de Cervantes, the stately homes of Deán, da Balconada, de la Parra and its most emblematic streets such as Rúa Raíña, Rúa do Franco, Rúa Nova and the Rúa do Vilar, all surrounded by old buildings and that are really worth visiting.

In this area there are also some of the best restaurants in the city such as Gato Negro, A Noiesa or Mesón 42. If you prefer to eat octopus, the recommendation is to go to Mesón do Pulpo and if it is a special occasion, you can go to Casa Marcelo that has a simply delicious tasting menu.

158.4 Convent of San Francisco

The Convent of San Francisco is a monastery built at the beginning of the 13th century and, according to tradition, it was San Francisco de Asís himself who ordered its construction. Although it is true that the monastery collapsed at the beginning of the 18th century and today only its Cloister, five Gothic arches and the tomb of Cotolay remain from the original building. The current building is the neoclassical baroque style and is worth a tour.

158.5 Food Market

The Food Market is the second most visited site after the Cathedral. There you can see local people buying seafood, fish, vegetables, fruits, meats, cheeses, etc. but you can also consume fresh products from the market such as oysters at A Ostrería, at Pulperia Abastos try their exquisite octopus or they cook for you at the moment at Mariscomania what you have bought in the market, for approximately five euros per diner.

158.6 Galician People's Museum

The Museo do pobo Galego offers you a walk through Galician culture through its history, it is located in the Santo Domingo de Bonaval convent. You will be able to hallucinate with its triple helicoidal staircase and the Church, where the remains of famous Galicians such as the poet Rosalía de Castro are found.



158.7 Climb Mount Pedroso

The recommendation is to climb Monte Pedroso either on foot or by car towards sunset, the views of the city, the natural surroundings and the cathedral are magnificent. The other very popular viewpoint is Monte do Gozo, which is located on a 380-meter hill 5 km from the city.

158.8 Monastery of San Martin Pinario

The Monastery of San Martín Pinario is located in the Plaza de la Inmaculada. This Benedictine monastery was built in the 10th century and stands out for its façade with various religious figures, its two cloisters and the Church, which houses a major baroque-style altarpiece and the beautiful choir stalls.

158.9 Alameda Park

The Alameda Park offers you walks among eucalyptus, chestnut and oak trees as well as several statues such as that of Rosalía de Castro, that of the two Marías and that of the playwright Valle Inclán. You can also go to the viewpoints on the Paseo de la Herradura where you will get fantastic views of the historic center and the Cathedral.

158.10 River walk along the Sarela River

Bordering the Sarela River, you can take a pleasant walk, starting with the Iglesia del Carmen de Abaixo.

Another worthwhile route is the Sar river path with its beautiful natural landscapes and you will be able to see a Romanesque temple such as the Colexiata de Santa María do Sar, built in the 12th century where you will be impressed by its interior and the inclination of its columns. Near this area there is an architectural complex designed by the architect Peter Eisenman, which is the City of Culture of Galicia, you will be pleasantly surprised by its design and its forms, in addition to its unique buildings offering an extensive cultural offer, which you cannot Stop watching.



Santiago de Compostela is a city steeped in history, which still preserves its medieval structures.

158.11 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

NINE

SARAGOSSA

This city in Spain has more than 2000 years of history and is bathed by the Ebro River. Zaragoza has an excellent nightlife and delicious gastronomic dishes such as Zaragoza-style loin, migas, Aragón ternasco and borage with potatoes. The city has a more cosmopolitan part and a more traditional part, such as its famous Basilica del Pilar.



If you plan to get to know Zaragoza, in this article we are going to indicate the essential places to see, so that you do not miss the most important things.

159.1 Basilica of Our Lady of the Pillar

The Basilica of Our Lady of the Pillar is the first Marian temple that exists in Christianity, this Baroque jewel is an important pilgrimage site since, according to tradition, the Virgin appeared on a jasper column in this place in the year 40 AD. C. and many come to see the image of the Virgin. However, non-believers can also observe its impressive exterior, which has 11 domes with glazed tiles of different colors, the Altarpiece of the High Altar, the Humilladero, the Choir, two paintings by Francisco de Goya and the Holy Chapel, which contains inside the wooden carving of the Virgin. Finally, you can enjoy unusual views of the city from the top of the Tower of the Pillar, you can also see the Ebro river, the domes of the basilica and you can go up by elevator.



159.2 Pillar Square

Opposite the basilica is Pillar Square, which is a meeting point for locals and tourists, where you can see some of its historic buildings such as La Lonja and the Town Hall (both in Renaissance style) and the Church of San Juan de los pancakes The square also has beautiful monuments such as the one dedicated to Francisco de Goya, La Bola del Mundo, which is a figure made to commemorate the discovery of America, and lastly, La Fuente de la Hispanidad, which contains the map of the Americas, only can be seen in its entirety from the top of the Tower of the Pillar.

159.3 Aljaferia Palace

The Aljafería Palace is known as the little Alhambra and was declared a World Heritage Site. It is a beautiful work of Islamic architecture built in the eleventh century, inside you can find typical horseshoe-shaped arches in the Arab style and charming rooms such as El Salón Dorado, the Torre del Trovador, the mosque, the patio of Santa Isabel, the Church of San Martín, The Throne Room and the Mudéjar Palace.



159.4 Cathedral of the Savior

The Salvador Cathedral located near the Basilica del Pilar was built on the aljama mosque and the old Roman forum in the 12th century. You will be impressed with this temple due to the excellent examples of Renaissance, Gothic, Mudejar, Baroque and Neoclassical art.



Outside you can see the impressive Mudejar dome of the Chapel of San Miguel Arcángel, the baroque tower from the 18th century and the neoclassical façade. While inside you can see the Gothic main altarpiece, the Main Sacristy, the Parroquieta, the Choir and the organ.

159.5 The Tube of Zaragoza

Going for drinks towards sunset in the Tubo area, which is located in the historic center of the city, is one of the best activities to do in Zaragoza. In its network of streets you will find many restaurants and places where you can taste the most traditional appetizers to accompany a drink, while enjoying an excellent atmosphere. You can try the delicious croquettes at Doña Casta, order the cod skewer with the patatas bravas at the "7 Golpes", the potato omelette at the Bar Circo, or taste the gastronomy at the Meli, among many others.

159.6 Saragossa Old Town

In the old town you can find old medieval buildings, Roman remains, samples of the Aragonese Mudejar, see El Torreón de la Zuda, the old Roman wall and the old Muslim tower of the alcázar.

Later you can go down Calle Alfonso I until you reach Plaza San Felipe where you can see the Church of San Felipe and several Renaissance palaces around you. The Plaza de España will be the next stop, where you can see the headquarters of the Bank of Spain, the Palacio de la Diputación and the Monument to the Martyrs that is dedicated to the people who died in the War of Independence.

From this point you can go through a part of Calle de Corso and then go walking through places like Plaza de San Pedro Nolasco, where is the Church of La Magdalena with its Mudejar tower, the Theater of Caesaraugusta, the Goya Museum and the impressive Palacio de la Real Maestranza de Caballería with its Renaissance style.

Finally, a few meters from the palace is El Arco and the Casa del Deán from the 13th century, which is definitely one of the best preserved works from medieval times, and the Plaza de Santa Marta.

159.7 Sunset from the Stone Bridge

The Stone Bridge was built in the 15th century and connects the Arrabal neighborhood with the historic center, from the middle of the bridge you will have some fantastic views of the Ebro River and that of the Pilar Basilica, the best time of day to visit this site It is towards sunset, in which you can have a panoramic view both day and night. Then you can go to the Balcón de San Lázaro and thus have a better perspective of the basilica and the bridge, both illuminated.

159.8 The Roman Saragossa

The Roman remains that are preserved from the year 14 a. C. are from a colony founded by Emperor Caesar Augustus. The recommendation is to start with the Caesaraugusta Forum Museum where an audiovisual is projected explaining the history of the Romans in Zaragoza, and then visit the River Port Museum, continuing with the Public Baths Museum and finish the route with the Museum del Teatro, where you can see the stands of an old theater built in the 1st century AD. C. with a capacity of 6000 spectators and see the Roman sculptures.

159.9 Central Market

The Central Market was designed by the architect Félix Navarro Pérez in 1895 inspired by Les Halles (a Parisian shopping center). Crossing its imposing neoclassical-style façade, you will find yourself inside the impressive iron and glass building, and then see a wide range of fresh products in the 74 stalls that the market houses.

159.10 Large Park Jose Antonio Labordeta

Once you enter this park you will find Avenida San Sebastian, full of fountains and gardens that can remind you of the Palace of Versailles and will make you fall in love at first sight.

Other magical corners of this park are the Glorieta de la Princesa, the Bandstand, the marble statue of King Alfonso I, and the Botanical Garden with its species from different corners of the world.

In Zaragoza you can see a mixture of styles from different eras and cultures, which make it a very interesting city to visit.

159.11 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

SHANGHAI

Shanghai is the largest city in China with a population of more than 24 million inhabitants and is one of the busiest ports in the world, due to its geographical position not only because of the mouth of the Yangtze River but also because of its inland waterways. It boasts world-class art galleries and museums, numerous lovely parks and gardens, as well as many traditional pagodas and ancient temples, a world-class transit system with impressive-speed train connections to other major cities.



We are going to guide you through this article through the most important sites in Shanghai so that you can visit the most emblematic places in the city.

160.1 Shanghai Promenade: The Bund

This beautiful promenade is located along the banks of the Huangpujiang River and is very popular with tourists because the area is European-style, you can find old English and French buildings that are now restaurants, offices, galleries and boutiques. You will find 52 buildings built in various styles where you will see Romanesque, neoclassical, Gothic, Baroque, Renaissance influences and one of the most impressive collections of Art Deco architecture on the planet. Other emblematic buildings are: the old headquarters of Hong Kong, the customs office of the port that has a fabulous bell tower, the Bank of China, the Shanghai Banking Corporation with a dome that you cannot miss and the old Peace

Hotel. At the Bund you can also board a boat around the harbor and cruise over the confluence of the Yangtze and Huangpujiang rivers.

160.2 Yu Garden

Also called the Garden of Happiness, it was inaugurated in 1559 and covers an area of approximately 20,000 m^2. The main room of the park has a building with walls adorned by dragons and beautiful ornaments on the ceiling, it consists of an exterior garden and an interior one. The Spring Hall is the most well-known building and the rocks in this area of the garden are of great historical importance, as it is the only surviving work of the garden master Zhang Nanyang. The newest of the gardens dates back to 1709 with attractive pavilions, miniature mountain ranges, decorative stones, small ponds and a beautifully decorated theater stage.

160.3 The Jade Buddha Temple

The current building was rebuilt in 1928 to replace the original temple that had been built in 1882. The temple is divided into two courtyards, three halls, and includes the Hall of the Kings of Heaven, notable for two Shakyamuni sculptures and his four statues. of the heavenly kings that are almost 2 meters tall. The charming Hall of the Great Hero features 18 figures of Luohan and his Buddhas of the Three Ages. Another of the most important Buddhist sites in the city is the Jing'an Temple on Nanjing West Road.

160.4 The Shanghai Museum

This museum was opened in 1952 and the most important classical art museum in China, the building is a work of art in itself with its unique round-square base and its four floors that include collections of ceramics and bronze, from prehistory until the nineteenth century. It also has large collections of jade, furniture from the Ming and Qing period (1368-1912), and coins. Even the Shanghai Natural History Museum is worth a visit.

160.5 Longhua Temple and Pagoda

Longhua Temple is one of the oldest religious sites in China and stands next to a 40m-high brick and wood pagoda that was built in 242 AD. It consists of five large rooms where you can find a great statue of Buddha, the Great Hall of the Great Sage and the Hall of the Heavenly King. Among the highlights is the 5-ton, 2-meter-high bell tower built in 1382 and the impressive view of approximately 500 Buddhas.

160.6 The Oriental Pearl Tower

This tower is 468 meters high and offers you an excellent view over the historic Bund Promenade, its name is due to 11 spheres of various sizes, the tallest of them being the Spatial Module where the outer shell and the floor are of glass. The tower offers you 15 observation areas, including a revolving restaurant with an excellent panoramic view.



160.7 Shopping on Nanjing Road

Nanjing Road in the main commercial street in Shanghai where you can find from street vendors to luxurious boutiques, there you can find typical Chinese souvenirs and large shopping centers such as Yibai and Jiubai. It is also home to many cinemas, restaurants and is also the center of street performances in the city.

160.8 Town square

It is where the Zhang Shanghai Museum, the City Hall, the Grand Theater Technique and the Urban Planning Exhibition Center are located, where you will find magnificent models with the existing buildings and can get a fascinating perspective of this modern metropolis.

160.9 The French Connection: Tianzifang

Tianzifang is the fascinating place for handicrafts, it has many handicraft shops and small galleries, instead of the big shopping malls found in other parts of the city. But it is also a very fun place to visit at night, since there you can find traditional Chinese food in numerous restaurants and also discover places with live music and artist workshops.

160.10 Xujiahui Cathedral and Sheshan Basilica

Xujiahui Cathedral is the largest Catholic site in Shanghai with a pair of 50-meter-high bell towers, an interior filled with fine stained glass windows, and a beautiful surrounding park worth visiting. The other important religious place is the Sheshan Basilica, a beautiful old Catholic church where tourists often zigzag through the 14 Stations of the Cross, they are uphill to reach the church and on the way you can enjoy splendid views of the city. city.

160.11 Shanghai Science and Technology Museum

This museum is the largest of its kind in all of China, where you can find many interactive multimedia exhibits, state-of-the-art science, permanent exhibits, exhibits of animals native to the region, robotics, space travel exhibits, the Shanghai Aquarium with a 120-meter transparent tunnel capable of providing a close-up view of the region's marine fauna and the Shanghai Zoo, with a large collection of species including South China tigers and giant pandas.



160.12 The Chinese Art Museum

It is the largest gallery in Asia and houses the most important works of modern art in China and if you are an art lover in general you should also visit the Center for Oriental Art, where you can watch classical music, opera, ballet and theater performances.

160.13 The Maglev

The Maglev is a train line that operates at high speed by means of magnetic levitation, it is the fastest transport service in the world and reaches a speed of up to 431 km/h, traveling the 30-kilometer stretch that goes from the Pudong International Airport to Longyand Road Station in about 7 minutes.



Shanghai, a modern city full of interesting places to visit!

160.14 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

ONE

STOCKHOLM

Stockholm is the capital of Sweden and is made up of 14 islands, it is one of the most beautiful and surprising cities in Europe. Located in an archipelago with more than 24,000 islands bathed by the North Seas, this Baltic capital is known as the Venice of the North for its large number of canals.

Stockholm is a cosmopolitan city that falls in love at first sight, with a historic center full of charming corners, it has fantastic museums and perfectly maintained parks.



We are going to guide you through this clean and tidy city, through its most iconic places for you to visit and not miss the most important things in Stockholm.

161.1 Gamla Stan

Gamla Stan is the historic center of the city, with medieval buildings with colorful facades and squares such as Köpmantorget, Järntorget and Stortorget that make this part of the city a charming place. This neighborhood also has other tourist sites such as the Cathedral of Saint Nicholas, the Royal Palace, the Parliament and the Nobel Museum where you can discover the history of Alfred Nobel.



In this part of the city you will also find restaurants where you can eat typical dishes of the city, you can go to Stockholms Gastabud and Nystekt Stromming to eat the traditional meatballs, fresh salmon or herring.

161.2 Royal Palace

The Royal Palace is the residence of the Swedish monarchy, this fortress was built in the 13th century and is one of the largest palaces in Europe with more than 600 rooms. Its most outstanding rooms are the Royal Apartments, the Banquet Hall, the Royal Chapel, the Carriage Museum, the Armory and the Library and it has approximately 100,000 old books.

161.3 Riddarholmen Church

The Riddarholmen Church is the pantheon of the most important kings of the country, it was built in the 13th century and impresses with its high spire and its brick facade. Inside you can see the spectacular Bernadotte Chapel with several stone sarcophagi, decorated with precious brials and a valuable collection of shields.

161.4 Parliament of Sweden

The Parliament is based in an imposing building on the island of Helgeandsholmen, decorated with frescoes bathed in natural light through a glass dome. During your visit you will be able to see some of its most emblematic rooms such as the Bank Lobby, the Plenary Hall, the beautiful Second Chamber Hall and the Communication Corridor.

161.5 Saint Nicholas Cathedral

It is the oldest church in Stockholm and this baroque-style cathedral was built just over seven centuries ago. Inside you can see a large number of works of art and a 15th-century sculpture representing Saint George and the Dragon, as well as the Vädersoltavlan painting, which is the oldest in Stockholm. It is important to note that this cathedral has been the site of several coronations and royal weddings.

161.6 Stockholm City Hall

Climbing the 365 steps to reach the highest part of the Town Hall tower, you can have the best views of the historic center. It is located on the shores of Kungsholmen Island with its tower that culminates in a needle with three crowns and the red color of its bricks stands out and when you leave the building, you can go to Stadshuset Park where you can see the beautiful Lake Mälaren and excellent views by Gamla Stan.

161.7 Kungstradgarden Park

The Kungstradgarden Park offers you a beautiful walk among plants, fountains, trees and flowers. But it also has several cafes where you can drink something hot and if it's winter, you can skate on its ice rink.

161.8 Subway

The Stockholm metro is one of the most impressive in the world, since in 90 of its 100 stations you can see them decorated with works of art by renowned artists. It is the largest art gallery in the world and although all the stations have something interesting, we are going to recommend the ones with the most important works: Radhuset, Solna Centrum, Kungsttadgarden, Tekniska Höskolan, Thorildsplan, Stadium and Slussen.



161.9 Vasa Museum

The Vasa Museum houses the largest warship in the Swedish fleet, which sank in 1628 due to its excessive weight and was recovered 331 years later (1961). It is preserved almost intact by the low salinity of the Baltic Sea. But in addition to seeing this great ship from the 17th century, you can enjoy more than 4,000 preserved objects from that time.

161.10 Skansen-Museum

This open-air museum located on the island of Djurgarden was opened in 1891 and is considered to be the oldest in the world. In this room with a large green space, the culture and history of Sweden in the time before the industrial revolution is shown. You'll be able to see more than 150 characteristic houses and farms from that era for each region of the country, including the town hall, an 18th-century stave church, and the Bollnästorget market square.

161.11 Drottningholm Palace

Drottningholm Palace was declared a UNESCO World Heritage Site. The palace built at the end of the 16th century is located on Lovön Island and is the best representation of the Swedish imperial era. Many tourists equate its beauty with

the Palace of Versailles and during your visit you can enjoy the Royal Theater, the exquisite decoration of the rooms, the design of the Chinese Pavilion and its beautiful gardens.



161.12 ABBA Museum

This museum is dedicated to the group ABBA that revolutionized the music of the 80's and were able to sell more than 400 million records. You will be able to see the history of the group from its beginnings in 1970 until its separation in 1983.

161.13 A boat ride

The routes made by boat through the Stockholm archipelago is one of the best activities you can do. You can take one of the cruises that leave every day from the city center and you will be able to get great views of the center of Stockholm, the island of Djurgarden and its bridges.

161.14 Sodermalm neighborhood

Södermalm is located on an island of the same name and is a bohemian neighborhood with a great atmosphere, art galleries, alternative shops and designer cafes. But it also has other points of interest such as the church of Santa Catalina, the Museum of Photography, the Church of María Magdalena, the Medborgarplatsen Square and Götagatan street where you can find a wide variety of stalls with vintage clothing. It can also bring you closer to the Mariatorget park at sunset or go up the Katarina elevator, where you can have incredible views of the city while the beautiful sunset occurs.

161.15 Sergel Square

This original square has the Kulturhuset, which is a cultural center full of galleries, bars and interesting activities at all hours, as well as a fountain and a spectacular glass obelisk.

Stockholm is an especially beautiful city full of interesting things to do and places to see.

161.16 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did

the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

TWO

TOKYO

Tokyo is an impressive city that is able to combine all the luxuries with traditional elements. This makes it one of the most visited and attractive sites in both Japan and the Asian continent.



This city has ancient temples, palaces, gardens and an entire ancient culture that makes it special among other cities in the world.

We are going to name the 14 best tourist sites in the Japanese capital:

162.1 1. The Imperial Palace

It is the residence of the Emperor and his family, among its greatest attractions are the beautiful parks of the seventeenth century, which in turn are surrounded by moats and walls. This imperial palace is built on a site where Chiyoda Castle is, which was the first fortress where the city began to grow.

The famous Nijubashi bridge, also called the double bridge, reflects the water and is where you get to the interior of the palace. You will be able to see a 2 m thick wall that surrounds the palace and one of its gates takes you to the Higashi-Gyoen Garden which is one of the few places that the public has access to.

Some of the palace gardens are open only two days a year, on January 2 the Emperor appears to greet the people and the same happens on April 29.

162.2 2. The Ginza District

The most important business in Tokyo is located in this district and it is as relevant as New York's Times Square.

The main cities of ancient times were linked by five roads that meet in Ginza, today it is a place full of impressive venues and exclusive shops, where the famous Kabuki-za Theater is also located.

162.3 3. National Museum of Natural Sciences

This museum is one of the oldest in Japan (1871) and is located inside the Ueno Park, inside you can see a large number of elements of history and natural sciences with interactive displays of scientific advances, nuclear energy, space and other aspects related to the development of the country.

In Nihonkan the Gallery of Japan you can see some samples of the Japanese people and prehistoric beings, including traditions, typical costumes and customs. But if what you want to see is robotics, old cars, science and technology, you'd better go to the Global Ckikyukan Gallery.

162.4 4. Ueno Park, Zoo

This park represents the largest green area in Tokyo with colorful and beautiful gardens, an aquarium, zoo, museums and temples. You can tour the Shinobazu Pond in small boats and visit the Toshogu Shrine built during the 17th century.

The zoo is the oldest in Japan, founded in 1882, where you can see the beautiful pandas from China, and its aquarium is one of the largest on the continent.

162.5 5. The Temple of Senso-Ji

This is the most notorious shrine in Tokyo and was built in the year 645, it is dedicated to Kannon the Buddhist goddess of compassion and although it has undergone several renovations, it still retains its original appearance. It is located in the Asakusa district and the Kaminarimon gate stands out, which is 3.3 m high. There you can receive the benefits of Vat incense that, according to legend, is capable of alleviating discomfort or ailments.

162.6 6. Tokyo National Museum

In this museum there are more than 100,000 works of art from Japan, India and China, including 100 of them that are considered national treasures. You'll find 6th-century Buddhist works, period weapons, military equipment, historical Japanese clothing, ceramics, and pottery.

The Tokyo National Museum was opened in 1931, it has Chinese works of art and Japanese paintings dating back several hundred years.

162.7 7. National Museum of Western Art

This museum called Kokuritsu SEIYO Bijutsukan is located in Ueno Park and was built by Le Corbusier, a Swiss architect in 1959. The samples found there are mostly works by French artists, you can find sculptures by Rodin, works by Paul Cézanne, Edgar Degas, Eduard Manet and Claude Monet.

162.8 8. Meiji Shrine

One of the most touristic sites in Tokyo is a beautiful sanctuary whose construction was completed in 1926, it has a forest of approximately 120,000 trees where the tree species of Japan are found. In its interior enclosure you can see a large number of royal treasures.

162.9 9.- Miraikan Museum

This museum is designed to showcase Japan's technological leadership and was created by the Science and Technology Agency.

The Museum is designed to showcase and highlight Japan's technological leadership. In its innovative relationships you will find interactive robotic displays, earthquakes, renewable energies and means of transportation such as the magnetically levitated train.

162.10 10. Tokyo Skytree

It is the tallest building in Japan at 364 meters, it has an observation deck with one of the most impressive views you will see and the tower has different cylindrical levels, including a spiral glass walkway that will take you to the highest area.

162.11 11. National Art Center

It is one of the best museums in the world and with a collection of more than 600 paintings (almost all from the 20th century), it is located in the Roppongi district and in a curved glass building.

162.12 12. Kabuki-za Theater

It is the most outstanding theater that dates back to medieval times and traditional Kabuki performances are held there and even if you don't speak the language, you will always be able to understand the performance.

162.13 13. Mori Art Museum

This museum is on the top floors of the Roppongi Hills Mori tower and there is also the National Art Center, where you can see works from around the world related to contemporary art and has constant exhibitions.

162.14 14. Tokyo Disney Sea

Disney comes to the Asian continent with this wonderful park, where you can find a resort, an incredible water park, a large shopping center and a fun entertainment center where they offer you classic Disney movies.

Tokyo is a pioneer city in technology and entertainment, but also in history. So it is a compendium between modernism and culture, so it is a place worth visiting if you want to have a beautiful tourist experience.

CHAPTER

THREE

VENICE

Venice is a city located in northeastern Italy and its historic center was declared a World Heritage Site by UNESCO. This city is located on a set of islands to the north of the Adriatic Sea, due to its geographical peculiarity, its rich artistic heritage and its ancient history, have made this city one of the most popular tourist destinations in the world. The city was built on an archipelago consisting of 118 small islands linked by 455 bridges, but also includes six districts that are on the mainland and where most of the population lives. Inside the city there is no car traffic and its inhabitants move both on foot and through the canals by boats known as vaporettos. Starting from the Grand Canal, a large network of canals emerges where you can see a multitude of small and large boats, but the best known are the so-called gondolas.



This city was founded in the 5th century, thanks to its particular geography it provided protection against possible attacks by the Germanic peoples. If you go to Venice it is important that you visit Saint Mark's Square, as it is one of the most beautiful places in Venice, although it is very difficult to enjoy this square without it being packed with tourists. This is because it is surrounded by illustrious buildings and is one of the nerve centers of the city. There you can find the spectacular Basilica of Saint Mark, which in turn has a 100-meter-high bell tower, but also countless outdoor cafes and small shops where you can find curious items.

You cannot miss the Doge's Palace, which is one of the most important monuments in Venice, built with Gothic architecture and inside it houses the paintings of such renowned artists as Tintoretto and Veronese. One of the curiosities of the palace are the cells that are in its basement, the story goes that Casanova escaped from there and fled across the rooftops of Venice. Another of the surrounding stories is that the Bridge that connects to the Palace is called the Bridge of Sighs because women used to walk around when the Ducal Palace was a prison and sighed for the men who were imprisoned there, which has given rise to the name of the famous bridge and that by itself, is another attraction worth seeing.

Another of the essential monuments of Venice is found on the small island of San Giorgio Maggiore, since the monastery of San Giorgio was established there in 982, it also has a beautiful basilica. Although the art center that belongs to the Giorgio Cini Foundation currently resides there, it really is a place that will really surprise you.

In the landscape of the city, the Santa María de la Salute church stands out for its enormous and beautiful dome that is capable of dominating the Venetian horizon, it is worth visiting and from there you can enjoy one of the most beautiful sunsets in the city.



From the most important bridge of the Grand Canal in Venice you can enjoy one of the best landscapes, in addition to the movement of water taxis, vaporettos and gondolas. The Grand Canal is the most important road and on its sides there are numerous churches and palaces that you should not miss. Strolling through the canals of Venice is quite a spectacle since it is one of the most romantic and beautiful cities in the world, although it is true that the gondola ride is significantly more expensive than the vaporetto, this small boat can move between alleys and canals through where other means of transport simply do not fit and in this way discover some untouristy areas of the city. Touring Venice while the gondolier sings is an experience that you have to live if you are already in the city.

Taking an excursion to Burano would be an unforgettable experience, because it is also not one of the typical tourist destinations, so it has even more charm. Urano is an island that is 7 km from Venice and can be reached by a vaporetto whose trip takes approximately 20 minutes, there you will find narrow canals full of color from the small houses that surround it, since their facades are painted each of a different color. But you can also visit the beautiful islands of Torcello and Murano, thus extending the fabulous experience.

If your visit coincides with the carnival dates, you should know that it is one of the most important events in the city, since thousands of people put on masks and dress up each year. You must join the hubbub that ignites throughout Venice, whether in the style of a harlequin, Pulcinella or any other costume that allows you to enjoy the surrounding party. The Venetians dedicate themselves on these dates to planning down to the last detail, since for them this tradition is truly important. Even one of the most interesting experiences is to walk through the mask shops to choose the one you plan to use, for this you will find hundreds of shops where you can buy all kinds of costumes and part of the ritual is to choose what you want to become for one night, in addition You can take home the mask as a nice memory of that day.



If what you really want is to savor the best dishes in Venice, you should know that the most traditional and delicious food will not be found in the typical tourist places such as Saint Mark's Square. While it is true that there are many places to eat in the city, you must find those places that are really worth it. You must search the alleys of the city where you can discover excellent trattorias with small wooden tables and their typical checkered tablecloths, where the Italian clientele abounds is where you must try the best pizza and the best spaghetti in Venice.

Do not forget to look for the secret corners of the city, between canals, alleys with colorful roofs and dreamy passages.

163.1 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

FOUR

VIENNA

Vienna is the capital of Austria and of classical music, located on the banks of the Danube, it is one of the most beautiful cities in Europe and the birthplace of great composers such as Beethoven, Mozart or Strauss. This city amazes for its extensive architectural and cultural heritage, as well as being one of the cities with the highest quality of life in the world.

If you go to Vienna it is important that you visit its most important places, so we will give you a guide to the places that you should not miss.

164.1 Schonbrunn Palace

This huge palace was the summer residence of the imperial family, built in the 17th century, it really impresses with its well-cared and extensive gardens, as well as its luxuriously decorated rooms such as the Great Gallery, the Breakfast Room and the Circular Chinese Room. You can visit more than 40 rooms, stroll through its beautiful gardens and visit the impressive Museum of Imperial Carriages.



164.2 Naschmarkt Market

Another of the most important activities is to visit the Naschmarkt street market, which has been in operation since the 16th century and is the oldest in the city. It houses a large number of stalls with fresh products and numerous restaurants, where you can try everything from Asian food to traditional Austrian cuisine such as apple pie, typical sausages or schnitzel.

164.3 Hofburg Palace

The Hofburg Palace is located in the historic center and was the residence of the Habsburg royal family for more than six centuries. You will be able to know the perfectly furnished and decorated imperial rooms. In this castle, a large part of the history of Vienna is concentrated in its many rooms, including the Imperial Chapel, the Church, the Treasure Chamber and the Sisi Museum, where you will learn a little about the history of this controversial character.



164.4 Austrian National Library

The Austrian National Library is located in the Hofburg Palace complex, it was built in the 18th century in the Baroque style and houses more than 8 million documents, including papyri, old books and maps, on its tall wooden shelves. Its great Imperial Hall is really amazing, since in addition to countless old books there are beautiful frescoes in its dome, several marble statues and a couple of fantastic globes, one terrestrial and one celestial.



164.5 Spanish Riding School

In the Hofburg Palace there is also the Spanish Riding School, which is more than 400 years old, being emblematic worldwide and the oldest in Europe. There you will be able to see magnificent specimens of the Lipizzaner breed and see the morning training sessions or the gala performances that take place on Sunday mornings. UNESCO declared this school as Intangible Cultural Heritage of Humanity.

164.6 The Vienna Opera

The Vienna State Opera is internationally famous and operates in a Renaissance building, where great works are performed in an auditorium that can hold up to 2,800 spectators. Inside you can see a beautiful marble staircase, the Tea Room, the lobby, a large stage and the Marble Room.

164.7 Capuchin Crypt

The Capuchin Church was built between 1622 and 1632, under this church lies the Imperial Crypt where 149 members of the Hapsburg royal family have been buried, including 18 empresses and 12 emperors. The magnificent sarcophagus of Emperor Francis and his wife Maria Teresa stands out, as well as that of the famous Empress Elizabeth of Bavaria (Sisi).

164.8 St. Stephen's Cathedral

This cathedral is the most important religious center in Vienna and it was there that Mozart's wedding and funeral were held, it was built in the 12th century and is located in St. Stephen's Square. It stands out for its high spire-shaped tower where you can go up by elevator and from the top, you will be able to see its charming tilework and wonderful views of the center of Vienna.

Inside you can see that the Gothic and Baroque styles intermingle, with the most interesting works being the image of the crucified Christ, the Pummerin Bell, the Pilgrim Pulpit, the Catacombs and the tombs of various royal figures including that of Emperor Frederick III.

164.9 Stadtpark

A quiet walk through nature through the Stadtpark that is located in the center of Vienna, where you can see beautiful sculptures, among which is the monument in honor of Johann Strauss. But also the architectural complex of the Wienflussportal and the Kursalon building, both worth seeing. This park stands out for its English style and was inaugurated in 1862. The Kursalon was where Strauss performed his first concert and there you can see presentations with the best works of Strauss and Mozart.

164.10 Ringstrasse

The Ringstrasse is a circular avenue with more than 5 km where most of the main historic buildings in the center are concentrated. In addition to the Opera and the Hofburg Palace there are important buildings such as the Votive Church, with a pair of twin spire-shaped towers and its colorful stained glass windows, the impressive façade of the Town Hall, the Austrian Parliament which houses the Chamber of the Federal Assembly and the Hall of Pillars.

164.11 Church of San Carlos Borromeo

This church was built after the plague by Emperor Charles VI, the temple impresses with its two columns that were inspired by Trajan's Column in Rome and you can go up by elevator to admire the magnificent frescoes of its dome inside.

164.12 Belvedere Palace

The Belvedere Palace was the summer residence of Prince Eugene of Savoy, it is a Baroque-style palace with three-tiered gardens and large fountains. It is made up of two emblematic buildings: the Upper and Lower Belvedere. In the Upper Belvedere is the famous work of Gustav Klimt "The Kiss" and the Marble Hall, among his most outstanding works and in the Lower Belvedere you can marvel at the Hall of Mirrors, the Hall of Grotesques, the Gallery de Mármol and La Orangery (a beautiful greenhouse).



164.13 Prater

This is the oldest amusement park in the world and dates back to 1895, preserving some of the attractions of that time such as the Giant Ferris Wheel, where you can enjoy beautiful views of Vienna and the park from its 60 meters. It also has other typical attractions such as a ghost train and a roller coaster, among others.

164.14 Mozart's House

The famous composer composed "The Marriage of Figaro" (one of his best works) in this house, and you can learn about his life story, as well as see Mozart's personal belongings and musical instruments.

Vienna, a true paradise to meet

164.15 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

FIVE

WARSAW

Warsaw is the capital of Poland, a city that was badly destroyed during World War II, but has been able to rise from its ashes, recovering all its splendor and becoming a city that harmoniously combines modern architecture with historic buildings. Warsaw has a large number of tourist attractions such as palaces, museums, churches, parks and milk bars, where you can taste Polish cuisine at the best price.



We have made a list of the essential places you should visit if you go to Warsaw.

165.1 Old City

One of the best activities you can do in Warsaw is to walk the streets of the Old Town, which is the oldest neighborhood and was completely in ruins during the Nazi occupation, but it was rebuilt so similar to the original that it was declared a World Heritage Site by the Unesco in 1980.

In the heart of the city is located in the beautiful Old Town square where tourists and locals converge, in the surroundings you can see its cobbled streets with houses of medieval architecture and their colorful facades. You can have a drink in the restaurants with terraces that surround the square and see the street artists or painters that are usually in this area.



The most interesting sites in the Old City are El Castillo Real, the Cathedral of San Juan, the picturesque Piwna street and the statue of the Little Insurrectionist, which was built in honor of the child soldiers who fought and died during the uprising.

165.2 Royal Castle

The Royal Castle located at the entrance to the Old City is an impressive palace in the neoclassical baroque style, built in the 14th century and destroyed by the Nazis, but later rebuilt with such detail that it remained the same as the old palace. Inside you can see the royal rooms with their period furniture and two important works by Rembrandt which are The Father of the Jewish Bride and The Girl in a Frame. At the front of the palace is the beautiful Castle Square where the Corinthian column erected in 1644 in honor of King Sigismund III, the most important and beloved in Polish history, stands.



165.3 Palace of Culture and Science

The Palace of Culture and Science was built during the Russian occupation by order of Stalin between 1952 and 1955, being one of the tallest buildings in the country with 234 meters high from where you will have the best panoramic views of the city. The building houses from institutional departments, offices, libraries, to two concert halls.

165.4 New City

The New City has numerous points of interest, founded at the end of the 14th century, it developed around the New City square and is separated from the Old City by a fortress that surrounded the city in medieval times. In the square is the church of San Casimir characterized by its white facade and there is a statue of Marie Curie, born in this city and the first woman to receive two Nobel Prizes (physics and chemistry). If you are interested in knowing more about his life and work, you can visit his old home located on Freta Street, currently it is one of the most beautiful House-Museums to see in the city.

The recommendation is to observe the most beautiful buildings that are on the banks of the Vistula River and then visit the most important churches such as San Jacek, the Holy Spirit and the Visitation of the Virgin Mary.

165.5 Warsaw Royal Route

The Royal Route was the path followed by kings to get from the Royal Castle to the impressive summer palaces Lazienki and Wilanów. Following this route is an excellent recommendation, leaving the Castle Square and then going through Krakowskie Przedmieście Street where some of the most important buildings are located, such as the University, the Churches of Santa Cruz and Santa Anna, the Presidential Palace, the Potocki Palace and the luxurious Hotel Bristol, among others. Upon reaching the monument in honor of Nicolaus Copernicus, the street changes its name to Nowy Świat where art galleries, the most luxurious shops and the famous Church of Saint Alexander, located in Trzech Krzyży

square and shaped like a Pantheon, are located. Roman. From this square begins Ujazdowskie Avenue where you will find the beautiful Ujazdowski Park with its castle built in the 17th century, ending the tour at the Lazienki Palace.



The route of the entire path is about 4 km and to get to the Wilanów Palace it is advisable to take a bus, since walking can take you two more hours.

165.6 Warsaw Ghetto

The Warsaw Ghetto was the largest in Europe established by the Nazis during the Holocaust. More than 400,000 Jews from both the city and other occupied countries were confined in the ghetto, after subjecting them to extreme conditions, deportations to concentration camps, hunger and disease, reduced the population to 50,000 people inside the compound and before After closing it, the first revolt against Nazism took place, which was the Warsaw Ghetto Uprising and in honor of this heroic act the Monument to the Heroes of the Ghetto was raised, you can also see the Jewish Museum of Warsaw and the Museum of the Uprising, where both offer you the sad history of the Polish Jews and their terrible consequences.

165.7 Prague neighborhood

The Prague neighborhood is the bohemian area of the city, where you can find numerous art galleries, cultural centers, urban art shows, design shops and original cafes. Also of note are the Church of Our Lady of Loreto, the Różyckiego Bazaar, the cobblestone streets of Brzeska, Mala, Ząbkowska, and the Cathedral of St. Michael the Archangel.

165.8 Chopin in Warsaw

The pianist and composer Frédéric Chopin lived more than half his life in Warsaw. To learn about his history, the best thing is to visit the Chopin Museum where you will find the manuscripts of his works, all kinds of personal objects and the composer's notes that are found in his 15 rooms. Then you can go to Lazienik Park where there is the monument dedicated to Chopin and the church of Santa Cruz that houses his heart.

165.9 Lazienki Park

On the Royal Route you will find the extensive Lazienki Park founded in the 16th century in the Baroque style. Several palaces are scattered throughout the park, among which the beautiful Palacio de la Isla stands out, located on an artificial island in the middle of a lake. Other sites worth seeing are Belvedere Palace, the White House, Myślewicki Palace, as well as numerous pavilions, gardens and monuments.

165.10 Wilanów Palace

Wilanów Palace is known as the Polish Versailles, it is a marvel of Baroque art and built in the 17th century. Inside you can tour the royal halls and visit the Polish Portrait Gallery and the Museum of Interiors. The palace that surrounds it has gardens full of charm such as the Baroque Garden and in the oldest area of the park you will find two levels of terraces, in addition to the Chinese English garden that has a beautiful pond.



Warsaw is an impressive city full of beautiful tourist sites to visit!

165.11 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

SIX

WASHINGTON

Washington is the capital of the United States and unlike other capitals in the world, it is not exactly the largest city in the country, nor is it even one of the most touristic. This does not imply that there are few things to see in Washington DC, but the contrast is very strong when comparing this city with its neighbor New York, since it is much quieter and full of history.

Most of the monuments are located within the National Mall that runs from the Abraham Lincoln Memorial to the Capitol. Although it is true that the distance of this esplanade is only 4 km, it will take some time to get to know the large number of monuments, interesting museums and gardens that you can visit.

In this article we will guide you through the most important sites in Washington. The most recommended route through the National Mall begins at the White House and the idea is to visit the emblematic sites of this area, in a clockwise direction.

166.1 White House

The White House is without a doubt the most mythical place to visit in Washington, it is filled with euphoric tourists as if they were about to meet the President, when the reality is that the building can only be seen from far away. They're putting up more and more security fences and increasing the number of armed secret service guys, it's not exactly a place where you feel comfortable, even the White House is a lot smaller than you see in the movies, maybe they show it from certain angles where they make it appear larger. In general, you will find a demonstration in front of the building, either against wars or racism.



166.2 George Washington Monument

The Washington Monument is one of the best known in the world, this great obelisk is surrounded by 50 American flags representing each of its states, it was inaugurated in 1885 and had the honor (even with the construction of the Eiffel Tower) of to be the tallest building in the world.



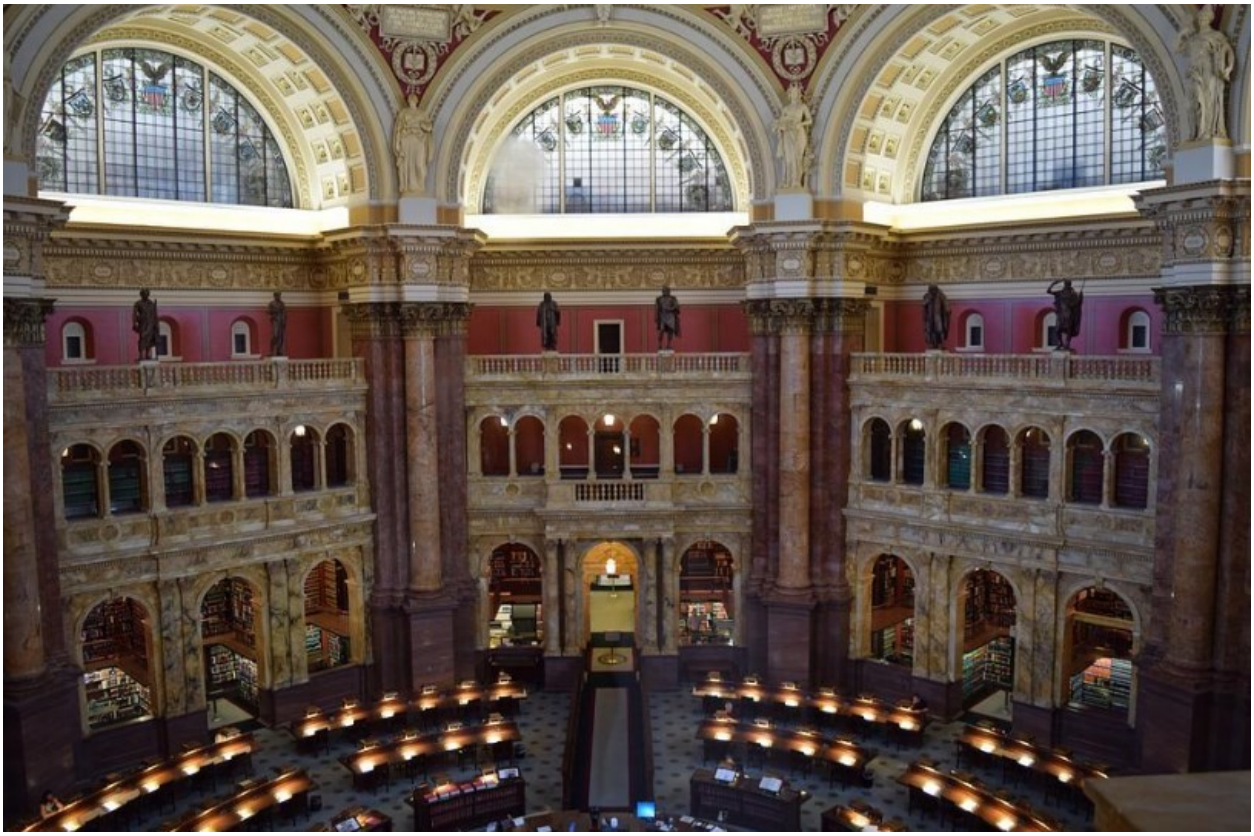
166.3 Capitol

The Capitol is a majestic white building in the neoclassical style with a large dome, which is definitely one of the most emblematic symbols of the United States. It is the place where the deputies of both chambers of Congress meet and it is there where most of the most important state events are organized. You can enjoy this architectural jewel and its beautiful reflection, in a small artificial lake adjacent to the Capitol.



166.4 Library of Congress

From the Capitol there is a tunnel that connects with the Library of Congress, it is one of the most spectacular in the world and houses approximately 160,000 documents, including a copy of Gutenberg's Bible and the Declaration of Independence. However, you can only visit the lobby and see the main room from outside through a glass panel.



166.5 Most interesting museums in the city

In the same National Mall there are several important museums, among which is the National Air and Space Museum, where you can see several of the most famous planes in history. There you can see the Wright brothers' plane and in the space travel section you can see an Apollo 11 module, as well as many other interesting things.

Another recommended museum to visit is the National Gallery, where you can see a very complete collection of works of art by great masters such as Rembrandt, Raffaello, Monet and some from the 20th century such as Joan Miró or Picasso. Also noteworthy are the National Museum of American Indians, which has a lot of information about the settlers before colonization, the National Museum of American History, the Holocaust Museum or the National Museum of Natural History.

166.6 Smithsonian Castle Garden

This garden is one of the best kept secrets on the National Mall, if you are coming from the Capitol it is located just after the National Air and Space Museum. The castle built in sandstone houses several administrative offices, but behind it is the picturesque garden that will leave you pleasantly surprised and under the shade of the trees, you can rest away from the hustle and bustle of tourists.

166.7 Tidal Basin and the Thomas Jefferson Memorial

The Tidal Basin is a beautiful, quite large lake that is located south of the National Mall, walking around the lake is a beautiful experience and if you travel in the spring you will be able to see the cherry blossoms. In this area there is also the monument dedicated to Thomas Jefferson with its impressive dome and it is one of the most beautiful to visit in the city. On the walk through the Tidal Basin you will also find other interesting monuments such as the one dedicated to

Franklin D. Roosevelt and his wife Eleanor Roosevelt, surrounded by a series of waterfalls, at the end of the walk you will find the monument of the activist and pastor Martin Luther king jr.

166.8 Reflecting Pool

After the Tidal Basin you will find the Reflecting Pool area, it is a pool where the image of the George Washington Monument is reflected.



166.9 Abraham Lincoln Memorial

The National Mall ends with the Abraham Lincoln Memorial which is a monument similar to the Greek temples. Inside is the immense sculpture of Abraham Lincoln and on its walls, you can read different fragments of the important speeches of this president, who was the one who promoted the abolition of slavery in this country.

166.10 The night lights of the National Mall

If you stand at night next to the Reflecting Pool you can see the reflection of the lights of the Washington Monument with the dome of the Capitol in the background. From this same point, looking to the opposite side, you will be able to observe the impressive lighting of the Lincoln Memorial, both scenes are a spectacle.

166.11 The Georgetown neighborhood

The Georgetown neighborhood is undoubtedly the most picturesque in the city, full of cobblestone streets and mansions, the most important streets are Wisconsin Avenue and M Street where you can find a large number of alternatives to eat. Georgetown University, considered one of the most prestigious universities in the country, and the Old Stone House, which is one of the oldest mansions in Washington, stand out.

166.12 Arlington cemetery

The Arlington Cemetery is located relatively close to the National Mall, it is made up of a large number of white tombs where American soldiers who fought in different wars are found, ranging from the War of Independence to the military interventions incurred in Afghanistan or Iraq. .

John F. Kennedy is the most famous person who rests in Arlington and there are also his wife, his children and in the vicinity is the grave of his brother Robert Kennedy. Finally, the recommendation is to go to the hill where the Tomb of the Unknown Soldier is and it is worth seeing the changing of the guard with all its solemnity.

166.13 Chinatown and Ford's Theater

Chinatown is a world apart full of shops with all the signs in Chinese, it is an excellent place to eat and very cheap. Nearby you can visit Ford's Theater, known for being the place where Abraham Lincoln was assassinated, where you can see a museum dedicated to this historical character.

Washington is a small city full of history and interesting places to visit.

166.14 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

SEVEN

ZÜRICH

Zurich is the most populous city in Switzerland, filled with museums, shopping districts and a lively nightlife, for which it is considered by many to be the "Center of Switzerland". Located at the Confluence between Lake Zurich and the Limmat River, very close to the Alps. This city is the cultural and financial heart of the country, as well as being one of the most expensive cities with the highest quality of life in the world.



Zurich has a rich cultural heritage within its old town and a large number of tourist attractions such as art galleries, museums, viewpoints, churches, parks, which are really worth knowing.

In this article we will make a list of the most important sites that you should not miss if you visit Zurich.

167.1 The historic center

Altstadt is the historic center of the city, it is made up of four neighborhoods and surrounded by some ruins that still remain of the old medieval wall. The most interesting area is around the Town Hall and near the Limmat River, it is there where the most charming squares and alleys are concentrated, you can see medieval houses and Renaissance buildings with their traditional style and colorful facades, as well as hundreds of restaurants and shops.



In this area you can find some of the interesting points of interest such as the Bahnhofstrasse shopping street, Peterskirche and Fraumünster, the Grossmünster churches, the Limmatquai guild houses, the Grimmenturm tower and the Cabaret Voltaire where the cultural movement of Dada began.

In the historic center there are also several of the best restaurants where you can taste the local cuisine, such as the Zeughauskeller that offers you delicious sausages with rosti or the Swiss Chuchi that specializes in fondues.

167.2 Lake Zurich

This huge lake is more than 40 km long where you can take relaxing walks or ride a bike along the shore, if you go in summer you can bathe in one of its beaches. You can also take a boat trip where you can see towns, beaches, luxury villas and Rapperswil, also called the city of roses, thanks to its gardens that are home to more than 15,000 rose bushes.



167.3 Grossmunster Church

The Grossmünster church was built between the years 1100 and 1220 by the Limmat river. Known as the great cathedral and it is of enormous historical importance, since it was there that the Protestant Reformation began in Switzerland in 1519 by Zwingli. Outside the Church you can see two impressive twin bell towers that were added between 1487 and 1492. Inside you can see fabulous stained glass windows, the choir window, a cloister with magnificent capitals, the bronze doors and its romantic crypt. Before leaving the church, the recommendation is to climb the 187 steps to reach the top of one of its towers and thus enjoy the beautiful views of the river and the city.

Other interesting churches that you should see in the city are Peterskirche, which has a tower with a beautiful clock, and Fraumünster, where you can see its 5 impressive stained glass windows.

167.4 National Museum of Zurich

The National Museum is located in a French-style building very similar to a medieval castle, there you can review the culture and history of Switzerland from prehistoric times to today.

This history museum is the most visited in the country and has an extensive collection of permanent objects, temporary exhibitions, conferences, workshops, debates, which are held with the aim of reinforcing knowledge and learning.

The other important museum you should visit in Zurich is the Kunsthaus, where you can see one of the most important art collections in Europe. There you can view the important works of great masters such as Picasso, Van Gogh, Much, Matisse, Monet, among many others.

167.5 Bahnhofstrasse

Bahnhofstrasse is also called the station street where you can see the most luxurious shops in the world, being the most famous in Zurich. On this street, which is approximately a kilometer and a half long, you will find stores that are unaffordable for most pockets, such as Cartier, Luis Vuitton and Tiffany & Co, among others. In addition to cafes, restaurants, art galleries and a large number of chocolate shops such as the wonderful Läderach Chocolatier Suisse.

Other essential streets to visit in the historic center are the medieval alley Augustinergasse, where you will fall in love with its colorful facades with its beautiful wooden windows, and Limmatquai Street, which is full of beautiful houses along the Limago River.

167.6 Üetliberg viewpoint

Üetliberg is a peak located 870 meters above sea level that has a viewpoint where you can get impressive views of the city, the Alps mountains (when the sky is clear) and the lake. To get to the viewpoint you have two alternatives, you can take the tram to Albisguiti and walk up for approximately 45 minutes along a beautiful path surrounded by nature. The second option is to take the train from the central station and it will take about 20 minutes to get there.

In addition to enjoying the spectacular views at the top of the hill, there are several restaurants where you can recover your energy (if you have walked up).

Another place that has good panoramic views of the city is a small hill where the University is and to get there, you must take the old Polybahn funicular on Limmattquai street.

167.7 The Opera

The Opera is located in the impressive neoclassical-style building that was built in 1891. The greatest opera and ballet artists have performed in this concert hall, with a capacity for 1,100 spectators, it has become the largest cultural landmark in the city and that you should not miss.

167.8 Lindenhoff

Between Bahnhofstrasse and the Limmat river is the Lindenhof district, being the oldest area of the city. In this medieval quarter you will find endless steep cobbled streets packed with craft shops, restaurants, charming cafes and Roman ruins located on the popular hill where the city was born a little over 2000 years ago. Today it is a spectacular viewpoint to watch the sunset and an oasis of peace.

167.9 Zurich Botanical Garden

The Botanical Garden belongs to the University and in this open-air space you can see more than 7,000 species of plants, as well as three dome-shaped greenhouses that house trees, flowers and plants from all over the world.



Zurich is a cosmopolitan city full of tourist attractions and full of charm, which are worth knowing.

167.10 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

EIGHT

COSTA RICA

It is not exactly a coincidence that this country has the name of Costa Rica, since ultimately the beautiful coasts are one of its great attractions. Puntarenas, El Limón and Guanacaste are three Costa Rican provinces that have access to the sea. This country has access to both the Pacific Ocean and the Caribbean Sea and its beaches are worth knowing.

We are going to name the places that you cannot miss if you visit Costa Rica:

168.1 Manuel Antonio National Park

It is one of the most impressive places in the country and where you can find white sand beaches, as well as an absolute connection with all the fauna that roams around the park.

168.2 Marino Ballena National Park

This is a protected place because it houses an enormous marine biodiversity, with an amazing beach and the best thing is that you can take a whale watching tour.



168.3 Corcovado

Corcovado is a sample of everything that the country can offer you, not only because of its large size, but also because of the immense amount of fauna that is found in freedom. Although it is true that it is one of the few parks where access with a guide is mandatory, it is really worth it!

168.4 Puerto Viejo and Cahuita

Puerto Viejo is one of the towns with the greatest personality in the country and it is there where a large part of the black community is concentrated. This site is characterized by its long party nights and its food. A few kilometers from this town is the Cahuita National Park, where you can enjoy spectacular beaches and irresistible seabeds.

168.5 Tortuguero

This town surrounded by canals is famous for the spawning of turtles between the months of July and October. However, if you travel at another time, the visit is equally interesting since, in addition to seeing how the locals live, you can take a tour where you are taken by boat through all the channels of the national park and it indeed has many experiences to offer.



168.6 Guanacaste

Liberia is the central city of this province of Costa Rica and among its attractions is culture, the Rincón de la Vieja volcano and, above all, its amazing beaches (whose offer is endless). Being the best known Flamingo, Tamarindo, Coco, Concha and many others.



168.7 Malpais and Santa Teresa

On the Nicoya Peninsula are Malpaís and Santa Teresa, where yoga and surf lovers tend to go. A relaxed atmosphere with a rough sea and wide beaches make this place attractive for fans of these disciplines and it is recommended to see the Cabo Blanco Absolute Nature Reserve in the village of Malpais.

168.8 Montezuma

This place is the country's hippie paradise and legend has it that some soldiers who did not want to participate in the Vietnam War took refuge there. The truth is that Montezuma is a place with a lot of magic to spend a couple of days.

168.9 Poas Volcano

Although it is true that there are more than 100 volcanoes in this country, only five of them are active and although there are other inactive volcanoes that are also worth knowing, the Poas Volcano may be one of the most interesting, since it can be seen its immense crater and is one of the largest in the world, it is also located in a national park with a lush forest.

168.10 Peace Waterfall

Very close to the Poas is the most impressive waterfall in the country, but it is located inside a private enclosure where they have already built a zoo, so the entrance fee is 48 dollars. It is not recommended for the price, especially in a country where you can see a diverse fauna that is free.

168.11 San Jose, the capital of Costa Rica

In San José you can learn a little about the history of the country, mingle with the local people and immerse yourself in their culture. It is advisable to take a walk through the center, visit the National Theater, see the majestic Metropolitan Cathedral, the Central Market, a colorful Church called Nuestra Señora de la Merced, stroll through one of its many museums and also in a good place to have a drink, eat or go dancing.

168.12 Irazu volcano

This volcano is the second highest peak in Costa Rica and reaches 3500 meters high, the view from this place on a clear day is simply spectacular and the landscape is purely volcanic.

168.13 Turrialba volcano

You can finally see this volcano since it was closed for a long time due to its intense volcanic activity. This route is special for lovers of hiking and adventure sports, its offer of activities is very wide, but it includes rafting down the Pacuare River, being one of the most important places in Central America when it comes to practicing this sport.

168.14 Arenal Volcano

This is one of the most popular volcanoes in the country, but you need a clear day to fully see it. This is because its almost 1,700 meters is usually covered by clouds. In the event that it is cloudy, do not worry too much, because this volcano is within a national park that bears the same name and also has Lake Arenal, which is the protagonist of certain tours and is completely navigable.



168.15 Hot springs of La Fortuna

La Fortuna is at the foot of Arenal, where you will find one of the attractions of a volcanic region: its hot springs. Although it is true that most of these places are private, there is a free hot spring and if you prefer you can stay in a hotel that includes hot springs.

168.16 Rincon de la Vieja volcano

Although this volcano is less known than the previous ones, it is really impressive and especially beautiful, and you can also find a beautiful waterfall in the surroundings.

168.17 Green Mount

Green Mount is a mountainous area whose landscapes are very green and there is a large concentration of tourist elements, it stands out for its suspension bridges and its cloud forests. One of the most amazing activities you can do in this area is to go on a zip line tour, where you are thrown suspended from a very inclined cable and you descend by gravity hanging from a pulley at a considerable height, it is an experience full of adrenaline.

168.18 Cities and towns

While it is true that Costa Rica is not exactly famous for its towns and cities, we can still tell you which are the most interesting options. Zarcero is a town with a very photogenic central park that has a topiary garden, as well as a very nice church called San Rafael. One of the most important cities in addition to the capital is Cartago, where the basilica Nuestra Señora de los Ángeles stands out, which is the most famous temple in the country and you can also visit the ruins of Cartago, to see the remains of a church destroyed by the strongest earthquake that shook the area.

Costa Rica in a country with spectacular beaches, interesting volcanoes, a biodiverse fauna and very warm people, where you can spend wonderful moments.

168.19 About the Author

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CHAPTER

NINE

GREECE

This country is famous for the beauty of its beaches and its islands, being one of the destinations that is at the top of the ranking when planning vacations. A true earthly paradise with beaches with transparent and incredibly blue waters, you can enjoy spectacular sunsets, choose a traditional tavern and savor exquisite meals, but also stay chatting with the cheerful and charming locals until late at night or simply dance, for those people who have more energy and can enjoy a beach club in the morning.



A vacation in Greece can give you the impression of taking an epic trip, whether on an island, in the capital or in any little-known city that remains in the interior of the country, the myth is always part of this country through ancient temples that are perfectly preserved, with a prestigious museum that contains the first great artistic works of humanity. If your interest is to go with your partner to a romantic getaway you will have arrived at the perfect place, but also if you are a young person looking for unbridled fun or what you want is simply to rest and forget about stress, Greece continues to be the ideal destination.



Tourism in this country is highly developed, so there are apartments and hotels for all needs, you can also count on ferries and flights to reach your favorite places. In Greece you can enjoy the typical Mediterranean climate that is characterized by hot summers and mild winters, however, in the maritime areas that are at high temperatures are mitigated by the wind. The recommendation is to go to Greece during the summer, but if you can avoid the months of July and August you could save a significant amount of money, since they are the months of high season and of course the accommodation, in addition to the tickets, are more expensive and busy, so the best time is definitely the months of June or September. In some cases it is even possible to swim even in the month of October, but in this month the seasonal flights are no longer in service.

Many tourists choose to go to Greece for its excellent beaches and its rich artistic and historical heritage. But is it better to stay on the mainland or visit one of the islands? It is advisable not to miss the most important places in Greece, when we talk about the islands it is advisable to visit Athens, where the Acropolis and the Parthenon are located, which are enough to make Athens a mandatory stop if you want to know these wonders and also not It only has a magnificent view that is unique in the world, it is also loaded with rock festivals, noisy taverns, trendy clubs and from the hill you can enjoy romantic sunsets. You can even take fabulous day trips, such as to the Cyclades Islands. There you can enjoy a sea with exuberant blue tones, a generous sun, a beautiful church on top of a hill and white houses with blue balconies

Each island of Greece has its charms, the glamorous place par excellence is Santorini, while the most transgressive is Mykonos, with Milos being the preferred island for those who want to avoid the tourist crowds and prefer a mix between tradition and nightlife. You can visit Naxos, Paros, Amorgos or Anafi. However Crete is the largest island and for many tourists it is the most beautiful, being the mythical palace of the Minotaur (Palace of Knossos) one of its biggest attractions, but it also includes archaeological museums, mountain trails and palm groves.

The wonderful islands of the Dodecanese such as Rhodes, Karpathos, Kos, Skopelos and Skiathos are the closest to Spain, while the Ionian Islands are very easily accessible from Italy via ferry, Corfu being the best known and with a more accommodation. Zakynthos is also very beautiful, iconic shipwreck beach and the island of the poet, but remember that there is also Ithaca, the mythical island of Ulysses and if you want to stay in mainland Greece, the alternative is also valid as it is just as fascinating but much cheaper and less visited. You can find wonderful beaches both in the east and in the west. Although it is true that archaeological sites are found throughout Greece, in case you do not have too much time it is important that you visit Delphi and Olympia. In the Meteora complex there are 6 ancient monasteries built on imposing stone towers, which are definitely a very unique attraction.

People in Greece are characterized by being jovial and welcoming. The accommodations manage to satisfy the needs

of any tourist, since its facilities range from the lowest cost to the rooms with the most unbridled luxury. Of course, everything will depend on your budget and the vacation you want to have, since you can choose accommodation in large resorts with a private beach, gardens, swimming pools and endless amenities or accommodation in simple guest houses or in studios that are typical of the islands and are the best relationship between charm, price and comfort. There are five-star hotels that have an infinity pool or may include a private pool and most accommodations allow free cancellation, that is, they can be revoked without penalty. They also have 24-hour telephone assistance, in most languages.

While it is true that mainland Greece does not adjoin land borders to the east and west, it is bordered to the north and northeast by Albania, Bulgaria, North Macedonia and Turkey. There are three seas that bathe Greece and they are: the Ionian Sea, the Aegean Sea and the Sea of Crete. There are the Greek Islands and the Ionian Islands, their western shores are towards Italy, while in the Dodecanese Islands they are less than 20 km from Turkey.

169.1 About the Author

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KINGDOM OF JORDAN - TOURISM

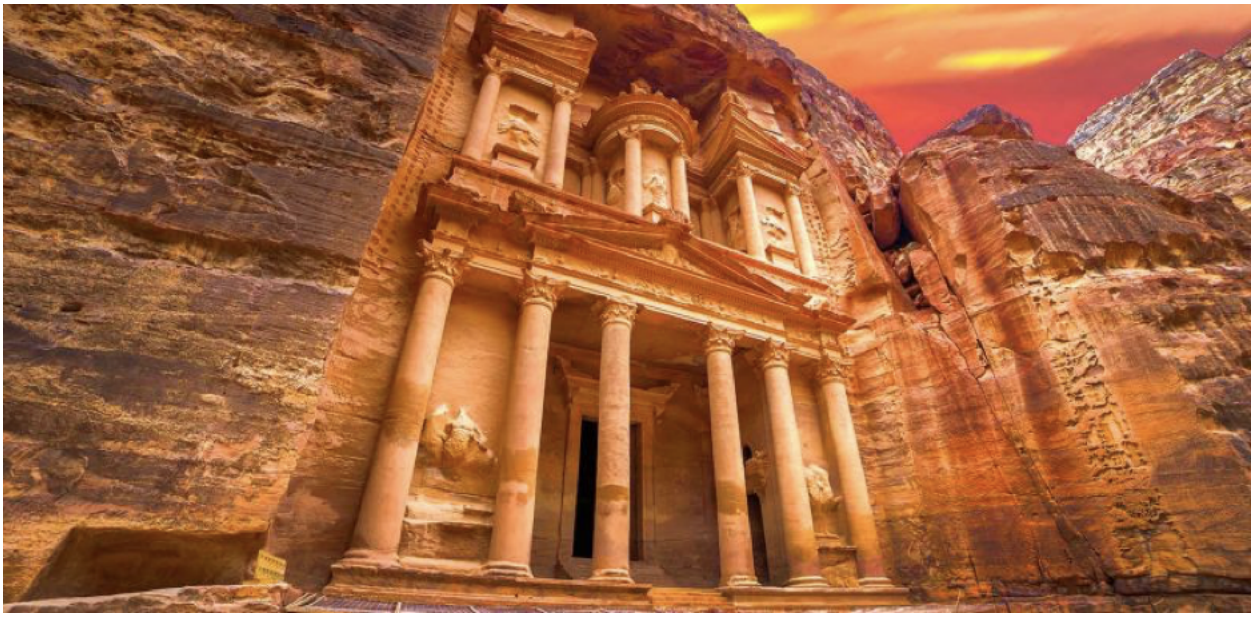
An ancient kingdom located in the middle of the middle east; south of Syria, North of Saudi Arabia.

Although its location is always surrounded by wars and conflicts, it's a peaceful modern country itself filled with sights and sounds as old as time, from Um Qais in the north to Aqaba in the south, you can't set foot on any city in Jordan without having the opportunity to tour an ancient historical monument.

In Jordan, you can step in the very place where Jesus was baptized and taste the wine made by the harvested grapes by Jordan River.



And wander one of the world's great wonders "Petra". Also, you can float in the dead sea on your back while sipping your cold beer, then you travel under one hundred miles south to the wonderful Wadi Rum "where plenty of movies were shot such as: Lawrence of Arabia, Red Planet, Passion in the Desert, Prometheus, The Last Days on Mars, Transformers Revenge of the Fallen, The Martian and Theeb" it's known for its exotic landscape and magical ambient atmosphere where desert collide with pink mountains leading you to Petra.



In Wadi Rum, the party starts!

You get there, you get some rest for a bit in the bubble camp, then you head off to one of the many DJ parties where you are going to have a blast with your friends!



Hospitality is a legendary and very unique tradition in Jordan, it's been called "The Switzerland of the Middle East", don't expect to pay for everything here! Specially for lunch, since it's customary for Jordanians to invite people no matter who they are and where they're from to lunch and you will leave with a full stomach!

As for the history of this small-sized old country, it was inhabited by humans since the paleolithic period, many kingdoms emerged at the end of the bronze age: Ammon, Moab and Edom and later rulers: Nabataean kingdom, Persian Empire, Roman Empire, the Rashidun, Umayyad and Abbasi Caliphates and Finally, the Ottomans who were kicked out in 1916 and after a few years, The Emirate of Transjordan was established and lastly, Jordan declared independence from the British in 1946.

Amman, which is the capital of Jordan is your destination for night life, countless number of bars and nightclubs you

can check out any time and party all night long while getting hammered “pre-covid”.



And don’t get me started on adventure in Jordan!

Walking the Jordanian trail, it’s a 40 days hiking adventure where you get to hike through 75 villages and cities on more than a 420 Miles walk. Going through The King’s road, you get to experience the most authentic and most beautiful nature in Jordan, from Madaba to Karak and Tafilah, then to Ma’an and finally Aqaba, getting lost in the scenery is guaranteed to anyone taking this road!

It’s hot in summer, cold in winter and wonderful in the spring, you really don’t want to miss out on visiting this wonderful country!

Peace.

CHAPTER

ONE

KENYA

Kenya is a country that makes you fall in love with its national parks and you will be able to do the best safaris in Africa, with paradisiacal beaches bathed by the Indian Ocean and exotic ethnic groups.

Although it is true that you can rent a 4×4 truck in Nairobi, it is advisable to hire a safari with a local company not only for safety, but also to observe as many animals as possible and the best time to travel to that country is between months from July to October, since it is at that time when the Great Migration occurs, where thousands of species cross the Mara River. Another good time are the months between January and March, since it is the dry season and a greater number of animals can be seen.

In this article, we will recommend the most essential places when visiting Kenya, so that you do not waste time in less important places.

171.1 Nairobi

Although it is true that Nairobi is not exactly the most beautiful city in the world, it does have some points of interest that are worth visiting. Among the most recommended places to visit are the National Museum, the House Museum of Karen Blixen who was the Danish writer of the famous book "Out of Africa" and visit the Maasai Market. You can also have dinner at "The Carnivore" which is a restaurant where you can taste all kinds of exotic grilled meats.

It is important to emphasize that before traveling around the city, you should check with your place of accommodation which are the safe areas to visit and what precautions you should take.



171.2 Lake Naivasha

Northwest of Nairobi is the Great Rift Valley where there are several beautiful lakes such as Nakuru and Naivasha. The latter is located in the highest part of the valley at 884 m high and you can go on a boat safari, where you will find bird species such as ospreys and pelicans, as well as observe hippos up close.

On the other hand, in the middle of the lake is Crescent Island, which is a true wild paradise, there you can walk among zebras, giraffes or other harmless mammals and without any danger of being attacked by a predator.

171.3 Lake Nakuru

If you are a bird lover, one of the best places to observe them, not only in Kenya but in all of Africa, is Lake Nakuru National Park. Although it is true that it is located approximately 150 km from Nairobi, it is impressive to see thousands of flamingos in this alkaline lake that is located in the southern part of the Great Rift Valley. But it is also one of the places where you can see black and white rhinos, the latter being in danger of extinction. On the road between Lake Naivasha and Lake Nakuru you can see hippos, impalas, warthogs, different species of birds, gazelles, baduinos, giraffes and zebras.



171.4 Maasai Mara

A safari for two or three days in the Masai Mara National Reserve is one of the most acclaimed activities by tourists in all of Africa. You will be able to see from a van fantastic landscapes of endless plains with lions, leopards, elephants, black rhinos, wildebeests, cape buffalo, zebras and crocodiles that you can find at the Mara River crossing.

Later you can go to a Masai village to observe the traditional life of this tribe and see their lively dances.



171.5 Aberdares National Park

In the highlands of Kenya at almost 4000 meters of altitude is the Aberdares National Park, with green hills, valleys with forests, tea plantations and two famous forest hotels The Treetops or The Ark. These hotels offer you, in addition to accommodation, visits to ponds where you will see herds of buffalo and elephants. The park also has impressive waterfalls such as the 270-meter Keruru Kahuru, 300-meter Gura, Chania Falls and Thomson Falls, which are of unparalleled beauty.

171.6 Mount Kenya

Mount Kenya is 5,199 meters high, making it the second highest in Africa after Kilimanjaro. If you have experience in climbing you can climb to its highest peak the "Batián" and if you do not know how to climb but you are in good physical shape, you can climb the peak "Lenana" which is at 4985 meters. But if you just want to observe, it will be more than magnificent to see its glaciers, snow-capped peaks, its forests and the wildlife of leopards, elephants, antelopes and black rhinos.

171.7 Amboseli National Park

Near the border with Tanzania is the Amboseli National Park which was declared a Biosphere Reserve. This park is famous for having large herds of elephants and other animals such as rhinos, lions, and leopards. Amboseli offers you landscapes of great desert plains, lakes where flamingos live, acacia forests, as well as the Oldoinyo Orok peak and traditional Masai villages.



171.8 Tsavo National Park

The Tsawo National Park is the largest in Kenya with approximately 21,000 km^2 and is divided into two zones, Tsavo East and Tsavo West. Although it is true that Tsavo West offers you a greater diversity of landscapes, it is much more difficult to observe animals due to its large amount of vegetation, while in Tsavo East it is easier to see them.

There are several must-see sites between the two parks such as the Mzima Springs, Chaimu Crater, Roaring Rocks Lookout, Lugards Falls, Ngulia Rhino Reserve, the views from Mudanda Rock and Crocodile Point.

171.9 Samburu National Reserve

Taking a safari through the Samburu National Reserve is another great idea, located on both sides of the Uaso Nyivo River. The abundance of water that exists on the banks of the river not only offers you a beautiful natural landscape, but also attracts thousands of felines such as leopards and lions, as well as endemic species such as reticulated giraffes, oryx, gerenucs and grevy zebras.

171.10 Lake Turkana

This lake, also called the Jade Sea due to its characteristic color coming from the algae, is definitely a spectacle. In addition to being able to observe cheetahs, many species of birds and lions, it is also famous for its paleontological excavations where hominid remains from different periods have been found.

171.11 Visit Lamu

Lamu is an archipelago made up of three islands (Lamu, Pate and Manda) where you can enjoy its paradisiacal beaches with crystal clear waters. In addition to touring the streets of ancient villages in Lamu, where you will see an Arab-style architecture with houses made of mangrove wood, coral stone and thatched roofs.

Between Lamu and Mombasa there are fantastic and transparent beaches where you can practice water sports, taste delicious fish dishes and watch incredible sunsets. The most paradisiacal beaches are Watamu, Diani, Silversands, Kilifi and Tiwi.



It offers you beautiful natural landscapes, wild fauna and spectacular beaches.

171.12 About the Author

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CHAPTER

TWO

QATAR

The world gives us the opportunity to discover fantastic destinations where some of them seem to be taken from a fairy tale. In hindsight, Qatar was a sparsely developed and sparsely inhabited desert, but this small part of the world has become a highly visited place for tourism in recent years and this tells us how a good conglomerate of effort can definitely change destiny from a town.

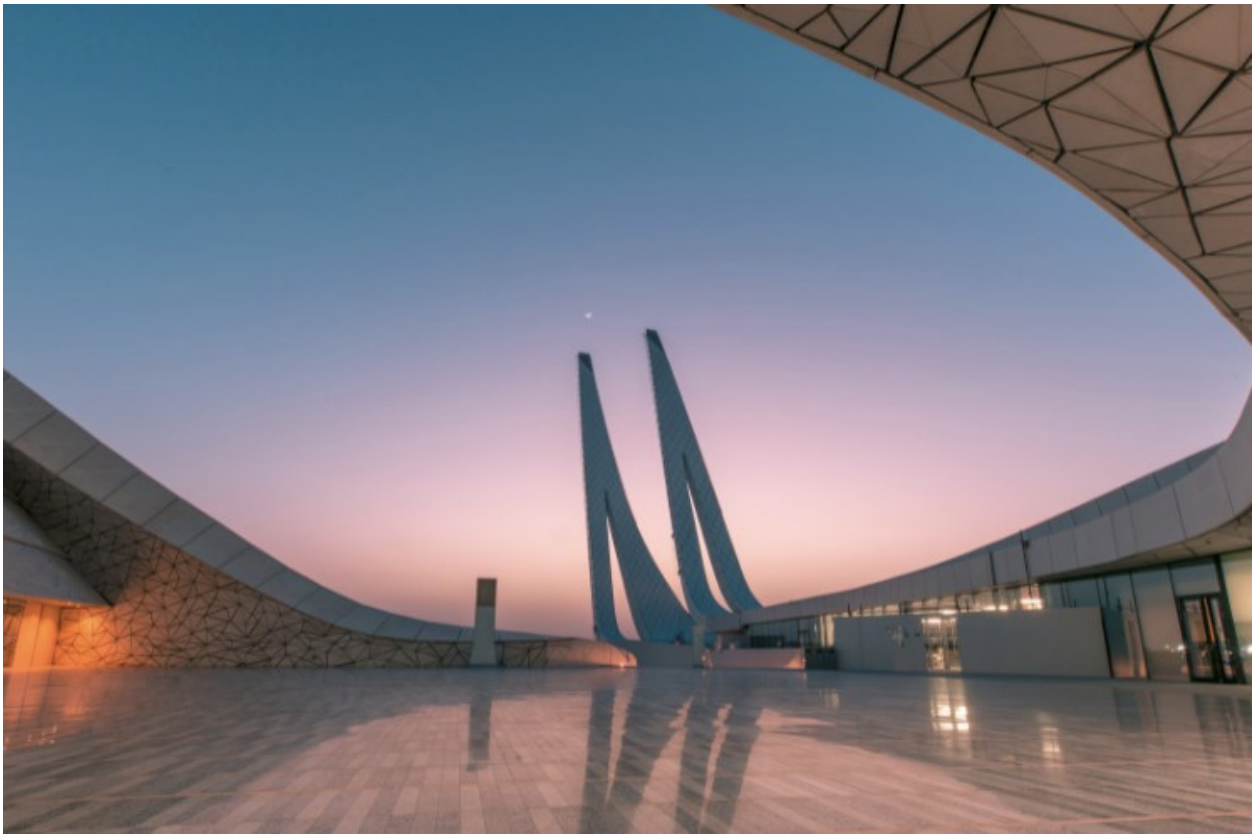
Qatar is a sovereign Arab state that is located in western Asia and has a single border with Saudi Arabia, since the rest of the territory is bathed by the waters of the Persian Gulf. This country has the third largest natural gas reserve in the world and that is why Qatar has the highest per capita income in the world, and is also the nineteenth most peaceful country on the planet.

Currently this country is internationally recognized as a tourist destination that not only has endless luxurious spaces, an architecture that intertwines cultural roots with the latest trends and without a doubt there is much to see in Qatar, if you visit we are going to name the most important sites and that you should not miss.



172.1 Katara Cultural Village

The Katara Cultural Village is a village located in Doha, which is the capital of the country and its most populous city. This is a cultural village where you can find a large number of interesting artistic spaces within the city and you will be impressed with its architecture, where you can observe the entire heritage of the Arab peoples. One of the most relevant spaces in Katara is its mosque, since it is characterized by its multiple uses. This mosque is used as an opera house, an open amphitheater, a multi-purpose cinema, a conference hall and a souk. As you can see, this mosque is a celebration of the local religion and culture. Starting with its architecture, its splendid finishes and its religious importance, it is definitely one of the places you must visit in this brand new capital.



172.2 Doha Museum of Islamic Art

In Doha there is also the Museum of Islamic Art, which is the main institution when it comes to promoting and protecting Islamic art in the region. The room not only has amazing architecture, but also houses jewels and secrets that are much more impressive than the building itself. The structure of the museum was designed by the North American architect Leoh Ming Pei and the museum was inaugurated in 2008. Although it is true that the collection is not exactly very extensive, it does contain works of art of a very high quality and therefore, it is one of the leading museums of Islamic art in the world.



172.3 National Museum of Qatar

The National Museum of Qatar is another of the wonderful cultural spaces and its building, which was designed by the French architect Jean Nouvel, is really another work of art. The museum was inaugurated in 2019 and the tour of its rooms is an enriching experience, since it has various artists and themes where you can see the traditions of the locals. In addition to being able to observe a pleasant account of the accelerated change and modernization of this great country.

172.4 The Pearl Monument

The Pearl Monument recalls the ancient times of the country where its main source of income was the sea, from where they obtained food and jewelry. Today its income comes mainly from gas and oil, but Qatar tries to keep its roots and makes a special effort to do so through The Pearl Monument. In large part, it is a commemoration of all those people who lost their lives searching for pearls at the bottom of the sea.

172.5 Aspire Park

The Aspire Park has 88 hectares of green areas that are the main lung and the largest park that exists in Doha. In a city that is filled with towering skyscrapers, you can relax in the middle of the city in this beautiful space. On the other hand, there you will find numerous attractions such as fountains, playgrounds for children and one of the few lakes that you can find in this country. It even houses several of the most famous works of art you can find in Qatar.

172.6 Imam Muhammad ibn Abd Al Wahhab Mosque

Although it is true that the name is long and very confusing, this is another of the most important and wonderful mosques in both the country and the region. It is named after an important Muslim scholar and preacher, and is considered the national mosque of Qatar. It is one of the most important religious structures, so it occupies an area of approximately 175,000 m^2 and was designed to accommodate up to 11,000 people to pray, as you will see it is a first-class religious site that you must visit.

172.7 MIA Park

The MIA Park is another of the places that Daha offers you to contemplate the world without worries. It is a park that is located next to the Museum of Islamic Art where you will find various activities to do and enjoy within it.

172.8 Doha Golf Club

Doha Golf Club is another of the places you should visit in Qatar. If you are a golf fan you will enjoy it to a great extent, but even if you do not have a greater interest in this sport, it is still a wonderful place that you must visit. This golf course was one of the first built in the Middle East, so it is not only important from a sporting point of view, but also from a historical point of view.

172.9 Aqua Park Qatar

Aqua Park Qatar is a place where you can have fun with the whole family, especially if you have children. This park has multiple water attractions, giant slides, pools of all kinds and endless activities that will not leave you wanting to leave this fabulous park. It is by far one of the most fun-filled adventures you can enjoy in this great country.

Qatar, a little piece of heaven in the world!!!

172.10 About the Author

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CHAPTER

THREE

SCOTLAND

Scotland is part of the 4 countries that make up the United Kingdom. Together with Wales and England it forms part of the great island of Great Britain and consists of more than 790 islands. Scotland, more than monuments and cities, is a country that impresses with its landscapes, its lakes and dreamy castles.

The recommendation to get to know Scotland is to rent a car either in Glasgow or Edinburgh, to have the freedom to stop wherever and whenever you want, in front of a beautiful waterfall, a castle or on the shore of a lake, this is simply priceless.

We leave you a list of the most incredible places you can see in Scotland

173.1 Eilean Donan Castle

Eilean Donan Castle located in the Highlands, which in turn is on the small island of Loch Duich. This castle was the setting for movies like Braveheart or The Immortals. The best photos you can take from the shore of the lake or from the back after the visit.



173.2 Neist Point on the Isle of Skye

Neist Point is known as the end of the Scottish world, it is located on the Isle of Skye and you can climb a small hill to sit on the edge of the cliff, where you will enjoy impressive views of the sea and there you will also find a beautiful lighthouse to visit .

173.3 Urquhart Castle and Loch Ness

Loch Ness is probably one of the most famous places in Scotland for the legend of the monster. This deep lake of dark waters began to be famous with a photograph of what seemed like a sighting of a monster in 1933, although later it was proven that it was not true, the legend continued over the years. But really the best place on the lake is Urquhart Castle, which although it is in ruins, it is a beautiful place.



173.4 Glen Coe

Glen Coe are great mountains that surround a deep glacial valley, located in the Highlands and of volcanic origin. It is one of the best places in Scotland for mountain sports and hiking. However, you can also make your way to Stalker Castle before you get to Glen Cloe on the island of Loch Laich, which is really worth seeing.

Also, while you cross the glacial valley you will find waterfalls, rivers, mountains and the incredible landscapes that surround it.



173.5 Saint Andrews

Saint Andrews is known worldwide for being the birthplace of golf and is a historic university town where you will be pleasantly surprised. One of the emblematic sites is its cathedral, where you can walk among its ruins surrounded by tombs from all eras. However, the best place where you can have the best panoramic views of the cathedral, the sea and the city, is from the tower that belongs to the church of Sant Rule.

Saint Andrews is a charming medieval town with its cafes, shops and markets. But you can also visit the beautiful beach of West Sands and next to it you can see people playing golf on the Old Course, which is one of the oldest in the world.

173.6 Whiskey distillery

Scotland is definitely the land of whiskey and you can visit any of its 108 distilleries, to the point that there is a whiskey route where they will teach you every part of the process of making this malt beverage, you can also taste various types of whiskey. Glenfiddich is one of the most renowned distilleries and can be a curious experience.

173.7 Dunnottar Castle**

Dunnottar Castle is one of the most famous castles for its location, you will find it on top of the sea on a rocky cliff and it is a perfect place to defend against enemy attacks, being only accessible by a steep and narrow path. You will be able to see the ruins dating back to the 14th and 15th centuries, what remains of the stables, the palace, the chapel and other rooms that turn out to be just as impressive.

173.8 Rosslyn Chapel and The Borders

South of Edinburgh is the Borders area, a region full of charming villages and impressive ruins of medieval Abbeys. Be sure to see the Rosslyn Chapel, which was built in the mid-15th century and is full of symbols, gargoyles, figures carved in stone, reliefs and according to legend, the Templars hid the Holy Grail in this place. A little further south you can find Melrose Abbey which is another incredible place and you can also include some interesting abbeys in your visits, such as Jedburg and Dryburgh.

173.9 Stirling

The town of Stirling is famous for its castle, but you can also visit the medieval town of Stirling, its beautiful cemetery, cross its famous bridge or visit the old prison. Near the town you can see the monument to William Wallace immortalized by the movie Bravehart.

The monument is represented by a huge Victorian tower from where you will have fantastic views of the surroundings. Inside is the huge sword of William Wallace and you will learn something about the history of this famous character.

173.10 Loch Lomond and the Trossachs National Park

Stirling and the gateway to this beautiful park full of forests, lakes, mountains and valleys, perfect for lovers of hiking and in its center is Loch Lomond, which is the largest and most beautiful lake in all of Great Britain. There are also other interesting places to see such as the beautiful Argyll Forest, Lake Katrine and the small town of Aberfoley.

173.11 Edinburgh

Edinburgh is the capital of Scotland and it is an extremely welcoming city, as well as having a great atmosphere in all its pubs. In this city, the fabulous Edinburgh Castle stands out and has two quite different parts that are the New Town and the Old Town. In this city there are many activities to do and places to see, but the most important are visiting the castle, having a drink of malt whiskey in one of its many taverns, strolling along Circus Lane and the Royak Mile, visiting the Palace of Holyrood and climb Calton Hill to watch the sunset, where you will have an excellent view of Edinburgh.



Scotland is full of history, it is embodied in each of its impressive castles and its beautiful landscapes will leave you pleasantly surprised

173.12 About the Author

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CHAPTER

FOUR

TANZANIA

The United Republic of Tanzania is a country located on the east coast of the central part of Africa, whose capital is Dodoma. This country has incredible natural parks, dream beaches, majestic wild animals and charming people. Indeed, Tanzania has everything you could want on a trip to Africa, impressive landscapes, paradisiacal beaches bathed by crystal clear waters and impressive animals that you can see from a jeep. Safaris on the island of Zanzibar and in the Serengeti are famous, but we are also going to guide you through its most beautiful and interesting places, so that if you visit Tanzania you can discover its most precious treasures.



174.1 Serengeti National Park

If you are a wildlife lover you should visit the Serengeti sometime. This park was established with the purpose of protecting the shocking phenomenon of the Great Migration and it is when each year more than 3 million herbivores travel up to 3000 km in search of more fertile land until they reach the Masai. Today it is the main source of tourism in the country and an impressive site to see animals in total freedom and this park extends through countless sheets, rivers and forests that are home to lions, leopards, rhinoceroses, cheetahs, hyenas , buffalo, zebra and other species.

Any day in the Seregueti begins at dawn, which is the time when the cats are most awake. Walking the paths of the park to see wildlife in first person is an experience without limits and then you can enjoy a beautiful sunset of all colors.

Later you can rest in one of the camps, to start the next day with another marathon safari day. It is advisable that you plan at least 3 days to get to know its 14,763 km^2 area, but you will also have the opportunity to contemplate one of the most beautiful landscapes in all of Africa from the heights of a balloon, which is an experience that you should not miss.



174.2 Zanzibar

One of the best tourist attractions in Tanzania is the Zanzibar archipelago made up of islands like Pemba and small islets located in the Indian Ocean. In these islands you will find a good dose of nature, history and idyllic beaches, which are worthy of a postcard.

The best beaches are on the island of Zanzibar, you can fall in love with the beaches of Nungwi as they are the least affected by the tides and you can see the construction of the traditional boats (the dhows) of the Swahili coast. Stone Town is the old town of Zanzibar and was declared a World Heritage Site by UNESCO, there you can see a whole labyrinth of coral walls, as well as carved wooden doors, which will leave you breathless.

But if you prefer a backpacker and youthful atmosphere, the recommendation is to go to places like Paje or Jambiani, where there are also beautiful beaches, or dive in the Mnemba atoll where you will find an impressive marine reserve and the best paradises for diving in Tanzania.

Taste the gastronomy at The Rock, which is a restaurant known worldwide for its excellent dishes and is located on an islet a few meters from the shore. But if you prefer luxurious accommodations and more comfortable beaches, a resort

in Kendwa is advisable.



In the Jonzani forest you can meet the red colobus monkey and it is the only place on the planet where you can see this primate

174.3 Ngorongoro Conservation Area

Ngorongoro is one of the largest volcanic calderas in the world. You can enter the crater of an extinct volcano where you can see various ecosystems such as forests, sheets or swamps, where animals live in total freedom.

174.4 Kilimanjaro National Park

If you take a flight from Kilimanjaro International Airport you should ask for a window seat to contemplate Kilimanjaro, which is definitely one of the symbols of Africa with its 5895 meters of altitude. But if you are in excellent physical condition and have a passion for the mountains, you can climb the snow-covered summit of Kilimanjaro. The tour can last between 5 and 7 days to climb the highest mountain in Africa.



174.5 Lake Tanganyika

It is the longest lake on the planet and the second deepest. Although it is true that it belongs to four countries, Tanzania is the one with the highest proportion with 46%. You can tour the Tanganyika by boat and sleep in one of its cabins to reach Kigoma, where you can get to know Ujiji and visit the Gombe Stream National Park, which is the habitat of several chimpanzee communities.

174.6 Tarangire national park

In this park you can also go on safari and see a large number of animals in freedom. But ultimately the beautiful baobabs are the protagonists of the park and can measure up to 30 m high. In the middle of the park by the passage of the Tarangire River you can see a large number of animals such as antelopes, zebras, elephants and giraffes in their natural environment.

174.7 Lake Manyara National Park

In this park you will find 329 km^2 of African savannah, groundwater forests, plains and the beautiful Lake Manyara. Here you will be able to spot some of the 400 species of birds that live in this territory, such as flamingos, pelicans, African marabouts, among others, but also climbing lions, giraffes, rhinoceroses, leopards, zebras and elephants. Tourists usually camp around the lake to enjoy both its sunrises and sunsets and the different ecosystems.

174.8 Dar es salaam

While it is true that the capital of Tanzania is Dodoma, its most populous city is Dar es Salaam. It is there where the largest number of international flights are received and it is located in a bay where you can see the calmest waters of the Indian Ocean. If you decide to visit the city, you will be able to appreciate an interesting architecture where the British colonial heritage is mixed with the German and Indian and Arab influences.

Among the most interesting activities in this city are walking around the center and perusing the offers in the Kariakoo market. Bathe at Cocoa Beach, which although it is not exactly the best beach in the country, it does have a quite pleasant atmosphere.

Another recommended activity is to go to the neighboring islands of Mbudya and Bongoyo where you can find beaches that have nothing to envy to those of Zandíbar.

Tanzania is a paradise of jungle, beaches and wild animals to discover, an unforgettable adventure awaits you in this African country.

174.9 About the Author

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CHAPTER

FIVE

TURKEY

Turkey, officially known as the Republic of Turkey, is the country that is the bridge between Europe and Asia. It shares borders with 8 different countries and 3 seas. It consists of 7 geographical regions and 81 cities. The region in which the country is situated is called Anatolia and is accepted as a peninsula. Anatolia has been a strategically important area throughout history. Turkish people came to Anatolia in 1071 first and since then they are living there. Never mind, let's focus on the country again.

The country has a population of over 80 million and Kurds are the largest minority with a population of over 16 million. Since the beginning of the Syrian Civil War, Turkey has been a shelter to Syrians and there are over 2 million Syrian refugees in Turkey. Even though there are ethnicities other than Turkish in the country, every Turkey citizen is accepted Turkish by law. That does not mean Turkey forces people to forget about their roots. The law has been put into order to ensure that every citizen is treated equally.

The country's official language is Turkish. Kurdish is the second most spoken language in the country, but it is not accepted as an official language, there are people who support this idea, though.

Even though, due to being the most populous city in Turkey, Istanbul is thought to be the capital of the country, the country's capital is Ankara since the law about the country's capital was accepted in 1923 by the new parliament of the new country.

If we are to talk about a country, we should talk about its economy. Turkey has a GDP of $794 billion in total which is the 20th biggest one in the world but when you consider the population (GDP per capita) Turkey is 67th in the world. Also, the purchasing power of the Turkish population is the 45th best one in the world.

One of the biggest industries in Turkey is tourism. It has been so beneficial to the economy of the country that tourism has been called a "smokeless industry". Turkey ranked sixth in the world in terms of the number of international tourist arrivals, with over 50 million foreign tourists visiting the country.

Beyond its rich history and diverse landscapes, Turkey boasts some of the most pristine coastlines in the Mediterranean. Especially in areas like Göcek, Bodrum, and Marmaris, where Yacht Charter Turkey provides a luxurious and intimate way to explore the turquoise waters, hidden coves, and historic harbors. Chartering a yacht offers tourists a unique vantage point to appreciate the coastal beauty and the rich maritime heritage of the region. Whether it's a serene sail through the crystalline waters or docking at a lively coastal town for some local delicacies, yacht charters provide an unmatched Turkish experience.

Another important point about Turkey is that there are 204 universities in the country. Some think this number is unnecessarily high, but the government continues to establish new universities each year. Every city should have at least a university as their main idea regarding this issue, and they have achieved this goal, but they have not stopped yet. There are 840 thousand university students in the country in total and this number is so high that graduating from a university is not important anymore.

Health is thought to be one of the areas where Turkey is good, but the numbers are saying this is not true. In 2018, the total expenditure on health as a share of GDP was the lowest among OECD countries at %6.3 of GDP. Also, Turkey has one of the highest rates of obesity in the world (%29.5).

Since the majority of Turkey's population is Muslim, there is a common bias about Turkey that is it is an Islamic country, but it is not. Since its foundation, the Republic of Turkey is a secular state with no official state religion. The first article of the Turkish constitution says that the country's regime is a republic, and the next article says that Turkey is a secular, social, democratic, nationalist, state of law and it respects human rights. Even though there have always been governments against some of these articles, including the current one, and they have taken some actions to executes their aims, they were not successful, until this one.

Turkey was founded by the old soldiers of the Ottoman Empire. Mustafa Kemal who was later given the surname of "Atatürk" (father of the Turks) was the leader of the independence movement of which aim was to defend Anatolia against enemies in the time following the First World War. They refused the conditions of the Treaty of Sevres and fought for years. Finally, they were able to establish Turkey with its today's borders except for Hatay which joined Turkey on its will after it gained its independence from France.

Turkey is considered to be a European country thanks to the Treaty of Lausanne with which Turkey's independence and sovereignty were accepted. But it is not a member of the European Union. Turkey has applied to become a member of the EU and some of the legislation and the laws have been adapted to those of the EU but there were a few points on which the two sides were not able to agree. So, the process has not been completed and the Turkish government is not trying to join the EU anymore.

If you are talking about a country, you should mention its culture. So, let's dive into Turkish culture. As we have mentioned above, there is more than one nation in Turkey, and this was also the case in the Ottoman Empire, the predecessor of Turkey. Therefore, the culture of the country is also a mix of different cultures. Like its geographical location, Turkey's culture is also a bridge between Europe and the Middle East. The cultures in the area were affected so much by each other that there are some disputed meals about their origins. For example, "yoğurt", a globally known food, is claimed by Greek people. They have been so successful in defending their claims that it is known as Greek yogurt almost everywhere. There are so many meals like yogurt, but we will not further discuss that matter in this article.

Turkey is a good country despite all its cons. I hope one day you can visit this country and enjoy the Turkish breakfast. (Be cautious, you can be addicted to it.)

If you want to read further about the country, you may use these resources as we did:

- https://en.wikipedia.org/wiki/Turkey
- https://w3.bilkent.edu.tr/international/information-on-turkey/
- https://www.budgetair.co.uk/blog/fascinating-facts-about-turkey
- https://blog.viravira.co/yacht-charter-turkey-guide/

CHAPTER

SIX

CHINO VALLEY

As in the state of Arizona in general, the Town of Chino Valley is also diverse, but I would say that Chino Valley's politics lean quite heavily toward the Right, the more conservative side of the political spectrum. I have no reference for this assertion other than the fact that I have lived in Chino Valley since 2006 and I DO pay attention to these things. I also feel that the subject of politics might be more important in this case simply because it does seem to affect our lives here more than in some other locations.

Before I proceed with examples of my assertion, I should note that among the many acquaintances I have made here in CV, the overwhelming majority of them, including the conservatives, are very friendly and kind people.

Even though it has been six months since our nation elected Joe Biden as President, I still see the occasional truck or car with a big Trump/Pence flag or sticker and just last week I noticed a neighbor finally took down his huge Trump/Pence sign from the front of his house.

The Town Council seems to make its decisions based on normal American Republican Party preferences, favoring big businesses and those with money, rather than those who actually work for a living. A case in point is a recent decision to allow development of new homes surrounding the park in the very center of our subdivision, even though that is contrary to the stated goals of the Town (maintenance of Open Space), common sense safety concerns, and also contrary to the plan of the subdivision as stated when most of us purchased our homes some years ago.

I see other signs of conservatism whenever I am out and about in town. It is not unusual to see a person carrying a weapon openly when I'm shopping. Guns are often worn and so are large knives. I simply do not understand why one would feel the need to be openly armed when shopping. That's because I'm NOT a conservative. I also see MOST local citizens carrying out their business without wearing a mask to prevent their infection or them spreading COVID-19. More conservatives scorn this preventative tool than do liberals. Bumper stickers supporting conservative views in subtle and very "in your face" language are common. I consider myself to be a little bit courageous by displaying my "Proud Democrat" bumper sticker.

Why am I taking up so much space discussing local politics? It's simply because it seems to be so important to so many of my fellow local citizens. I believe that many of them are fearful that they are in danger of losing the "American way of life", and to me, that is a sad thing. I also find it sad that THEY are making ME afraid that THEY cannot accept something so simple and American as a change of leadership due to the results of an election. OK, that's it. I said what I had to say. My Democrat neighbors and I know who we are and we DO peacefully coexist with our Republican neighbors.

What do I like about Chino Valley? Pretty much everything else. Most people here are very thoughtful and considerate of each other. The views are beautiful. We have mountains to the east and to the west. About 80 miles away to the Northeast, are the San Francisco Peaks. One of the three pinnacles is Humphreys Peak, the tallest mountain in Arizona. "The Peaks" are visible from CV on most days, sometimes snowcapped. The weather is generally moderate and almost always easily tolerated. We have very little obvious pollution. We have most of the services, supplies and restaurants/bars that we need and when we do need to travel, many more choices are only about 20 miles away. We have only one supermarket though. We COULD use a little competition to keep prices down.

The ambiance in Chino Valley is decidedly "Western" (USA jargon implying "cowboy style"). That's fine with me. From the time I was about eight years old, until I was almost 60, I lived in Colorado, the majority of that time in the

mountains, NOT in a city. My first job was working in a stables, guiding tourists around the surrounding mountains on horseback and tending to the horses. So, I usually feel quite comfortable in my Arizona home.

Much of the wildlife I mentioned in my article on Arizona, can be found within the town limits of Chino Valley. We literally have cattle pastures to the right and the left within walking distance of our house. We often walk our dog there (we walk every morning) and that is where I have seen Coyotes, endangered Mexican Gray Wolves, Pronghorn Antelope, and also snakes and tarantulas, MMWWAAHAHAHA.... Pronghorns are "the fastest land animal in North America" and watching them run is fascinating. They run effortlessly for long distances.

To wrap it all up, living in Chino Valley is like living in a town, just barely, and like ALMOST living in the wild. We REALLY enjoy that.

Here's some references:

- https://www.chinoaz.net/
- https://www.nwf.org/Educational-Resources/Wildlife-Guide/Mammals/Pronghorn
- https://en.wikipedia.org/wiki/Chino_Valley,_Arizona



176.1 About the Author

Harley Armentrout is a happy husband and father, former silversmith, aerospace electronics prototype assembler, test, calibration & repair technician, also writing test procedures at BallAerospace. Then 21 years in the gaming industry, in a range of positions, culminated as a Gaming Inspector, observing and reporting on rules violations, safety issues and criminal activities for the Yavapai Prescott Indian Tribe. After "retiring" Harley taught himself a few graphic design skills and he works as a freelance designer.

CHAPTER

SEVEN

ARIZONA

Arizona is VERY diverse. Politics is an example. In the north, around Flagstaff, liberal politics are the norm. The same is true in the south, around Tucson, while most, but definitely not all of the middle of the state embraces conservative values. So much for that.

Most areas of the state enjoy a view of the mountains. It's difficult to find a location where one cannot see peaks in the distance, if not up close. For that reason, there are areas in the south that are cooler than places farther north. Even though Tucson has quite a few cacti, it is cooler than the Phoenix area farther north, sometimes broadly referred to as "The Valley". Speaking of valleys, let's not forget The Grand Canyon. Red rock formations can be found in many areas of the state, including IN and around some cities. The varieties of cacti are huge (60 species) and they exist to some extent over a large swath of the state. I would mention the names, but most, other than Saguaro, would be unfamiliar to many readers. Varieties of evergreens are everywhere, including the world's largest Ponderosa Pine forest.

As one might expect with such varied terrain, sports opportunities are numerous as well. We have tall mountains (Humphreys Peak is 12,633 ft.) and the lowest point is along the Colorado River in the southwest, at about 70 ft. Name an outdoor sport and it is possible, from snow skiing to dune buggy racing. I have driven my Jeep off-road in many places around the state (seems like a sport to me). I included a couple of photos in an article in this series, on off-road driving.

I could go on and on providing examples of Arizona's diversity and not even begin to touch many important points. The people are an example: Native Americans, Hispanics, Blacks, Whites, Asians, young and old, folks relocated from all over, to this land filled with wonderful sights, and of course tourists from EVERYWHERE. I suppose this is beginning to sound like a tourist advertisement of some sort, but the truth is that it's difficult to not sound like a promotional piece while describing Arizona.

The wildlife is incredible. In and around our small town, there are an unbelievable number of different creatures. We have cattle and horse ranches. In our neighborhood I have seen thousands of small lizards over the years, a good thing because they eat insects and we have plenty, some Coyotes, Bald Eagles, Great Horned Owls, Roadrunners, Vultures/Buzzards, Red Tailed Hawks and ALL the more common birds that one might expect (my favorites being Quail and Hummingbirds). We have also seen endangered Mexican Gray Wolves, Javelinas (like a wild boar), and although I haven't seen one, Mountain Lions in the nearby mountains.

One day my wife, in a somewhat panicked state, pointed out a snake that looked a lot like a poisonous Coral Snake on our kitchen counter. Yeah, REALLY! How the hell a snake got in the house, let alone on the counter, I have no idea. I looked it up and found it was just a harmless look-alike, but nevertheless a shock for us. We let it go outside. Due to climate change and pollution, we don't see as many bats and toads as we used to.

We also have tarantulas, SOME varieties of which are not especially scary. Our son picked one up one day and held it for a minute or two - no problem. I would not suggest picking up a Scorpion or Centipede though. Bunnies, Jackrabbits, squirrels, and moles are everywhere.

Arizona is surrounded by (starting in the south and going clockwise) Mexico, California, Nevada, Utah, Colorado (the corners touch) and New Mexico. So Arizona ranges from low to high altitude, from desert to evergreen forest; from completely rural to densely packed cities; from liberal to conservative; and you will find all kinds of wildlife in very surprising places.

The Navaho Reservation in the northeastern part of Arizona and also occupying parts of Utah and New Mexico, is larger than West Virginia, Maryland, Hawaii, Massachusetts, Vermont, New Hampshire, New Jersey, Connecticut, Delaware, Rhode Island or the territory of Puerto Rico. It is almost as large as the last five of these listed states added together (New Hampshire through Rhode Island). The Navaho Nation deserves to be considered as a separate and important entity for reasons other than just it's expansive size. For more information on the Navaho Nation, please see the link listed in the Resources below.

The climate where I live, a little northwest of the center of the state, is generally mild: Winters not too cold, summers not as hot as some other areas, spring is nice but windy, and so fall is my favorite.

RESOURCES - Check these websites for more information on Arizona:

- https://www.britannica.com/place/Arizona-state
- https://www.tripadvisor.com/Tourism-g28924-Arizona-Vacations.html
- https://www.visitarizona.com/
- https://en.wikipedia.org/wiki/Navajo_Nation
- https://www.mapsofworld.com/usa/states/arizona/

177.1 Logo



177.2 About the Author

Harley Armentrout is a happy husband and father, former silversmith, aerospace electronics prototype assembler, test, calibration & repair technician, also writing test procedures at BallAerospace. Then 21 years in the gaming industry, in a range of positions, culminated as a Gaming Inspector, observing and reporting on rules violations, safety issues and criminal activities for the Yavapai Prescott Indian Tribe. After "retiring" Harley taught himself a few graphic design skills and he works as a freelance designer.

CHAPTER

EIGHT

COLORADO

Best known for its wonderful and diverse scenery, encompassing most of the southern Rocky Mountains in the U.S.A., Colorado is simply put, colorful. The word "Colorado" is derived from the Spanish word for "colored red". For many years Colorado vehicle license plates said "Colorful Colorado". A little more than half the state in the west, is occupied by the Rocky Mountains and the "front range", and the western edge of the Great Plains in eastern Colorado contain vast farm and ranch lands. We can't ignore the fact that there are also deserts with huge sand dunes, high plains, deep canyons, deciduous forests and buttes to delight in.

The state has been a territory of the U.S. Since 1861 (after multiple disputes over a period of years, involving Spain, France, Mexico, the U.S., and other interests), and in 1876 President U.S. Grant signed the proclamation admitting Colorado to the Union as the 38th state. It is nicknamed The Centennial State, commemorating 100 years since the signing of the United States Declaration of Independence. The area has been inhabited by Native Americans for over 13,000 years. The 2020 United States Census listed the population as 5,773,714 people engaged in a wide array of activities such as agriculture, ranching, mining, forestry, manufacturing, government and defense, and tourism. Unfortunately, Climate Change is having an adverse affect on some of these activities. It is just slightly southwest of the center of the U.S.

The metropolitan area of the capital, Denver, known as "the Mile High City", just east of the front range, contains about 85% of the population of the state. It was built very near sites of the Cheyenne and Arapahoe Indian tribes' seasonal encampments. The Ute Indians to the south also (as one might expect) suffered at the hands of those looking for wealth in Colorado. The infamous Sand Creek Massacre occurred in 1864 about 170 miles S.E. of Denver where the murdering militia was based. Mining was one of the drivers of early Denver history as well as other usual frontier town activities such as gambling, saloons, livestock trading, agriculture, and other commercial activities to support a large population. Denver also aspired to become a transportation hub. On June 24, 1870 the citizens cheered the completion of the Denver Pacific Railroad link to the first transcontinental railroad of the U.S.A. routed through Cheyenne Wyoming. Denver was finally linked to the rest of the nation and this was the beginning of a period of economic prosperity (and notoriety, as explained in my referenced Wikipedia articles). As such, Denver and Colorado attracted a wide variety of ethnic immigrants and people moving to the area with quite different ambitions: military, some religious, and some predatory. Denver is now a very cosmopolitan city (not a complement or a criticism, just a fact).

One especially good thing happened in Colorado on November 7, 1893. Colorado became the second state to grant universal suffrage to women, and the first to do so by majority vote of the men of the state. Colorado was the first western state to host a large political convention- when the Democrats held their convention in Denver in 1908. The Great Depression was very hard on Colorado, but following World War II a major immigration wave helped to stimulate the tourism industry and high technology became an important part of the state's economy. This author benefited from the technology stimulus when working at several small electronics firms and at Ball Aerospace in Boulder (six years) from approximately 1978 to 1992.

Another notable aspect of Colorado's history was the Chicano Movement, a civil rights and social movement that began in Denver in 1969 and promoted the well being of Mexican Americans (Chicanos). From the 1940's through the 1970's, several other movements were supported in Colorado and in 1967 Colorado was the first state to loosen restrictions on abortion in cases of rape, incest or threats to a woman's mental or physical health.

Politics aside (and included), my family and I enjoyed our last 27 years in Colorado, at 9000' on a steep acre and a

third, with literally hundreds of Pine trees and about 30 Aspen trees partially encircling our house. Fall was absolutely perfect with the yellows and oranges. We had four or five tall (75') Blue Spruce trees on one side and many wildflowers, including gorgeous Columbine in our "yard". We had a view of very tall (12,000-14,000') mountains to the west and the sunsets were nothing short of spectacular.

We moved to Arizona in 2004, about a year and a half after seven FEET of snow fell in less than five days. I was on the roof, shoveling (some neighbor's roofs caved in), when I decided I didn't need the ladder to get down. That was no problem at all but for the fact that on landing, I got stuck. It took me a few minutes to get unstuck and my 17 year old son a few minutes to create a path over to me. After five days of shoveling a path to the driveway and from there to the road, the snowplow left about an eight foot wall of compacted snow for us to deal with. From that point to the nearest grocery store in Nederland, the road was one lane for ten miles, with several turnouts for passing. Thank goodness I had enough beer to last for that five days, and enough firewood, food, and the electric service miraculously continued. Old age convinced my wife and I to move, but we DO miss that beautiful place in the Colorado mountains. I also miss the absolute thrill of skiing in those mountains. In my youth I would say skiing is the next best thing to sex.

The final chorus to Rocky Mountain High by John Denver: "And the Colorado Rocky Mountain High I've seen it rainin' fire in the sky Though he'd be a poorer man if he never saw eagles fly Rocky Mountain High"

- https://en.wikipedia.org/wiki/Colorado
- https://www.colorado.gov/
- https://www.colorado.com/
- https://en.wikipedia.org/wiki/Denver



178.1 About the Author

Harley Armentrout is a happy husband and father, former silversmith, aerospace electronics prototype assembler, test, calibration & repair technician, also writing test procedures at BallAerospace. Then 21 years in the gaming industry, in a range of positions, culminated as a Gaming Inspector, observing and reporting on rules violations, safety issues and criminal activities for the Yavapai Prescott Indian Tribe. After "retiring" Harley taught himself a few graphic design skills and he works as a freelance designer.

CHAPTER

NINE

ARUBA

Each one of the Caribbean islands has specific characteristics and in the case of Aruba we can mention its picturesque capital, its arid geography, the famous dividivi which is a tree with a twisted trunk that remains intact under the persistence of the wind and has become the symbol of Aruba. It is an autonomous country and is part of the Netherlands.

This island is sunny 300 days a year and with a temperature of approximately 28 °C, so going to the beach is a plan that is guaranteed and if that were not enough, it is outside the hurricane belt. In this article you will find a list of the best activities you can do on this beautiful island.

179.1 Beaches

Among the multiple beaches that you will find on the island is Eagle Beach, which is the widest in Aruba, where large hotels and water sports abound, in the same way you can find them in Druif Beach and Palm Beach. But if you prefer to visit quieter beaches you can go to the south of the island, specifically to Rodger's, a beach very popular with locals and fishermen, or to the north where Cura di Tortuga or Boca Catalina are located, where you will find two natural pools formed of rock volcanic and capable of protecting these beaches from the great waves of the sea.



179.2 Diving or snorkeling

If instead of resting on white sand and bathing in turquoise waters you prefer to investigate the marine fauna, the perfect beaches for swimming, snorkeling or diving are Baby Beach and Arashi Beach. However, the recommendation for the most experienced is MangelHalto, which is protected by reefs where you can see yellow tail snapper, blue spike snapper, parrot fish and at deeper dive points, you can see barracudas, moray eels, octopus and other types of marine fauna.



179.3 To surf

If you are a lover of challenging the waves, the recommendation is to go to Boca Grandi, which is located in the south of the island, yes, this beach is only suitable for experts, since the currents are usually excessively strong. For those people who prefer to observe, they can be entertained watching the jumps of the kitesurfers. For those who like bodyboarding, the ideal beach in this case is Andicuri, which is also the occasional venue for competitions of this type, being for many the best beach in the Caribbean to do this activity.

179.4 Tour Aruba on a Harley Davidson

For motorcycle lovers, there is the possibility of exploring the island on a Harley Davidson, but they also offer you the possibility of touring it in a 4 × 4 vehicle, on horseback, bicycle, segway or quadricycle.

179.5 Ostrich Farm

Visiting the Ostrich Farm can be a very interesting experience, since you will be able to learn about the behavior of these curious animals and you will have the opportunity to feed them, you can also see the Butterfly House that is located inside a tropical garden.

Another interesting stop on the outskirts of the city is the Aloe Museum, located in the Hato Plantation. You can also live an intense adventure in the Arikok National Park located in the center of the island. There you can appreciate the dividivi trees, tropical flowers, exotic cacti, iguanas, lizards, birds, etc. In this park you will be able to observe a unique

cultural heritage, since in the enclosure you will find caves with original rock art of the natives of the island, unusual geographic formations of limestone, quartz and lava. It even has walks through dry rivers that will take you to hidden bays like Boca Prins, Moro and Dos Playas.

179.6 Stroll through Oranjestad

The capital of Aruba has a perfect mix between the old and the modern, buildings such as the town hall whose façade is an intense green, the oldest building on the island, the Zoutman Fort built in 1798, a bustling port where You will find a large number of shops, local crafts, art and excellent Caribbean cuisine. The most recommended way to get around Oranjestad is by taking the tram that leaves from the cruise terminal and goes through the main street, making stops at six points of tourist interest.



In the unique culture of Aruba, European, African and various Latin American influences converge, being able to integrate up to 90 nationalities and you will notice this in the gastronomic influence, which is worth tasting. Some of the more traditional local dishes include the keshiyena glazed gouda, mixed with chicken and vegetables with a cheese topping as the finishing touch; the chicken, fish or meat stew that is served with mashed corn or rice and the pastechi, which is a sweet bread stuffed with meat.

179.7 Visiting Aruba during Carnival

In Aruba, one of the most important and largest festivals in the Caribbean is celebrated on this date. If you visit the island during carnival, you will see troupes that dance to the rhythm of soca and calypso, torchlight parades, costumes with bright costumes and the end of the This party is celebrated with the burning of a figure that represents King Momo, this is done just before Ash Wednesday.

On the other hand, the island is also home to several festivals that bring a large number of people, such as the Aruba Music Festival, the Electric Festival, the Soul Beach Music Festival and the Caribbean Sea Jazz Festival.

179.8 Getting married in Aruba

This island is undoubtedly one of the most romantic places to share as a couple and that is why many people decide to spend their honeymoon or have their wedding in Aruba. For those who want to get married, they will be able to find the best wedding planners in the entire Caribbean on the island, celebrate the ceremony in picturesque churches, on the beach or in original natural landscapes. If the bride and groom want to formalize their civil wedding, it is not complicated to carry it out if they have the minimum requirements. Also for those people who need to receive the blessing of a certain cult, the possibilities are opened in various churches and chapels on the island.



Aruba is a magical place with paradisiacal beaches and a large number of tourist attractions to offer.

179.9 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

BALI

Bali is an island in Indonesia known as the Island of the Gods for its large number of temples, wild nature, beautiful rice fields, volcanoes, waterfalls, lakes, endless beaches and the incredible kindness of its people, in addition to the delicious cuisine, which you offers an unforgettable experience.

Through this article we will take you by the hand through the most iconic sites of this paradisiacal island.

180.1 Luhur Uluwatu Temple

The Luhur Uluwatu temple is located in the south of the island on a 75-meter-high cliff, it was built to ward off evil spirits in the 10th century, it stands out for the large number of tourists who go to the temple to see the wonderful sunset in the Indian Ocean. This site is close to beaches that are worth visiting such as Balangan, Bingin or Padang Padang. One recommendation is that you have to be careful with the monkeys and keep your glasses or small objects well, because they are capable of taking them and running away. Several places provide food for the monkey to drop the objects, in case of theft it is advisable to go to these specific places.



180.2 Ubud

Ubud is a city that is located in the central part of the island, so it is the perfect place to stay and have the points of interest closer. But there are also many things to see in Ubud and it is able to mix the modern with the traditional. The most important places to visit in this city are the temples, the market, the Monkey Forest, the hiking trails that are found through the rice fields, the massage and yoga centers, the traditional houses, the craft centers, the art galleries and enjoy its cuisine in its restaurants and cafes.

180.3 Rice terraces

Bali's main crop is rice, so rice terraces are scattered all over the island. Although it is true that there are very beautiful rice fields around Ubud, we also recommend you visit the Tegallalang and Jatiluwih rice fields, which we consider to be the most beautiful, with an intense green, full of water and surrounded by a great environment.



180.4 Pura Tanah Lot

Tanah Lot is one of the best temples in Bali, built in the middle of the sea on a rocky islet where you can see the sunset or sunrise with the temple, the ocean in the background and the waves breaking on the rocks, that's all a show. You can see this Hindu temple dedicated to the god of the sea up close at low tide by accessing it from the beach, since you cannot visit its interior, but it is a unique experience to complement sunrise or sunset.

180.5 Volcanoes

Bali is part of the Pacific Ring of Fire with high seismic and volcanic activity. The Batur volcano is the highest on the island and measures 1717 meters, being the best known and although its last eruption was in 1964, it is still active. You can climb the crater in an excursion that ranges between 2 and 3 hours, but if you take it easy it is accessible to all travelers. Once at the top you will have excellent panoramic views of Lake Batur, the valley and the small plumes that rise from the caldera of the volcano.

The other recommended volcano to visit is El Batran, which has a large caldera with several lakes and there is the Pura Ulun Danu Batran, one of the most beautiful temples in Bali. The last volcano on the list is Agung, sacred to Hindus and of great importance to the Balinese, since they consider it a replica of Mount Meru.

180.6 Pure Besakih

It is the most important temple in Bali and the most sacred, it is considered the mother temple of all the others, since it is an immense complex made up of 22 temples. Penataran Agung is its most outstanding temple with seven levels of terraces that symbolize the layers of the universe, but only the followers of its religion can climb the grand staircase.

180.7 Waterfalls

Bali has excellent waterfalls perfect for taking a bath such as Git Git, which is the highest on the island and is very easy to access. Sekumpul is one of the most impressive in Bali but can only be reached by motorcycle. Goa Batu where to get there you have to walk a long way, but the effort is worth it. Aling Aling is one of the most popular in Bali and you can jump from its top and finally the Nung Nung waterfall, which in addition to having easy access has a large waterfall.

180.8 Ulun Danu Temple

The Ulun Danu Temple is dedicated to the goddess of water and is one of the most beautiful in Bali. It is located on the shore of Lake Bratan at about 1200 meters high, the image of it is reflected in the lake that has been formed on a crater and with mountains around lush vegetation.



180.9 Other Bali Temples

Bali has more than 10,000 temples, and it is very important to choose which ones to visit, so the most important ones, in addition to those mentioned in advance, are the following:

Gunung Kawi: This temple stands out for being located near a river surrounded by rice fields and is very different

from other temples in Bali, since the sanctuaries are carved into the same rock.



Tirta Empul: It is located next to a spring in which the Balinese consider sacred water, where they bathe for its healing properties.

Taman Ayun: Temple composed of pagodas with different heights, whose set ends up being spectacular.

Pura Lempuyang It is located on Mount Lempuyang at more than 1000 m above sea level, it is one of the most photogenic.

Tirta Gangga: It stands out for its statues, its fountain and its pool where you can walk on top of the stones.

Goa Gajah: This temple is known as The Elephant Cave as its entrance carving is in this shape.

180.10 Balinese beaches

Bali has hundreds of kilometers of coastline with beaches with turquoise waters and fine sand, the most famous being Kuta beach for its lively nightlife and its great waves, Jimbaran beach with much calmer waters. Sanur Beach, Seminyak and Nusa Dua are other beautiful beaches, as well as having luxurious hotels and resorts around them, with a more distinguished atmosphere.

Bali a paradisiacal island full of warm people and charming places!

180.11 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

ONE

CURACAO

Curaçao is part of the Lesser Antilles and is an island in the Dutch Caribbean, its capital is Willemstad. This island stands out for its impressive beaches, its colonial architecture and its coral reefs, where you can find a wide variety of activities and attractions to enjoy. If you want to make the most of your vacation in Curaçao, we will guide you through its most emblematic and essential sites, which you cannot miss.

181.1 Kenapa Beach

It is located on the northwest coast of Curaçao and has two beaches, the smallest being Klein Knip and the largest Grote Knip, both of which you can dive, sunbathe or practice other water sports. In the environment there are rocky cliffs where you can jump from heights or simply watch others plummet into the sea.



181.2 Marine Aquarium

The Sea Aquarium is a wonderful attraction for the whole family that is located on the Willemstad waterfront and has pools of water fed directly from the sea, where you can see a wide variety of marine fauna and feed or touch some species such as manta rays, sea urchins, starfish, sea cucumbers, among others. The aquarium also has interesting shows with dolphins, sea lions and sharks.



181.3 Alma Blu

If you are an art lover you will find several galleries that exhibit photographs, sculptures and paintings. One of the best galleries to visit is Alma Blou for its large collection of art pieces and it is the oldest on the island. It is located within an old plantation that remains in Willemstad, specifically in Habaai.

181.4 Savonet-Museum

The Savonet Museum offers you a walk through the history of the island through its exhibits, from more than 4000 years ago to today, it is located in the Christoffelpark National Park and focuses mainly on the plantations of Curaçao, since it is the backbone of the island's economy.

181.5 Sunset Blueview Terrace

If you want to try the gastronomy of the most traditional dishes, the recommendation is to eat at the Blueview Sunset Terrace. It is a beachside restaurant with sensational views of the ocean, where you can try the grilled iguana, an indigenous dish that is offered throughout the island.

181.6 Handelskade

Handelskade is a part of the wharf at St. Anna Bay in the Punda area of Willemstad, this street is one of the most photographed in Curaçao for its pastel colored Dutch colonial buildings. Where you will also find fantastic cafes and bars, the other recommended place to visit in the area is the Queen Emma Bridge.



181.7 Israel-Immanuel Synagogue

The Mikve-Emanuel Synagogue is a Jewish temple built in 1732, where the first Jewish settlers fled the Spanish inquisition and arrived in Curaçao. Next to the synagogue there is a museum, with a large number of historical objects related to the history of the temple.

181.8 Kura Hulanda Museum

This museum is located inside the former house of a 19th century slave trader, where you will be able to see the history of the slave trade on the island, but you will not only be able to see objects related to the slave trade, but other interesting collections such as Mesopotamian relics, Antillean art and pre-Columbian gold.

181.9 Little Curacao

Klein Curacao is also called Little Curacao, an uninhabited island located 15 miles off the coast of Curacao, which you can reach by boat. There you can dive or simply swim with a snorkel, to enjoy the large amount of marine life found in the coral reefs. You can also swim in virgin beaches and visit the lighthouse (which still works).

181.10 Beaches

Curaçao is famous for its crystal clear white sand beaches, the best and most beautiful beaches are Mambo Beach, Blauwbaai, Cas Abao Beach and Playa Lagun.



181.11 Snorkeling and diving

In the depths of the Caribbean Sea surrounded by coral reefs, you can dive or snorkel to see sunken shipwrecks, turtles, delicate coral gardens, manta rays, tropical fish, dolphins, etc. Some of the best dive sites can be accessed directly from Porto Mari and Blauwbaai beaches. However, there are some others where they are only accessible by boat, including the mushroom forest reefs.

181.12 Shete Boka National Park

Shete Boka National Park has more than six miles of coastline to the north of the island. It is famous for several species of sea turtles where they lay their eggs in one of the 10 bays that make up this coastal park. The recommendation is to visit Boka Pistol, which is located at the top of some hills formed by limestone and offers spectacular views and the second place to visit is Boka Tabla, where you can see an underground cavern where the waves break.

181.13 Christoffelpark National Park

Christoffelpark National Park is perfect for admiring Curaçao's native fauna and flora, where you can see 450 different species of plants including wild orchids. As for the fauna, you will be able to observe white-tailed deer that are in danger of extinction and owls, among the rarest animals. From the top of Christoffel Mountain you can enjoy the beautiful panoramic views of both the park and its surroundings.

181.14 Drink Curaçao Produced in Curaçao

The most famous product has the same name as the island and is an orange liqueur produced by the Genuine Curacao Liqueur Factory established in 1896. You can visit this distillery and take a tour of its facilities where you will be taught

about the production process and learn a little about the history of this liquor, the most famous being the blue one, but there are also other flavors available such as rum, coffee, raisins, red, green and chocolate.

181.15 The Forts

In Willemstad there are many forts but there are three that are the most important, the first is Fort Amsterdam, which is the most important on the list and was declared a World Heritage Site by UNESCO, it currently houses several government offices, the Governor's office and the Council of Ministers. Second on the list is Rit Fort which dates back to 1828 and is located in Otrobanda, today it is a commercial center that has bars, restaurants, shops and an ice cream parlor. The last recommended fort is Fort Nassau, located five minutes from the capital, it was built to protect St. Anna Bay in 1797.



181.16 Ostrich farm

The ostrich farm is located 15 minutes outside of the capital, you can take a safari vehicle around the farm grounds, to see African ostriches and emus. You will be able to observe the birds at any stage of their life, from their stay inside the egg to their adulthood.

181.17 Hato Caves

The Hato Caves were formed millions of years ago, can be visited and feature impressive waterfalls, pools and limestone formations. There are even statues inside the cave, with Madonna's status being the most important.

Curaçao is a picturesque island with paradisiacal beaches and an impressive marine fauna to discover.

181.18 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

TWO

DATABASE

182.1 Overview

- *What is a database?*
- *When to use NULL*
- *What RDBMS should you use?*
- *Avoid NULL (usually)*
- *camelCase or underscore_case?*
- *When to Index?*
- *Why "ID"?*
- *Naming ID Columns*
- *Normalization Example: States*
- *Database Design: Three Areas of Optimization*
- *Enum: Just Say No*

182.2 What is a database?

This may seem like a very simple question, but it can have different answers, depending on who you ask.

In order to avoid confusion, it is important to be aware of how different people might perceive this question.

If you were asked to provide a quote for creating a database, what kind of number would you provide?

Because I can think of many different numbers. I could create a database for $5.00. I could do it for $100. Or $10,000. Or $1 million.

In theory, you could launch a database management tool, create a new, empty database instance, and you're done! You created a database. That will be $5.00 please.

That is usually not what people mean, though.

Typically when I discuss "designing a database," I am referring to the act of creating a database schema, which is primarily the tables and columns needed to store all data necessary for a specific project.

But people who are not database designers, or may not have any kind of technical expertise at all, may have very different perceptions of what a "database" is.

They may expect a database to have data in it.

They may expect a database to have a comprehensive front-end.

They may think of a "database" as being something like "IMDb.com," which has a sophisticated front end, fancy graphics, and a list of all possible movies, TV shows, and casts.

So before embarking on a database project, one needs to define what it is that will be included in the delivered "database"?

- What are all the project specifications?
- What are all the available sample data files?
- Will the database use explicit foreign keys or just implicit linking names?
- Will data need to be loaded into the database?
- Will there be human-friendly views for displaying database data?
- Will the system need to have automated data-loading tools?
- Will the system need to have tools for manually entering data?
- Will the system need to have data-editing tools?
- Will the system need a front end? What kind?

Anybody who is a project owner or project manager of an information system which includes a back-end database should be aware of how the simple word "database" may signify different things to different people, including database designers.

Database designers and programmers who create databases should be aware that when they refer to a "database," different people will have different perceptions of what this entails.

182.3 When to use NULL

I previously wrote that optimal database design will avoid using columns that allow NULL. A database schema will be faster, easier to maintain, and easier to program for if you mostly avoid allowing NULL values.

But there ARE times when allowing a NULL value makes sense. Sometimes your column setting should be to "allow NULL."

The main reason for this is when you have a column whose value really does need to differentiate between null and a default value.

For text string columns (varchar), this is rarely the case. But for many other datatypes, this can make a difference.

Let's consider numbers. If possible, I like to avoid using NULL for number columns as well. For example if I have inventory count column, I would prefer to use zero as a default and not allow null. This would mean that the system will display zero inventory for a product if the value is not known. Rather than allow null, the default for the column is set to zero.

But what if the system demands a distinction between "zero inventory" and "we don't know the inventory"? Then there are two ways to handle this: - We could set the inventory column to allow null - Or we could use an additional boolean column to indicate that the inventory is unknown.

Both of these are valid options. But note that the second option actually requires an additional column. So it actually requires a more complex database schema, and potentially more complex coding.

The right way to handle this situation will depend on the needs of the project.

But keep in mind that if you use "zero" to indicate BOTH meanings: "I don't know what the inventory is" and "I checked, and I verified that the inventory is zero"… that you are introducing ambiguity into the system unless you do something to differentiate these meanings.

Here is another example of when it would be a good idea to NOT allow null for a numeric field:

The latitude and longitude of a location can be stored as a pair of decimal values. Here is an example: Latitude: 33.428606 Longitude: -111.927360

But what if you want to store a location in the database before you know the latitude and longitude?

You COULD disallow NULL for these columns and set their default to zero.

But the problem with that is: Zero is a legitimate value for a latitude or longitude. Zero signifies the equator or the Prime Meridian.

So if you set the default value to zero, and disallow NULL, how do you know if any given value in the database is unknown versus actually being at the zero position?

You can't use a negative number as a placeholder, either (e.g. "-1" or "-99"), because negative values are legitimate values as well. (And that would be kind of deceptive anyway!)

So I would set these columns to allow null, and I would record them as null in the database if the information was not provided… if the data was submitted without latitude and longitude info.

There are other reasons to use NULL. This is the main reason.

182.4 What RDBMS should you use?

The abbreviation "RDBMS" is short for "relational database management system."

Although we don't always think of it as such, an RDBMS is a software application, like Microsoft Word or Adobe Photoshop. It needs to run on a computer somewhere. It is different in the sense that we typically do not launch it independently on our own computer. In a typical information system, an RDBMS is running on a remotely accessible server and allows many users to connect to it from various "front-end" applications, such as a mobile app, a web application, or a desktop application.

An RDBMS may be hosting multiple databases concurrently. It may allow one, a few dozen, or many thousands of users to connect to it concurrently.

Which should you use?

I don't know. It depends on your situation. Some RDBMS are free and open-source. Some cost money to purchase or use. Some will work on your server of choice. Some won't. Some will work with specific front-end software that you want to use. Some won't.

There are many considerations that go into choosing an RDBMS. But a key thing to understand is that all of them can utilize database designs which are optimized for these key criteria: data integrity speed maintainability

The same RDBMS can be hosted on a server which runs quickly or not so quickly. Some commercial hosts (such as AWS) intentionally throttle (limit) the speed of their databases for customers at lower-paying tiers.

For most information systems of small to moderate size, the choice of a specific RDBMS is not going to be the key factor in the speed and efficiency of your system. More important factors are: - where it is hosted - how you use it

When a database-based information system has a query which runs slowly, a page that loads slowly, an update that takes a long time, a report that makes you wait, etc…

Nearly always, if your database system is having speed problems, it is NOT because you are using MS SQL Server instead of Oracle, or because you are using MySQL instead of PostgreSQL.

It isn't the choice of the RDBMS that is causing the problem. The problem stems from one of these causes: - the database design - the SQL query design - how the application source code was written - the host server settings and configuration (such as memory, available hard drive, etc.)

182.5 Avoid NULL (usually)

Columns in SQL database tables can have values. Their value can also be set to NULL. Whether or not to allow an individual column to be set to NULL is an important decision in database design.

The importance of the NULL/NOT NULL decision is often overlooked. I often see inexperienced database designers use this incorrectly.

Simply put: When optimizing a database for: - data integrity - speed - maintainability

. . . it is best to set all or most columns to NOT NULL.

This may seem counter-intuitive, depending on when, where and how a person first learned database design.

NULL means that you don't know the value, right?

So let's take this table: Table: USERS ID first_name middle_name last_name

Maybe we want to collect names of users. We block rows from being created without a first and last name. But we don't want to require users to enter a middle name or middle initial. In the front-end interface, we leave that field optional.

So if a user doesn't provide a middle name, should we store that as NULL, because we don't know the value?

No.

Using NULL is indeed a "semantically pure" decision. But we are not optimizing our database for "semantic purity." We are (instead) optimizing our database for data integrity, speed, and maintainability.

Allowing the middle_name column to be NULL introduces an additional state or property to the column. This actually increases the memory requirements of the column. It may be a very slight amount, but with a large table, it is faster to deal with columns that do NOT allow null.

And queries are more complex if you allow NULL. Queries may need to use functions to check for null status, instead of simply querying columns directly.

Where clauses and joins are particularly trick. Many queries which use a column which allows null will fail if not handled properly. One might run a query that is supposed to return 100 rows of data. But it only returns 80 rows. Why? A programmer or user could spend a long time being baffled by the results until they realize that the query did not properly account for the NULL-able columns which were part of where clauses.

What are you going to do with that null value middle name? You're going to display it as blank on the front-end, or in the report.

How is that result any different than simply storing the middle name as a blank (empty string)? It's not. The result is exactly the same.

So by setting the column to NOT NULL, you reduce the complexity of the database table by eliminating one possible state and also eliminating one possible value which has no meaningful difference from another possible value.

If "NULL" and "blank" mean the same thing, then they're redundant. And it is better to use only one of them.

There ARE legitimate reasons to set a column to "allow NULL." I do use NULL-able columns in my database designs. But I use them cautiously and sparingly. I try to avoid using them whenever possible, but if there is a need for them, I use them.

When NULL-able columns should be used can be discussed another time.

182.6 camelCase or underscore_case?

The formatting of table names and column names within a database schema has been debated for decades. The same discussion occurs in relation to programming source code.

The discussions (arguments) go round-and-round. They will probably never end.

I don't want to write anything lengthy about this. Let me point out a few general facts:

- This relates specifically to optimizing for maintainability. This doesn't make any difference when it comes to optimizing for data integrity or speed.
- The most important decision on this topic is to be consistent. Stick with one format throughout the database design. Otherwise, people will type in the wrong column names and table names, and that will cause errors.
- Although some RDBMS are case-insensitive with regards to table names and column names, some are case-sensitive. Moreover, the programming languages you use to interact with a database may be case-sensitive. Don't ever be sloppy with regards to case. Always capitalize names consistently. Never use alternatively-capitalized variants to signify something different.

Before I whether or not you should use camelCase or underscore_case for naming tables and columns, let me point out that there ARE other alternatives, which I find even less preferable than these two naming conventions: - alllowercaseruntogether - ALLCAPSRUNTOGETHER - spaces between words - dashes-between-words - ALL_CAPS_WITH_UNDERSCORES

These alternative formats, which you may see in some databases, are all inferior. They are either difficult to read, or they are error prone. Some of these formats might even seem impossible, such as naming tables and columns with spaces in between words. In most RDBMS, something like this IS possible, it's just a very bad idea, because such a name only works by enclosing it to force the system to recognize it as a string, such as by enclosing it within double-quotes. That's just asking for trouble, though. Also, there may be places where it won't work at all, so you would end up with a table schema which is not very portable.

I do not use camelCase in table and column names. I use underscore_case.

Two main reasons: I find that underscore_case is easier to read.

Not everybody agrees. But I think most people agree.

The other main reason I use underscore_case: It is programmatically very easy to resolve into a human-readable word, phrase or label.

For example, if I want to automatically convert a table to a form that is presented on a user-interface screen to be seen by human users, I might want to convert the name of a table and its columns to titles and labels. It is easy for any program (including a "replace" command within SQL) to convert underscores to spaces, and thus make a human friendly label. Like this:

original_product_name => original product name

But what if a column is like this: originalProductName

Not so easy is it? A clever programmer using an application programming language can come up with an elegant function to handle this. But can it be done easily within a pure SQL query statement? Not really.

And even the cleverest programmer is going to run into trouble working with something like this:

originalProductUPCCode

How would you easily convert that to something human-readable? It's not even very readable in camelCase.

Compare that to this:

original_product_UPC_code

You can see how this is much easier to read as part of a schema. And it is much easier to utilize in automated name conversion scripts and functions.

My advice: - Be consistent. - Don't go to war over naming conventions if you're a guest in an already-established database. - if you have a choice, use underscore_case.

182.7 When to Index?

Indexing is a awesome. It really is like a magic bullet to turbo-charge the speed of your database system.

But that doesn't mean you should index everything all the time. High-quality database design requires an awareness of what indexing means for your database, including when to use it and when to NOT use it.

One of the most common "big mistakes" I have seen in database schemas created by programmers inexperienced in database design is that they don't add any indices to tables that really need them.

They might be a programmer creating a new app or web application, and they create a database that their system needs. They add a few test rows, connect the database to the front-end, and everything works fine. So they think they're done.

And they are done. As long as the table is small. For a few rows or a few hundred rows, having an index is not going to matter. But then their system grows. More people use it. Now they have 10,000+ rows in that table, or 100,000+ rows… And their whole system starts to get slower, and slower, and slower. Why?

Because their system involves a search on the "name" column within that 100,000+ table. That search is taking a long time, although it was previously very fast. Add an index to the "name" column and like magic, the queries begin returning results instantaneously, just like when the table only had 100 rows in it.

Don't wait to add an index that the table will need when it grows.

If a table might grow to be large enough that indexing will make a difference, add the index to the columns that need it right from the beginning. This will mean your design is really "finished" and you won't need to monitor the system for the point in time when it starts to slow down because the table is getting too big to operate quickly without additional indices.

So we know that adding an index to a table can speed it up tremendously. Does that mean we should simply index every column right from the start?

No. Don't index every column.

I only add an index to a column if it will be beneficial. I don't do it by default.

There are many tables that may have a dozen or a few dozen columns, but which only need to have one or two of them indexed.

Here is a very simple guide about when to add an index to a column: - add an index to columns that are uses as SEARCH criteria - add an index to columns that are used in a "SORT BY" clause - add an index to columns that need to be referenced by FOREIGN KEY LINKS - add an index to columns that are used in any JOINS

Note that there other index types aside from the standard index: unique constraints and primary key indices and others. We will not discuss those index types today, except to point out that if a column already has been indexed using one of these other index types, it does NOT need to be indexed again. You don't need to index the same column twice. A unique constraint index (for example) does double duty: preventing the same value from being used twice in a column AND also provides the speed optimization that a non-unique index provides.

Can't I just index everything and not think about it?

No, you shouldn't do that. Although indexing is great when you can benefit it, indexing isn't "free."

Every index you add DOES increase overhead on the system. Indices take up file space. Indices require additional processing time when inserting rows. Indexing columns unnecessarily will create a net drain on your system rather than a boost.

A truly interactive information system which connects many relational tables to each other (joins, foreign keys), allows a user to conduct searches and to sort data using different criteria is likely to have MANY indexed columns. But it won't have EVERY column be indexed.

182.8 Why “ID”?

In a previous entry I suggested that when designing a new database, the best name for an “ID column” (“primary identity column” or “primary key column”) is simply:

ID

Yet… if you have seen a wide range of databases created by different people using different RDBMS, covering different periods of time, you may have seen many different naming conventions. Here are some examples:

We have have seen various databases which use different names: ID id Id state_ID state_id state_Id STATEID StateID StateId stateid state_num state_primary_key

Why is “ID” the best name to use?

Let us put aside the interesting fact that some software and source code libraries specifically look for this name and provide some benefits when using it. That is really a minor point. And it is NOT a “universal” thing. Not by a longshot.

I like to use “ID” because it is very readable and instantly recognizable. It really stands out as something distinctive and different from the other column names. Look at this example of column names for a single table: ID name abbreviation description population capitol

I like the way that the capitalized form “ID” stands out.

Also, if I reference this column name in a foreign key column (linking from another table), I like how it stands out from the table name:

state_ID

I want to consistently use the same primary identity column name as a part of foreign key column names. When I use “ID”, I can pick that part of a column name out quickly and easily.

One final question: Why don’t I use a naming convention like this for the ID columns: STATES state_ID name abbreviation

I have seen this in some database designs. In these designs, there are NO primary identity columns named “ID”. These columns are all named something different.

Don’t do this.

This introduces unnecessary complexity and duplication into your database design.

Your goal should be to make the database design as simple and as non-duplicative as necessary.

If you add a version of a table name in the table’s primary identity column, then your database is NOT as simple.

Instead of having ONE name for ID columns (“ID”), you end up having many. You would theoretically have as many different names for ID columns as you have tables.

A table with 20 table would have 20 different tables would have 20 different names for primary identity columns. 20 is NOT as simple as 1.

And you have also introduced duplication. Because what you really have, if you reference the “full name” of these columns is this: states.state_ID users.user_ID products.product_ID

See how each column DUPLICATES information?

If I have an ID column within “states” table, I don’t need to name the column “state_ID.” I already know that the “ID” column within the states table is the ID column for states.

See how these column names avoid unnecessary duplication: states.ID users.ID products.ID

So to summarize my advice on this topic: - keep it simple - make it easy to read - avoid duplication - use “ID”

182.9 Naming ID Columns

I want to discuss one of the most important aspects of database design: naming ID columns.

What are "ID columns"? This is one simple and common way to refer to primary identity columns.

For example, in a table like this: STATES ID 101 Name Alabama Code AL

…the "ID column" is the first column: "ID".

This is the column within the table that is intended to be unchanging, and it is intended to be the most reliable way to reference a row in a table. These columns are also known as the "primary key." There are some technical distinctions between the complete meanings of these terms, but that is a topic for another day.

Many techniques impact two or even three areas of database optimization (data integrity, speed, and maintainability.) But naming ID columns is something that is really ONLY related to ONE of these areas of optimization: maintainability.

This IS important, even though the database engine itself doesn't really care. Your database is not going to run faster due to the column names you use. The technical ability of your database to be able to enforce data integrity will not change.

But your ability of human user and developers to maintain the database will be significantly impacted.

Your naming conventions can positively or negatively impact the human actions that have an effect on data integrity. So I suppose we could say that how you name ID columns impacts "one and a half" areas of optimization.

We have have seen various databases which use different names: ID id Id state_ID state_id state_Id STATEID StateID StateId stateid state_num state_primary_key

How should you name your ID columns?

The most important answer to this question is:

CONSISTENTLY.

Because if you are consistent, your database will be maintainable.

If you are not consistent, then mistakes will happen. Subtle bugs will creep in that are hard to track down. The ad hoc queries that users write won't work.

BE CONSISTENT!

So many choices! Argh! Just tell me what to do!

Okay: Here is a short answer to what to do:

If you are coming to an already-established database and you are being asked to use it but not recreate its naming conventions, then just BE CONSISTENT. Use whatever naming convention is already in place.

If you are adding a new table to a database in which ID columns all look like this: "id", then that is what you should use.

Simple.

But if you are designing a database from scratch, you can use the convention you prefer. This may be a slightly "controversial" decision. The preferred format may vary depending on the specific RDBMS being used.

I will tell you that in working with MySQL databases, the convention I see most often in "best practices" databases, and the convention I personally use in creating new database is to always use: ID

Two letters only. Capitalized. Always and consistently when I create new databases, I use "ID."

Some MySQL tools actually recognize this column name and provide you with a few extra benefits when you use "ID." For example, phpMyAdmin will automatically provide you with in-line editing functionality on query result screens in which the ID column is "ID", but doesn't provide this functionality when ID columns are spelled or capitalized differently. Maybe this will change in the future, but for now, it's a significant advantage.

So when confronted with the question about how to name an ID column, my simple answer is:

- Use the naming convention already in place within your database
- Use "ID"

(Tomorrow, I'll explain more reasons for using "ID".)

182.10 Normalization Example: States

I want to discuss one specific data concept: States.

As with most any specific data concept example, this discussion serves a dual purpose. It presents ideas about how a specific type of data can be handled, and it also serves as an example of root principles.

So we will talk about how to handle states, which is a common, useful concept. But this example also illustrates principles for optimizing the database for data integrity (through normalization) and for speed.

Sometimes I see databases which store contact information, such as a user's address, and the table with contact information has a varchar (text string) column for "state."

Often these are varchar columns that contain values such as "NY", "AZ" and "NSW."

I never do this. I never store states as text strings. Even in a small, simple database, it is better to store states in a separate table, such as "states" or "locations", and then link an address to that table through an integer foreign key link.

So I may have a table like this: ID Name 1 Alabama 2 Alaska 3 Arizona

And in the table with contact information, we would store only the integer that references the states/locations table like this: state_ID = 1

(This means "Alabama.")

This will save all kinds of headaches.

What we do NOT want to have happen is somebody else on the team coming to us and saying:

"Why are there only 90 customers from New York in this report? I know there are 100."

And then we look in the database and we have to tell them: "There are 90 customers from New York, but there are also 5 customers from "N.Y.", 4 customers from "NY", and 1 customer from "NewYork."

If we store states as blind text strings in a varchar field, then we are asking to have problems with data integrity. People don't always spell state names correctly. People don't always get the abbreviations correct. So we want to constraint the possible values for states to a list that contains ONLY possible values.

And it isn't that complicated to do so. There are only 50 states in the United States. Even if we add in all states and territories from Australia and the United States, and all provinces from Canada, and even the special military service mailing codes, there are still fewer than 100 items in our "states" table.

If our database encompasses other countries, then we can license a comprehensive location data source, build our own or (most likely) either leave this blank or allow for a general "province" field for other countries. In practice, most international addresses work fine with a city name, a postal code and a country name, and don't need a "state" field.

Normalizing states (storing values as foreign key-referencing integers such as 1, 4, and 40) instead of using varchars ("AL" or "Alabama") will also improve the speed of your database.

If you have only a few hundred records, it won't matter. But if you have a large number of records, such as a hundred thousand or more, you will definitely notice a difference between how fast it takes your database to do a search for all records using a text string ("AL") versus an integer (1).

182.11 Database Design: Three Areas of Optimization

Real database design is more than just creating a database schema that "works."

Real database design means creating a database schema that works well. It should work well now, and it should work well in the future, as a project continues to be used and (in all likelihood) changes as new features are added or new situations are encountered.

Whenever I engage in the task of "database design" – whether I'm designing a database from scratch or redesigning an existing database – I like to explain to project owners, project managers, and development teams that I'm focusing on three areas of optimization:

- data integrity
- speed
- maintainability

This helps everybody (including myself) stay focused on important goals and helps explain why I make the decisions that I make. These are straightforward concepts that everybody from non-technical people to highly experienced programmers can understand.

If you think about it, these same goals (or "areas of optimization") should seem very similar to key "best practices" used in non-database programming.

In practice, it is rare that I find a database project which needs to be optimized for some other goal.

Here are simple examples of these optimization concepts:

[optimization for: data integrity] Question: Why do we need to add a foreign key constraint to this column?

Answer: This will help guarantee that valid data is always stored in this column which references a foreign key. Even if a programmer messes up with integrity checking at the source code level, or even if a back-end database user attempts to inset invalid data, this foreign key constraint will ensure that only valid data is input into the table.

[optimization for: speed] Question? Why do we need to add an index to this column? The table already works without it?

Answer: This column is used by the front end as a key search field. The system will return results much faster if we index it.

[optimization for: maintainability] Question: Why do we have to change these column names? The app is already written to use "location_ID" in most tables, and "location_Id" in a few tables.

Answer: Then we need to change the app's source code AND change the column names so that they all match. Things may work now. But as soon as anybody starts making changes, somebody will mis-type the column name, and case-sensitive source code will fail to work.

I find that that nearly every decision in database design can be explained as something that is done in order to optimize the database for one of these three areas: data integrity, speed, and maintainability.

Rather than doing database design based on a large collection of "textbook rules" whose meanings and purposes are obscure, I like to use these key goals as a guiding philosophy.

182.12 Enum: Just Say No

There is a time and place for everything, so the saying goes. And I agree this is true for most database concepts and techniques.

But not for enum. Don't use enum at all. It's a nasty habit.

Many database designers might have blissfully worked their entire careers without running into enum. But then they help out with somebody else's database and see these little critters all over the place.

So what is "enum"? This is an odd data construct masquerading as a "datatype" option within an SQL table. Instead of being a specific type of data (such as varchar, int, decimal, etc.), an enum is actually a LIST of items, such a list of varchar values.

If you're thinking: "A list? Isn't that what a table is for?"

…Then my response is: Exactly.

A column which uses the "enum" datatype in a table is essentially hiding a little table WITHIN a column. It may seem handy, but it is a complete violation of the SQL relational data model.

Enum columns are NOT part of the ANSI SQL standard. They are NOT universally accepted among SQL databases. They are NOT handled the same way by different SQL databases. So when one uses an enum, one ends up with a table design which is not easily or consistently portable.

"But they're so convenient," some people might say. They can be used to store a discrete set of values, such as for a drop-down menu in a mobile app. An example might be a "status" field which contains only these possibilities: "pending", "in progress", and "complete."

Create an enum field and you've got a varchar that only allows those values: pending in progress complete

But by doing that, you're basically hiding these values in a place that isn't where users of the database would look for it.

You can't simply type in "select * from status_types".

There are no standard SQL queries for obtaining the possible values of an enum datatype column.

And what if you want to ADD a NEW status type? Are you ABSOLUTELY certain your system will NEVER need a new status type?

A few months into the project, it turns out you need a new status type: "under review."

Can you just add that status to the enum set of values? It's not so simple. This change will actually require a change to the table schema. Which is fine if you've got a tiny database. But what if that column is used in a table with 5 million records? In many RDBMS, adding a single string ("under review") to that list will actually require the database software to create an entirely new table, with the new schema, and copy all of the record to it. You could wait an hour just to add "under review" to your list of possible values. It might seem far-fetched, but I've seen this. It's a pain.

But if you had a separate table for "status_types," it would take a microsecond to add that new fourth value to a tiny 3-row table.

So EVEN if you don't care about standards, EVEN IF you don't care that many standard database tools and techniques won't know what to make of enums, and EVEN if you don't think your database schema will ever migrate to another type of database… you could still run into major headaches if you use enum.

There are better ways (standard ways) to handle discrete, defined lists. That's what relational databases are all about. Enum may seem convenient, but it's really a cheap shortcut that will come back to bite you in the end.

182.13 About the Author

Preston is a world-class database designer and programmer. In addition to being the lead developer for Fundraise Genius, Preston is the Data Chief at the Virginia G. Piper Center for Personalized Diagnostics within the Biodesign Institute at Arizona State University. Additionally, he's co-authored several scientific papers on programming and biology. Preston lives in sunny Arizona.

CHAPTER

THREE

HOW TO USE THE .SQL FILE

183.1 Introduction

This document provides detailed instructions for using a database dump file (also known as a .sql file) to restore a database or load a database elsewhere.

The system currently has an "Email Database" tool that lets authorized administrators send a database backup file to themselves via email. This same process is automatically run on a weekly basis by a cron job running on the server.

The "back up file" is of a very specific format, known as a database dump file. This is a plain-text, human-readable file. It is the most common type of file used for transferring database data from one database to another and for storing a backup of a database. This file format can be used by many different tools and different database types (RDBMS).

The automated system automatically names the .sql file using the database name as the base of the file name, followed by the "sql" extension. For example: "sitename_db.sql". With regards to its functionality , the exact name of this file does not actually matter.

The .sql file is essentially just a list of SQL commands. The file can be uploaded using a tool. Alternatively, the file can be opened using a text editor and the individual command can be run manually on the database server from the command line or within a tool that lets users manually run SQL commands and queries.

This is also known as a database "script." This is a "script" for recreating the database.

This particular .sql file contains all of the database structure and all of the data. But it does not contain views. Views are maintained in a separate file known as "views.sql" (or "views.txt").

183.2 Installing the Database

There are various ways to install a .sql file on another database. These instructions provide one specific way for doing so, a method that can be done using only a web browser.

WARNING: These are instructions for installing the database in a clean, empty database. Do not try to upload the .sql file into an existing live database, which already has the complete database installed. That would cause errors and/or data duplication.

1. Log into cPanel

"cPanel" is short for "control panel." It is a web-based administrative front-end for working on a website.

For example, go to:

https://id.cpanel.net

Enter credentials: username: YourWebHostingAccountUsername password: [*******]

2. Within cPanel, click on "phpMyAdmin"
3. Go to an empty database.

You may see a database named "sitename_db_backup". Click on its name in the left-hand panel.

(If you do not see a database to use, you will need to create one using the "MySQL Databases" from within cPanel.)

You should see that the "sitename_db_backup" is empty. You should see a note at the top of the screen that says "No tables found in database."

It is a database in the barest sense of the word. But it has no contents, no tables, no data.

This is just an example.

The point of installing the .sql file is to put it into an empty database. You an create your own empty database anywhere you want. You can name it anything you want.

4. Click the "Import" button in the top menu.

You should see a headline that looks like this:

Importing into the database "sitename_db_backup"

Below it you will see a button:

File to import: Browse your computer:

5. Click the "Browse" button. Select the sitename_db.sql file from your computer.

(Leave all the settings at the default.)

6. At the bottom of the page, click the "Go" button.
7. Wait a minute or two. The .sql file will be imported into the database server.
8. When the process is over, you will see all of the database tables are now listed in the left-hand panel of php-MyAdmin.

There are many tables. They may not be listed all in one panel. There will probably be a drop-down menu which lets you select which "panel" of table names you want to view.

183.3 Additional Notes

At the end of the upload process, you may see a red or pink area with errors or warnings in it. You might see a line that looks like this:

/!50001 CREATE ALGORITHM=UNDEFINED/

This is a line from the .sql file which failed to run.

You might see a warning or error like this:

1227 - Access denied; you need (at least one of) the SUPER privilege(s) for this operation

This is all normal. You can copy at the lines shown (e.g.: */!50001 CREATE ALGORITHM=UNDEFINED/* ...and search for them in the .sql file. Or just look at the VERY end of the .sql file. You will see that all of the database structure-creating and data-loading commands ran successfully. But there may be a few lines of other setting-oriented directives that did not run.

An automatically-generated .sql file may often include a few final directives that can not be run successfully through this standard "Import" button. These final lines have no actual impact on your database data. They are related to temporary server settings.

NOTE ABOUT .sql FILE SIZE: Different servers will have different server-level settings for the maximum file size allowed when importing a .sql file. I have this setting currently set to: Max: 100MiB on my dedicated server. This means that a .sql file up to 100 MB can be uploaded.

If your web hosting account resides on my server, that is the setting that you should see. You may see this value set to lower or higher numbers. A default value for this setting, found on many servers, is 10MiB.

The good-sized website may have a lot of data, yet still have a database file size that is only a few MB in size. So the setting is high enough (by far) to import these .sql files at their current size given the current database contents.

If you were to import the file onto another server, you would probably find that that server's setting are high enough as well. But some servers have a smaller setting, such as 10 MB. And the .sql file may grow as new data is added to it.

If you encountered a server that won't accept the .sql file, there are other ways to load the same .sql file. You can upload using the Linux line command. (This is much faster.) Also, it is possible to divide a single .sql file into multiple files and load them one at a time. This will work fine, as long as you are careful not to split up an SQL command.

183.4 Purge the Database to Reload It

If you want to purge the "test" database or "backup" database, you can do so. You may want to practice the loading technique multiple times.

Or you may want to load a later, newer data set onto a server.

You should not import the .sql file into an already-populated database. This may cause errors and/or data duplication. It is better to purge the entire database and load the data from scratch into a blank database.

The easiest way to purge the database is to drop it and re-create it. Here is how to do that:

1. Log into cPanel
2. Go to "MySQL Databases"
3. Under the heading "Current Databases", click on the "delete" button next to the database ("site-name_db_backup"). There is a trash can icon next to the "Delete" link/button.
4. You will asked to confirm the decision. Click the "Delete Database" button.
5. Click the "Go Back" link to return to the "MySQL Databases" page.
6. Underneath the heading "Create New Database" and the label "New Database:", enter a database name in the text field. Such as "sitename_db_backup."

(Or, if you wanted to create a back-up server or development/test server, you could use the same name for the database as is used on the live server: "sitename_db".)

7. Click the "Create Database" button.
8. Click on the cPanel button in the top left corner to return to the main cPanel page.
9. Click on phpMyAdmin
10. Click on the name of the database: "sitename_db_backup"
11. You will see that it is empty. You may safely click on the "Import" button and load a .sql file here.

183.5 Users

Keep in mind that these directions only tell you how to load a database onto a MySQL server using phpMyAdmin and cPanel.

We have not created any user accounts for the database. If you actually want source code to be able to interact or use the database you will need to create database-level user accounts. This is different than user accounts found in the database itself in the "users" table.

183.6 About the Author

Preston is a world-class database designer and programmer. In addition to being the lead developer for Fundraise Genius, Preston is the Data Chief at the Virginia G. Piper Center for Personalized Diagnostics within the Biodesign Institute at Arizona State University. Additionally, he's co-authored several scientific papers on programming and biology. Preston lives in sunny Arizona.

CHAPTER

FOUR

ABSINTHE



No other drink has such mythology attached to it quite like absinthe.

As a once illicit spirit it seems that drinking absinthe will never escape appearing dangerous or forbidden. Although drinking absinthe was at its height in the late 1800s, the spirit actually dates back to ancient Egypt when it was used for medicinal purposes. Its popularity grew in France after soldiers returned from fighting in Algeria.

There, it was used as an anti-malarial and mixed with wine to make it palatable. When phylloxera, a vine disease decimated the wine industry in the 1870s, its popularity grew as it was inexpensive and easy to produce.

During the Belle Époque it was known to be the beverage of choice for many artists and poets of the time such as Van Gogh, Monet and Toulouse-Lautrec. It was served in French cafes, cabarets, bistros and music halls and even the city of New Orleans was drinking absinthe as it made its way across the pond. However, the temperance movement assisted by winemakers targeted absinthe as the reason for society's problems and wanted it banned.

Shortly after the First World War began it was outlawed in France and banned in the U.S in 1912. Spain and the Czech Republic continued to produce and legally consume it but much of the world forgot about absinthe.



In 2007 the laws regarding absinthe in the U.S were reinterpreted, stating that absinthe must be thujone free, though technically that doesn't mean zero—but what is thujone? Thujone is a chemical compound found in a number of plants but most famously it's found in Artemisia absinthium, or grand wormwood. And while wormwood has zero hallucinogenic properties, thujone was blamed for absinthe drinkers going mad during the height of its popularity.

Thujone offers a menthol-like aroma and is toxic if consumed in large quantities yet the amount of thujone found in wormwood is so small that you would die of alcohol poisoning before you would die of thujone poisoning in fact there's more thujone found in sage than in wormwood.

Absinthe is a distilled spirit flavored with aniseed, grand wormwood and fennel. These botanicals are known as the holy trinity. Other botanicals can be used but those three are required. Absinthe begins its life as a neutral spirit which can be made of any agricultural ingredient, though beets and grains are commonly used.

The neutral spirit is infused with the proper botanicals then redistilled. At this point it can be bottled as is or reduced slightly with water. The final alcohol content ranges from 55 to 72% ABV. If bottled clear, it's considered to be made in the Swiss Style also known as blanc or blue. If after redistillation the maker wants to achieve a green color they add herbs to macerate in the spirit. This is the French style of absinthe also known as vert.

184.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

FIVE

ARAK

A middle eastern drink.



Arak, also known as lion's milk, is the most popular alcoholic drink in the middle east, which is an essential ingredient in various types of celebrations.

However, this drink has a certain ritual, to live the experience of drinking it according to the origins. Arak is made from grapes and anise seeds, distilled twice, and mixed with some cold water before drinking it.

Drinking arak is a traditional ritual of the celebration, and one of the traditions of drinking it is to knock the bottoms of the cups together before drinking.



It is advised not to drink Arak on an empty stomach. Among the most famous dishes that go along with the arak drink, are oriental mezze dishes, such as muhammara or raw meat.

The first mezze dish served with arak is the sliced cantaloupe with feta cheese, and it is usually served with arak without the need to order.



There is usually a troupe of male musicians in Turkish bars, who play melodies on oriental musical instruments, such

as the qanun, lute, or flute. This group is known in Turkish as “Fasil Ekipi”.

Arak can’t be drunk directly, but it is diluted by adding about twice the amount of water, and adding ice cubes to it. This dilution, especially in the Turkish, Shami and Iraqi type of it, which is sometimes called Zahlawi, causes the color of the Arak to change from colorless to white like milk.

The well-known tradition is to add water before the ice, because if the ice is added first, an undesirable layer will form on the top of the drink, and for the same reason the same cup cannot be used, and a new one must be used. So, in restaurants, when arak is ordered, several glasses are brought along with the bottle.



The most famous type of Arak in the world Rakia in Serbia, Turkey, Bulgaria, Albania and Greece. Cognac in France. Water of life or Almahah in Morocco.

Arak has always been prepared from fermented grapes with the addition of anise, as in Syria, but there are variations in some countries. The name varies in countries such as Turkey, where it is called “raki”, and it is called ouzo in Greece, the Republic of Macedonia and Bulgaria. In these countries, it may also be made from many seeds such as figs, peaches and potatoes. Among the varieties of arak is also the Iraqi arak, which is made from fermented date juice, and from raisins in Egypt.



In Iran, it is called ‘erg seki’, meaning ‘dog Arak, and it is made without anise and has a high alcohol content.

And the “Arak” drinking sessions turn into sessions to “open the heart” and share worries and secrets between friends.

185.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel’s whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

SIX

BEER

Beer is one of my favorite subjects because, yes, I drink it. Like many of my other articles, I'll caution readers to do their own research because "beer" is a very complex subject. I'm not encouraging readers to drink a lot, just saying that the varieties of beers are a huge number and so many things contribute to the different flavors and characteristics that books have been written on the subject.

Beer begins with a starch source, normally barley, but other grains are commonly used, such as wheat, corn and rice. Then the starch is mixed with hot water and then crushed malt. Next, brewer's yeast is added to produce the fermentation and carbonation. There are many steps following, some quite technical and many that are mostly for the purpose of adding flavor.

Beers are generally and pretty much technically divided into two categories, Ales and Lagers. The difference lies in the types of yeast used for fermentation. Ales are made with top fermenting yeasts that act fast and produce bright, flowery, fruity and peppery flavors. Lagers are made with much slower acting, bottom fermenting yeasts that produce clean, crisp, dry flavors.

My personal favorite source of flavor is HOPS, which is a component of nearly all beers. There are several different varieties of hops. Hops adds aroma and bitterness as well as flavor, and the bitterness is balanced often by adding other ingredients that provide sweetness.

When the British held India as a colony, they found in the 1820's that during the course of the long voyages from England to India, their ales would sometimes spoil. They discovered that adding more hops would preserve the ale quite well and an Australian advertisement coined the term India Pale Ale. Thus the term IPA. IPA's are my favorite!

Another thing that I have found to be interesting is the effect of the beer's temperature on the experience of beer drinking. During the summer I keep my IPA in the refrigerator because I don't want to drink warm beer. On the other hand, in the winter I keep my IPA in the garage and just grab a bottle right off the shelf there when I want one. THEN the bottle is cool but not cold and the flavor is smoother and yet richer. It's hard to describe but if one likes a flavorful beverage like I do, it might be worth your while to try a beer that is just cool, not cold.

Beers have been brewed around the world for literally thousands of years and are part of the culture of many nations today. Beer is the third most popular beverage after water and tea. You can read more about beer by following these links that I used in researching this article:

- https://en.wikipedia.org/wiki/Beer
- https://www.thespruceeats.com/india-pale-ale-ipa-profile-history-ingredients-352843

ENJOY! Seriously, but not too much!

186.1 Logo



186.2 About the Author

Harley Armentrout is a happy husband and father, former silversmith, aerospace electronics prototype assembler, test, calibration & repair technician, also writing test procedures at BallAerospace. Then 21 years in the gaming industry, in a range of positions, culminated as a Gaming Inspector, observing and reporting on rules violations, safety issues and criminal activities for the Yavapai Prescott Indian Tribe. After "retiring" Harley taught himself a few graphic design skills and he works as a freelance designer.

CHAPTER

SEVEN

WHISKEY



Whisky, or Whiskey, doesn't matter really, as long as it leads to the strong, kickass taste of the most prestigious "in my opinion" drink.

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"Whiskey, like a beautiful woman, demands appreciation.
You gaze first, then it's time to drink."
-Haruki Murakami
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Kegs are for college students and vodka is for ladies. When you want a man's drink, you need a tumbler full of something sophisticated AND rugged. Dig deep with us on the ultimate drink, the drink of all drinks and the holder of the throne. Whiskey.

Whether served neat or with one hard cube, a splash of water, or diluted with sweet vermouth and bitters, there is no better time to tipple whisky…

Or whiskey. To whichever you prescribe, but only after realizing the subtle and dramatic differences between the two, although it can be clearly identified that the same result is waged.

So aside from location, how do these various whiskeys and whiskies differ? Let's begin where Henry II began…



By the 13th century, the Irish were producing distillates from grains such as corn and barley and aging them in oak for prolonged periods. The result was a yellow to dark orange alcohol that embodied flavors of earth and dried fruit. Hence whiskey was born.

The recipe for whiskey production, generally speaking, involves the three steps of fermentation, distillation, and aging. It begins with the fermentation of grain – it is always grain, whether barely, corn, or rye – then the distillation of the liquid in a pot still or column still, followed by prolonged aging in oak.

But if the Irish were the originators, how come Scotch is more prevalent? Like anything else, economics and politics play as much a hand in success as quality. Unfortunately for the Irish, economic and political turmoil dating back to the beginning of the 19th century has left much ground to recover.

187.1 Scotland



So, they weren't first, but how have they revolutionized the whisky trade. What makes Scotch unique aside from its styles (single malts, blended malts, blended grains) is how it varies from region to region. Whether it's notes of iodine and smoke from Islay or rich and floral nuances from The Highlands, there is a Scotch to be enjoyed by all types of whisky drinkers.

187.2 Canada



Although Canadian whisky, notice no "e", has lost support from American drinkers over the years – especially after Prohibition was repealed – it still sells volumes at home and internationally. Remarkably smooth, Canadian labeling laws tend to be somewhat lax when compared to its U.S. neighbor. Apart from having to be distilled in Canada with cereal grains and aged for 3 years, there is no legal bearing as to what qualifies as a Canadian whisky, Canadian rye whisky or rye whisky, although rye is the grain.

187.3 United States



Talk about pride and something distinctly American. Bourbon… wait, I meant rye whiskey… no we're talking Tennessee whiskey, benefiting from the Lincoln County Process a.k.a. Jack Daniels… alright all of those products fit the aforementioned statement but let's break down what's what.

Though it bears the name of the eponymous Bourbon County, bourbon whiskey can be produced legally anywhere in the United States. The fact is, despite owning 95% of production, there are several states that distill bourbon outside of Kentucky, including Tennessee, Pennsylvania, Virginia, Colorado, even as far north as New York.

187.4 Japan



Who can forget Bob Harris (Bill Murray) struggling through his photo shoot in 2003's Lost in Translation: "`For relaxing times... make it Suntory time?`"

That was probably the best international marketing the Japanese whisky industry could have hoped for. Producing their own style of whisky since the late 1800's only recently has the industry achieved recognition globally, and it's about time, the Japanese love their whisky.

More comparable to the Scotch style, Japanese whiskies are produced throughout the country as single malts and blended varieties. Flavors range from salty and peaty to oily and fruity depending on the distiller.

187.5 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

187.5.1 Important Links

- https://www.iowalegendaryrye.com/the-history-of-whiskey-and-prohibition/

CHAPTER

EIGHT

ACTIVISM

This article is about politics (to those not interested in USA politics, sorry, this will be especially boring), but more importantly, it is about discovering the TRUTH. Today, in 2021, there are so many lies printed and published on the web that discovering the truth can be very difficult. Several years ago, I THINK in about 2014 and definitely before D. Trump declared his candidacy, I did a search on the web that led me to a very interesting article.

I cannot remember the exact terms I used in my search, but the question was generally phrased like this: What policies do present day Democrats share with the Eisenhower administration? I used both Bing and Google and the same result was first on Bing and second in the Google results. It was an article on the Daily Kos website that unfortunately, I can no longer find. Regardless, history has recorded the truth!

The article explained that the Eisenhower administration advocated and implemented policies such as Unemployment Insurance and other "social policies" which are similar to current policies advocated by Democrats. Also, tax rates for the wealthy and for corporations were at the highest levels ever seen in the USA. Infrastructure spending was also a huge part of Eisenhower's agenda.

Here's how that all worked. Corporations and wealthy citizens contributed huge amounts to the Federal budget coffers. The government was in turn able to support less fortunate citizens, so that they were able to buy necessities and even had some left over for discretionary spending. The spending on infrastructure projects created many jobs of course and those newly employed people spent their money and paid their taxes as well. The less fortunate among us, those at least partially supported by the "social policies" were able to buy products and services from businesses, many of which were wealthy corporations which were paying those high taxes.

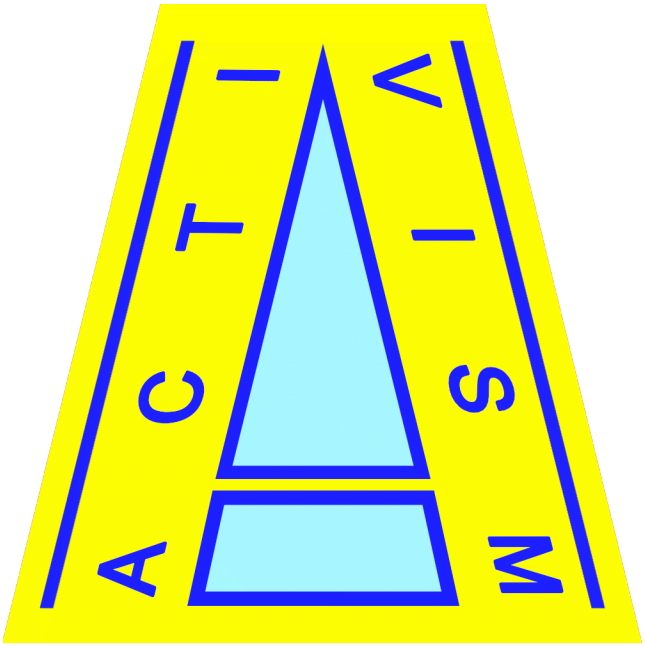
One result of all this was that corporations realized that they had customers to buy their products and services, so rather than keeping the money they would have saved on tax breaks, as corporations do now, they invested in equipment (which had to be produced by other businesses) and supplies, and they hired tremendous numbers of people to help provide the products and services that they KNEW they could sell. Of course this all snowballed. They hired workers who then had jobs and could buy even more products and services. The businesses that supplied machinery, and materials to the corporations hired and invested too.

I hope you can see where this is all leading. The Eisenhower era enjoyed perhaps the most tremendous growth rate and prosperity of any time in the history of the USA. Corporations gladly paid the high taxes because THEY were growing and prospering.

Today, members of the same political party that supported those policies implemented by - the Eisenhower administration, say "Oh no, that will never work! We need tax breaks for the poor corporations and wealthy people!" WHAT? It strikes me that I have discovered THE TRUTH here. Giving huge tax breaks to large corporations and the rich is not working. Those corporations and people do nothing but just keep the money they are saving. If the social programs are not supported, our less fortunate citizens, the ones criticized as lazy and worthless, do not have money to spend, so why would the big businesses hire anyone, or produce more goods or services? The polices NOW advocated by Republicans are not working and the policies supported by Democrats are the ones that the Eisenhower administration PROVED WILL WORK.

No, Democrats are not always right and Republicans are not always wrong, but as an ACTIVIST, I MUST speak the TRUTH and THAT is something we ALL need to keep in mind and LOOK FOR.

188.1 Logo



188.2 About the Author

Harley Armentrout is a happy husband and father, former silversmith, aerospace electronics prototype assembler, test, calibration & repair technician, also writing test procedures at BallAerospace. Then 21 years in the gaming industry, in a range of positions, culminated as a Gaming Inspector, observing and reporting on rules violations, safety issues and criminal activities for the Yavapai Prescott Indian Tribe. After "retiring" Harley taught himself a few graphic design skills, and he works as a freelance designer.

CHAPTER

NINE

AUSTRALIAN ACTORS



Australia's known for its beautiful beaches, outback, and of course, overly large and poisonous animals. however, that's not the only thing. Australia is also known for producing some of the greatest actors of our generation with them nailing any accent or dialects they're required to do! yeah, a lot of people don't know these actors are in fact Aussies!

Hugh Jackman? I mean of course he's on our list he was actually born and raised in New South Wales Australia appearing early on in his career in shows such as curly and snowy river.

before landing his breakout role in 2000's x-men as Logan aka Wolverine. after that his career truly took up with the act of meeting one of the most sought-after in the industry, peering him work such as van Helsing, the prestige, and the frontrunner.

Jason Clarke? Jason Clarke is an incredibly versatile actor with roles in films such as mud bound, Everest, etc. thanks to his flawless American dialects many don't even realize that this actor hails from Queensland, Australia. Jason began his career in his mid-20s appearing in TV shows such as Water Rats and Blue Heelers before landing a reappearing role on the popular soap opera home and away.

his big international break was when he landed a role alongside Shia LaBeouf and Michael Douglas in Wall Street money Never Sleeps, before going on to appear in lawless Texas killing fields and dawn of the Planet of the Apes. this dude just doesn't stop!

Emilie de Ravin? to take care of people Emilie de Ravin has popped up in many Smash Hits over the years mostly opting for smaller indie roles but once in a while earning a big Hollywood gig. de Ravin of course shot to fame when she starred as Claire Littleton and lost which ran from 2004 to 2010 she also appeared in the popular TV series Roswell as Tess Harding.

Many don't know that de Ravin is Australian with the actress being born and raised in Mountain laser Victoria however she didn't always want to be an actress when she was 15 she was accepted at the highly selective Australian Ballet School in Melbourne before dropping out and undertaking acting and learning her first role in the TV series Beastmaster.

A true Australian legend, The Joker? Heath Andrew Ledger was an Australian television and film actor. After performing roles in Australian television and film during the 1990s, Ledger moved to the United States in 1998 to develop his

movie career. His work includes nineteen films, most notably 10 Things I Hate About You (1999), The Patriot (2000), Monster's Ball (2000), A Knight's Tale (2001), Brokeback Mountain (2005), and The Dark Knight (2008). In addition to his acting, he produced and directed music videos and aspired to be a film director.

At about 2:45 p.m. (EST), on 22 January 2008, Ledger was found unconscious in his bed by his housekeeper, Teresa Solomon, and his masseuse, Diana Wolozin, in his fourth-floor loft apartment at 421 Broome Street in the SoHo neighborhood of Manhattan.

Mel Gibson? By the 1980s, Mel Gibson was internationally known for his starring roles in the Lethal Weapon series, and the following decade he was recognized as an Academy Award-winning director for Braveheart. Gibson's standing as a bankable star suffered in the wake of his controversial comments and domestic abuse allegations in the 2000s, but he later rediscovered directing success with the Oscar-nominated Hacksaw Ridge.

Mel Gibson returned to the director's chair for his next project, an ambitious film about the final 12 hours of Jesus Christ's life entitled The Passion of the Christ (2004). The unlikely blockbuster made headlines for its controversial adaptation of the Crucifixion. A devout Catholic, Gibson stated at the time that the Holy Spirit was making the film through him: "I was just directing traffic," he said.

Gibson's next historical epic, Apocalypto, released in December 2006, focused on the decline of the Mayan civilization and was filmed in Yucatec Maya language with subtitles. The film, which featured an Indigenous cast of Mexican and Native American actors, was critically acclaimed and a box office success.



Nicole Kidman? With a long list of awards, honors and achievements in her kitty including the Australia's top civil honor the Companion of the Order of Australia, one Academy Award, three Golden Globe awards and one BAFTA, Nicole Kidman is undoubtedly one of the reigning actresses that Hollywood takes pride in. An actress by profession and a philanthropist by heart, Kidman is an iconic figure that the world looks up to.

Having an affinity and talent for acting at a young age, Kidman trained herself professionally for it. Ever since her debut at the Australian film industry, Kidman showed signs of making it big which seemed much more a convincing dream when she moved over to Hollywood. 'Days of Thunder' was her first American movie. Over the years, Kidman has been a part of some of the best Hollywood flicks and has contributed heavily for the success of each of them including, 'Batman Forever', 'To Die For', 'Moulin Rouge', 'The Others', 'The Hours' and so on. Other than being an artistically endowed actor, Kidman is also extremely benevolent and generous. She has been actively involved for various causes including the welfare of women and disadvantageous children. Additionally, she was appointed goodwill ambassador

of the UNICEF and United Nations Development Fund for Women (UNIFEM).

Hugo Weaving? Hugo Weaving is an English–Australian actor, best known for his performance as 'Agent Smith,' the main villain in the science-fiction film series 'The Matrix.' He has also gained a huge fan base after his performances in films such as 'V for Vendetta,' 'The Lord of the Rings' film series, and 'The Hobbit' film series. After being born in Nigeria, to English parents, Hugo spent his early years moving between England and Australia.

He made his acting debut in 1981, with a bit role in the film '…Maybe This Time.' He made his TV debut in 1984, with the Australian miniseries 'Bodyline' and then appeared in key roles in miniseries such as 'The Dirtwater Dynasty' and 'Melba.' He received critical acclaim for his roles in 'Bangkok Hilton' and 'Proof.' In 1999, he received his first major career breakthrough when he was cast as the main villain in the film 'The Matrix.' The film became a phenomenal critical and commercial success, making Hugo an overnight star in Hollywood. Since then, he has remained a critically acclaimed actor, with appearances in films such as 'Cloud Atlas,' 'The Dressmaker,' and 'Jasper Jones.' He has also lent his voice to 'Megatron' in the 'Transformers' film series.

189.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

AUSTRALIAN ARMY

“2021”

The largest country in Oceania and the world’s 6th largest country in total area.

With 26 million Aussie living the best life having cheeky barbies in the arvo and sharing a cold bevvie with the mates!

But, don’t let the friendly people of Australia fool you, they are locked and loaded!

As many nations have emerged as a result of colonialism, Australia, the country that has never lost a war, has shared its fair share of conflicts in its history. One might ask; how strong of an army Australia has since it’s right there with Canada holding a record of zero losses at wars!

Let’s find out!

The Australian army is ranked #19 out of 140 countries according to globalfirepower.com, and the 12th biggest spender on military defense budget in the world, with some military media stating that the country intends to become a “Lethal Military Force”, you can expect it to climb above in the spending budget to exceed the 12th rank position!

Much of the money spent goes to the navy which is not surprising given the country’s geographical location, which shows on the map that Australia as a country is an island.

It has also joined in the spending frenzy on the aforementioned F-35 joint strike fighters, which honestly is really cool.

With 61,000 active personnel and 21,000 in reserve, it could do better since there are over 10 million available manpower and 280,661 Blokes and Sheilas reaching military age annually.

Now let’s talk about equipment, I know you’ve been waiting for this!

With 59 tanks, 2040 armored fighting vehicles, and 75 towed artillery, don’t let the 59 tanks fool ya, they are really good tanks! They were highly rated leopard ones, but they have been replaced with M-1 Abrams.

Where the United States exceed all the planet with their air force power, the Aussies are doing pretty well in this field, the country has a total of 465 aircraft, just over 150 of which are fighter and attack aircraft, it also has a small fleet of F/A-18F super hornets and F/A-18A and B hornets as well as EA-18G growlers.

As for the navy, Australia has 47 ships and is one of few nations to own aircraft carriers, the Aussies also own 11 frigates, 6 submarines, 13 patrol crafts, and 6 mine warfare ships.

As for owning nuclear weapons, Australia doesn’t seem interested in developing them, it does, however, have aircraft that could deliver them.

In conclusion:

Australia’s armed forces—the Australian Defense Force (ADF) — comprise the Royal Australian Navy (RAN), the Australian Army, and the Royal Australian Air Force (RAAF). The titular role of Commander-in-Chief is vested in the Governor-General, who appoints a Chief of the Defense Force from one of the armed services on the advice of the government.

In a diarchy, the CDF serves as co-chairman of the Defense Committee, conjointly with the Secretary of Defense, in the command and control of the Australian Defense Organization.

Australia has been involved in United Nations and regional peacekeeping, disaster relief, and armed conflict, including the 2003 invasion of Iraq; Australia currently has deployed about 2,241 personnel in varying capacities to 12 international operations in areas including Iraq and Afghanistan.

Ta!

- Aussie: Australian
- cheeky barbies: Barbecue
- arvo: the afternoon
- bevvie: beverage
- Blokes: man, or guy
- Sheila: woman or female
- Ta: thank you

190.1 References

- https://www.globalfirepower.com/
- https://en.wikipedia.org/wiki/Australia

190.2 About the Author

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CHAPTER

ONE

BALL AEROSPACE

Whew! That's a big subject! In 2016 Ball Aerospace celebrated it's 60th year of aerospace research and equipment production. Today, approximately 65 years since its founding in 1956, in Boulder, Colorado, Ball Aerospace is huge. In 2014 it was cited as the 88th largest defense contractor in the world. I worked there from 1980 to 1986 in Ball's primary facility in Boulder, Colorado.

Ball Aerospace is in the space business, building spacecrafts, satellites, and scientific instruments used for research and defense. Ball also produces lubricants, optical systems and antennas of many different types.

My relevant background began in 1978 when I was hired as an electronic assembler by a small custom electronic assembly firm, Technical Manufacturing Services, which was started by two former employees of Ball Aerospace. Upon hire at Ball in 1980, I became a Prototype Assembler, working as part of a team that developed innovative electronic assembly techniques. I also worked in the Antennas Lab, building and testing the antennas that astronauts wore on their extra-vehicular backpacks. (Antennas can be very tricky. One day one of the antennas I was testing was not performing properly. I cussed at it and then it started working. I'm not kidding!) During that time I studied electronics and after a year I received my certification as an electronic technician. Then I worked in Receiving Inspection at Ball, inspecting, testing and certifying incoming electronic parts. Then I was promoted to the Metrology Lab, testing, calibrating, certifying and repairing equipment used in aerospace electronics labs at Ball, other institutions and in space. I held a Confidential Security clearance and certifications for assembly, cleaning and static protection of aerospace flight electronics. I also designed and built some test fixtures and I wrote test procedures.

So what is the point of me describing all of my great accomplishments while I was employed at Ball Aerospace? It certainly is not bragging. I was a small player in a **BIG** game and I would only like to give the readers an idea of the enormity and the complexity of the business that is Ball Aerospace.

Much of the work we were doing at Ball Aerospace was for NASA (National Aeronautics and Space Administration) and one of the projects I worked on was for IRAS (Infrared Astronomical Satellite), a cryogenically cooled space telescope. The project required that EVERY instrument and tool used had to be certified as accurate and complying with specifications. One day, one of the NASA inspectors shut the project down (temporarily) because a FLASHLIGHT had not been certified. As one might imagine, that caused a few arguments. Err, um, OK, more than a few arguments.

I also spent just a little time working in a giant anechoic chamber, a huge, very tall room that had literally every surface covered in sound absorbing materials for the purpose of working with antennas and any other source/receiver of energy. Imagine being in an environment that has absolutely no echo whatsoever. Such an environment simulates the sound behavior characteristics of space. Some people find that environment quite disturbing and creepy. The scientists who worked in the antennas department were considered "out there".

I worked in "clean rooms" from time to time. Because in space, contaminants can be a real problem, adhering to, and affecting the behavior of electronic and especially optical devices, we had to be very conscientious in avoiding ANY contamination of objects that would end up in space. We avoided such contamination and we spent a great deal of time cleaning, using cleaning agents that would leave no residue. Whew - talk about being picky!

We could not take anything into a clean room that might be contaminated and that included ourselves. How would we accomplish that? We would enter a clean room and then put on clothing that was "clean" and then go from there into another clean room. The clothing consisted of booties, a sealed "bunny suit" with gloves, a head covering with

a face mask, and if someone with a beard was dressing for the occasion, they would also wear what we called "face panties" to keep any beard hairs/particles from escaping. Respirators were in order and clothing was sealed with elastic and Velcro. To top it all off, we were grounded, through a sort of network of resistors to avoid any static charge from damaging sensitive electronic components. The resistor network was so that if any heavy current was present, we could not be short circuited and electrocuted easily.

The static protection I just described was pretty much standard practice when working with most equipment, in or out of clean rooms. You may have the impression that Ball Aerospace is a business that revolves around and depends upon technology for its existence. You would be correct, and you would also be correct in projecting that assumption upon much more of the technology with which we are surrounded today.

Check out some of the following references for more details:

- https://en.wikipedia.org/wiki/Ball_Aerospace_%26_Technologies
- https://www.ball.com/aerospace
- https://choosecolorado.com/success-stories/ball-aerospace/

191.1 Logo



191.2 About the Author

Harley Armentrout is a happy husband and father, former silversmith, aerospace electronics prototype assembler, test, calibration & repair technician, also writing test procedures at BallAerospace. Then 21 years in the gaming industry, in a range of positions, culminated as a Gaming Inspector, observing and reporting on rules violations, safety issues and criminal activities for the Yavapai Prescott Indian Tribe. After "retiring" Harley taught himself a few graphic design skills, and he works as a freelance designer.

CHAPTER

TWO

COOKING & HEALTHY MEALS

This is a HUGE category and will require research on your part, but here's some general guidelines/thoughts on the subject.

Generally speaking, fresh beats frozen or canned. Whole foods beat processed. What these two statements really mean is that elements that are often added to processed foods are not all that healthy. SALT is a big offender BUT, keep in mind that we need some salt. Preservatives are a big offender. Avoid chemicals in general.

This is not to say that we don't want to add anything to our food. Spices are some of the healthiest things we can consume. The list of healthy ones is long and includes Cardamom, Chili peppers, Cinnamon, Cocoa (yeah, really), Cumin, Garlic, Ginger, Rosemary and Turmeric. Research will tell you that these spices have many health benefits and can prolong your life and your productivity in many ways. Turmeric is the giant among these in my mind and I've been consuming almost daily doses of it for many years. It reduces inflammation, may ease pain, and research shows that it may help to prevent dementia. YIKES! My research tells me that it is better, tastier and less expensive to just add the spices to my food rather than to buy "supplements". Lucky for me, I like spicy foods.

Generally speaking, veggies and fruit provide the fiber, vitamins & minerals that we need, while avoiding the fats that we don't need (but like salt, we need some fat). Potatoes were classified as a starch in the past but have recently been reclassified as a vegetable. Colorful veggies & fruits sometimes provide specific benefits/vitamins & minerals. However, meats provide protein that we need to grow and maintain muscle, bones, connective tissues, etc. We can get these proteins from other sources and you will need to seriously research that if you want to lead a vegan lifestyle. It is best to avoid fatty meats if we are going to eat them though. I try to avoid meats grown by cruel factory farms in particular.

Many people advocate consuming organic foods. They CAN benefit us by avoiding the multitude of intentional and unintentional additives introduced into our diets in the processes of feeding and protecting plants and animals that we consume. These additives do harm to us and to our environment. Just be aware that some foods labeled as organic are not really organic. As always, there are bad actors out there who are willing to take advantage of us in pursuit of their greed. DRAT - more research!

There are foods that some of us definitely want to avoid, such as those containing gluten or lactose. If you are gluten or lactose intolerant, switching to foods free of those substances can be super helpful to enjoying life without serious digestive issues, but again research will be required and there may be some higher costs. There are quite a few alternatives available though and many are quite tasty. I even found that there are gluten free beers and one of them is my new favorite beer.

There are quite a few gluten free breads and pastas available as well. One can find them in many grocery stores just by reading the labels.

OK, on to the actual cooking.... That will frequently require my last category, oils & fats. I think by now everyone knows there are many choices out there and some are tastier or more healthy than others. Some of the healthy ones are very tasty. I prefer olive oil and I buy good quality ones simply for the good taste. Other oils that are frequently referenced as healthy are Canola, Corn, Peanut, Safflower, Soybean, and Sunflower. Opinions differ on these regarding the health merits of each.

So we can cook our foods, or in many cases just cut them up and assemble them into all kinds of dishes. Baking, grilling, frying/sauteing them all have their uses and advocates and really, the only way to find the ones you like best are to get yourself a cookbook or two and start experimenting. This last paragraph is somewhat of a let-down, eh? But entire big, fat books are written on the subject because the combinations are endless. Have fun! "Just do it"



192.1 About the Author

Harley Armentrout is a happy husband and father, former silversmith, aerospace electronics prototype assembler, test, calibration & repair technician, also writing test procedures at BallAerospace. Then 21 years in the gaming industry, in a range of positions, culminated as a Gaming Inspector, observing and reporting on rules violations, safety issues and criminal activities for the Yavapai Prescott Indian Tribe. After "retiring" Harley taught himself a few graphic design skills and he works as a freelance designer.

CHAPTER

THREE

CINEMA IS CONSIDERED AS THE SEVENTH ART

Art is not a simple subject to define and there is no consensus when it comes to specifying it, in fact, the concept of art has evolved as time goes by and new forms of art are presented. Artistic techniques and concerns have been changing since its inception and cinema does not escape this context, given that it is a comparatively new art with respect to traditional arts. We must remember that the cinema officially began on December 28, 1895, when the first film made by the Lumiere brothers was shown, where some people could be seen carrying out different types of activities such as: the demolition of a wall, the exit of workers in a factory, a ship leaving a port and several people arriving on a train. UNESCO named these tapes as an important part of the memory of the world. It is no secret to anyone that from those tapes from the end of the 19th century to the present day, cinema has evolved and been completely transformed.

Let's go with some history, the art began when the people in the caves carved their hieroglyphs representing hunting and daily life. Centuries later between the Hellenistic period of 323 B.C. C. until 31 a. C. which was after classical Greece, after the death of Alexander the Great and before the suicide of the mythical Cleopatra VII. Architecture was considered the greatest art and that the rest of the arts came from there.



Art was divided in Roman times according to which part of the personality or the organism was used to perform them,

which could be either the mind or the body, and their ability to obtain the final product, which could be a object, a dance, knowledge, among others. On the other hand, Cicero came to catalog the arts according to their importance and classified them into "major arts" to refer to politics and tactics of military strategy, while rhetoric, science and art were counted among the "middle" arts. the police, finally, the "minor arts" which referred to music, sculpture, athletics, acting and painting.

But there was a classification that reached the modern era and was somehow the most accepted, it was made by a famous Greek doctor and philosopher named Galen in Roman times. He divided the arts into two classifications: "the liberal arts" and "the vulgar arts". The former were subdivided into trivium and quadrivium, the trivium being the arts made up of rhetoric, dialectics, and grammar, while the quadrivium was made up of geometry, music, arithmetic, and astronomy. On the other hand, the vulgar arts (also called mechanical) included sculpture, architecture and painting. With some differences between authors, this classification lasted throughout the Middle Ages until the Renaissance.



193.1 The Beautiful Art

The term "fine arts" has been used since the 18th century to refer to the main arts, where the French philosopher Charles Batteux includes poetry, dance, painting, sculpture and music as fine arts, but he also held the term arts mechanical for the other artistic activities, he also pointed to rhetoric and architecture as activities that fall between the two categories.

Cinema is classified as the seventh art The art classification that is used today comes from an Italian artist named Ricciotto Canudo who stood out as a film critic, playwright and from his work, left as a legacy the "Manifesto of the seven arts" that was published in the year 1911 where he expresses the arts categorizing them as follows:

- Architecture

- Sculpture
- Paint



- Music
- Poetry / literature
- Dance



- Cinema

The new forms of art expression need new concepts and words, therefore, they also require new classifications and that is why some authors have added other types of art to this classification, such as:

- Photography
- Comics
- Video games
- Wardrobe
- Theater

However, many authors differ from this last classification, but as we stated before, there is no general consensus. In short, the most accepted classification of art includes cinema and it is important to emphasize that the positions found in the list do not refer to the order of importance of each of the arts.

193.2 About the Author

Graduated in Mechanical Engineering, and a master's degree in teaching component, I gave classes in several institutes of mathematics and physics, but I also dedicated several years of my life as a television producer, I did the scripts for mikes, the camera direction, editing of video and even the location. Later I was dedicated to SEO writing for a couple of years. I like poetry, chess and dominoes.

CHAPTER

FOUR

DAVID BOWIE THE LEGEND



Let's take a look at the life and career of the legendary David Bowie!

David Robert Jones was born on January 8, 1947 in Brixton London England though he showed musical interest at a young age it was only in the early 60s that he really pursued the art, he started by joining several blues bands but branched off on his own when they had little success.

Renaming himself David Bowie he released his self-titled debut in 1967.

Its lack of success led Bowie to participate in a promotional film called "love you till Tuesday" which showcased several of his songs a particular interest was 'Space Oddity'.

That track became a hit after it was released at the same time as 'the first moon landing'. His sophomore effort of the same name however was another commercial disappointment.

To promote his third album 'the man who sold the world' Bowie was put in a dress to capitalize on his androgynous look, in 1971 a pop influenced record called hunky-dory came out and was followed by the creation of his flamboyant Ziggy Stardust persona and stage show with backing band the spiders from Mars.

Then came his breakthrough record the rise and fall of Ziggy Stardust and the spiders from Mars which climbed the charts thanks to his performance of the single star man on Top of the Pops

1973's Aladdin Sane was his first number-one album mixing a hard rock sound with styles such as avant-garde jazz, the spiders from Mars were disbanded shortly thereafter.

After the covers album pinups turned Bowie into the UK's best-selling artist the funky concept record Diamond Dogs featuring the hit rebel rebel was released.

The elaborate stage shows for the tour that followed as well as the worsening state of Bowie's health due to his cocaine addiction would later be seen in the documentary cracked actor

1975 saw the release of young Americans an album that was less glam rock and more soul.



This album spawned his first US hit a track that was written with John Lennon "Fame" his next album station-to-station featured the song golden years and introduced another alter ego the thin white duke.

This persona resembled his character in the 1976 movie The Man Who Fell to earth. up next was a trio of albums recorded with Brian Eno known as the Berlin trilogy beginning with 1977's Lo this ambient and abstract album produced the UK hit sound and vision this was followed by a more pop rock but still minimalist album called heroes whose

title track later became a Bowie signature tune, and in 1979 with his drug addiction now behind him Bowie released 'lodger' which contained new wave and world music elements.

1980's scary monsters and super creeps featured the hit ashes to ashes which was accompanied by an iconic music video.

Bowie's career lept on new heights in 1983 with the success of the album let's dance and the music videos for the singles 'modern love' and 'China girl' high sales continued with the dance inspired tonight, an album that featured the top 10 hit blue jeans, in 1985 the music video for Bowie's duet with Mick Jagger dancing in the street was debuted at Live Aid, two years later Bowie released the more techno based album never let me down that featured the single day in day out

1999 saw the release of an album with more rock tracks entitled hours. this was followed by the critically and commercially acclaimed heathen in 2002 and another successful record in 2003 called reality.



Emergency heart surgery in 2004 forced bowie to slow down so in the latter half of the decade he recorded only a few songs and played a couple of gigs but, continued to act while he released albums some of his most notable film appearances include Twin Peaks fire walk with me mr. Rice's secret Zoolander and The Prestige

A true chameleon of the music world David Bowie has incorporated many different styles to make his own with his distinctive voice and extravagant stage shows he is surely an artist who will continue to be influential throughout the ages.

On 10 January 2016, two days after his 69th birthday and the release of the album Blackstar, Bowie died of liver cancer in his New York City apartment.

194.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

FIVE

DOGS

"Dogs" is a complex subject because they are all different. Imagine that. Really. The point is that each one must be treated according to his or her personality and past experiences that shape their personality. This makes sense, but many people fail to recognize that fact.

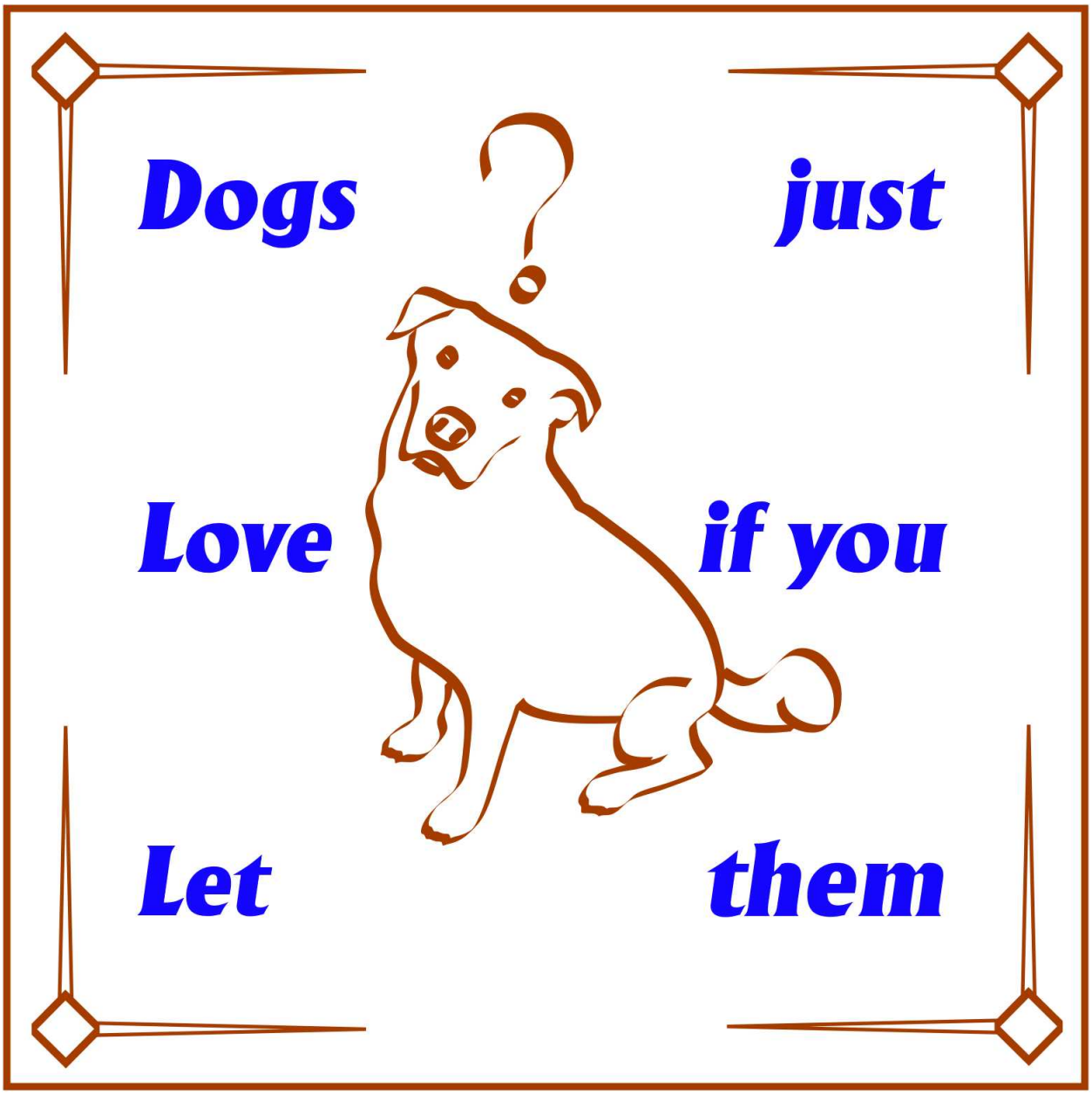
The idea is, that when you get a new dog, the best approach to training depends on the personality of the dog, so the best starting point is for you and the dog to get to know each other before serious training begins. In the first few days, keep training to a logical minimum, potty training, discouragement of destructive behaviors, etc. Keep the dog close to you and treat it with respect (but don't coddle it too much) so it knows you are someone it can trust. Observe it closely and LEARN what its likes, fears and preferences are, THEN you can adjust your training methods to yield the best results. This is especially important when your dog is a rescue. You likely will not have more than a clue as to the dog's past experiences.

Since dogs are pack animals, you want the dog to see you as the leader of the pack. In a pack, the leader is fair and he (or perhaps in your case, she) treats the members of the pack in a fair way. So THINK about the signals the dog is sending and how you can best communicate YOUR desires to the dog when training begins. Do NOT punish a dog for breaking rules until you have told the dog what the rules are. At first, discipline the dog gently and reward it randomly for appropriate behavior. By that I mean that the dog should expect a reward but not a specific reward. Treats are great, but don't give the dog a treat every time it comes when you call - sometimes a treat, other times just praise. That is teaching the dog how real life works.

Give your dog something it can count on, but only in a general way. Dogs need structure. Seeing YOU as the leader, a fair leader, will give it that structure. If you pay attention, you'll see what is working and what is not. Positive reinforcement is better than negative.

You WILL leave the dog alone occasionally. Don't make a big deal out of it. Leave the dog in a room, a crate or the house, but just leave. Let the dog know it is not being punished and that wherever you leave it, it will be safe - no big deal. Until you feel the dog can be trusted, a crate or a specific room is just fine. Just don't make it a big deal with all kinds of coddling or any other emotional display.

I'm not a an expert, but I have learned what I learned about dogs through my own experience (eight dogs over a period of many years) and also the from advice I found on blackbeltdogtraining.com. It's NOT what it sounds like. Robert Cabral IS an expert and a very caring dog trainer. Go here: www.blackbeltdogtraining.com/articles and download and read "Bringing Home Your New Dog". It's a great starting place for you and your new friend! There are many other articles as well that can be very helpful. Enjoy!



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CHAPTER

SIX

DRIVING OFF-ROAD

One of my favorites, going off-road is like a little vacation. I get to see beautiful scenery, sometimes wildlife, and since it requires some concentration, I'm not thinking about other responsibilities. It's a kick to share with someone else or just enjoy by myself. The important thing is to do it deliberately, not like Tiger Wood.

When going off-road it's important to prepare for the experience because many things can go wrong. I drive a 2000 Jeep Wrangler TJ and because I take care of it, my 21 year old Jeep is still going strong. It hasn't had a back seat in years. Since I don't have a lot of money, many of the things that others add to the outside of their vehicles, I keep inside.

Among these things are my "high lift" jack. I also have an air tank which I fill up before I leave home. And rather than a winch, I have what's called a "come along". It's a little hand operated winch that takes up little space and weighs very little. I can hook it up to the rear, the front or the side of the Jeep, so it's versatile. You may think that limits me because I can't operate it and drive at the same time, but that's not exactly true. I have a chain for some added length and more importantly, I have a stretchy, heavy duty nylon tow strap.

One day I got stuck and needed to use the "come along". All I needed was just a couple more feet of forward movement to get to the place where I could drive without assistance. So I hooked the device to a tree and then to the tow strap, which I hooked to the jeep. Then I cranked the "come along" until the tow strap was stretched very tight, got into the Jeep and the tension I had cranked into the tow strap was enough to pull me forward just enough to get some good traction so I could just drive. WHEW!

I also carry a tool kit and a tire patch kit. The air tank will fill up a patched tire. Binoculars come in handy and one never knows, so I carry a pistol and ammo "just in case". A cell phone sometimes does not get a signal, but most of the time does. Sturdy shoes/boots, appropriate clothing, water, a blanket, and a folding shovel can come in handy. I also have a flashlight, some matches, a fire extinguisher, a utility knife and a rather large "emergency knife" with a saw blade on one side. Just for pure enjoyment, I have plenty of music on a USB stick.

The Jeep itself is somewhat reasonably equipped. I have skid plates under the oil pan, and the gas tank and "rock sliders" under the rocker panels. The front differential has a "cable locker" to send power to both front wheels at the same time and it has its own HEAVY DUTY cover. The rear differential has a skid plate and an electronic locker to send power to both wheels, so it is a true 4 wheel drive vehicle.

The tires and suspension are quite important. The slightly oversized, knobby tires, and my lower gearing, get power to the wheels more effectively. I also have a smallish "lift" in the suspension, so the bottom of the Jeep will clear rocks, logs & other objects more easily.

The shocks are adjustable. The overall effect of the lift, with longer springs and adjustable shocks, is to make the suspension more flexible. On-road, one usually wants a suspension that will keep a vehicle sitting flat on the road and stiff enough, like a sports car or a racer, to keep it from leaning a lot on corners, . Off-road that is just WRONG. Off-road, one WANTS the suspension to flex - a lot - as much as it needs to, to clear objects. The long springs combined with shocks that will adjust to a softer setting, allow that flex and clearance. With the soft shock setting, the vehicle does not get thrown around by all that flexing.

I have also added some tweaks for more power. A throttle body spacer, high flow air cleaner, and high flow exhaust provide that power while NOT hurting my gas mileage.

Of course all these modifications come in handy in deep snow or mud too. The low range of the normal Jeep power train will let me literally climb fairly steep inclines at an idol. The good old Jeep 4.0 liter, inline 6 cylinder motor with tons of torque, lets me use the clutch at very low RPMs and the result is that after over 165,000 miles, I'm still on my original clutch. Can you tell? I really like my Jeep. Here's a couple of pretty places I've been.







196.1 About the Author

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CHAPTER

SEVEN

1ST AUSTRALIAN TASK FORCE (1 ATF)

197.1 Copied from Wikipedia

Australian Army casualties during the Vietnam War were 521 killed and over 3,000 wounded, the bulk of which were sustained by The 1st Australian Task Force.

The 1st Australian Task Force (1 ATF) was a brigade-sized formation which commanded Australian and New Zealand Army units deployed to South Vietnam between 1966 and 1972. 1 ATF was based in a rubber plantation at Nui Dat, 8 kilometres (5.0 mi) north of Ba Ria in Phuoc Tuy Province and consisted of two and later three infantry battalions, with armour, aviation, engineers and artillery support. While the task force was primarily responsible for securing Phuoc Tuy Province, its units, and the Task Force Headquarters itself, occasionally deployed outside its Tactical Area of Responsibility.

Significant battles conducted by the Task Force were Battle of Long Tan in 1966, Battle of Suoi Chau Pha in 1967, and Operation Coburg and the Battle of Coral–Balmoral in 1968. Other significant actions included Battle of Hat Dich in late-December 1968 and early 1969, Battle of Binh Ba in June 1969, and Battle of Long Khanh in June 1971.

A number of 1 ATF operations resulted in major defeats for the enemy including Operation Marsden in 1969 whereupon enormous caches of weapons and supplies and the main hospital servicing the local Communist forces were discovered and destroyed; and Operation Townsville in April 1970 whereupon Australian and New Zealand platoons captured the operational signals codes and one-time cipher pads used by the VC headquarters. As a result, senior U.S commanders including General CW Abrams, Commander USMACV were alleged to have referred to it as "the biggest intelligence coup of the war."[1] 1 ATF was withdrawn in late 1971.

Nui Dat (Núi Đt) is a former 1st Australian Task Force (1 ATF) base now part of Ba Ria city in Ba Ria–Vung Tau province, Vietnam. It is not the name of an official ward, it just means "dirt hill" (núi đt).[1]

In 1966, when the area was part of the then Phuoc Tuy Province it was the location of a prominent 1 ATF military base in South Vietnam during the Vietnam War. The site was chosen by Lieutenant General John Wilton in 1966 and was built mainly by men from the 6th Battalion, Royal Australian Regiment.[2] The occupation of Nui Dat required the removal of all inhabitants from within a 4,000-metre (2.5 mi) radius of the base in order to ensure the security of the facility. Ultimately this policy—which was an unusual step among allied bases in Vietnam—required the resettlement of the villages of Long Tan, with a population of 1000, and Long Phuoc, with a population of 3000. Both villages were subsequently destroyed; a task which was complete by July 1966.[3] After the withdrawal of Australian forces in December 1972, the base was "stripped bare".[4][5]

The task force began arriving at Vung Tau between April and June 1966.[5] From 17 May to 15 June, US and Australian forces secured the area around Nui Dat during Operation Hardihood, deploying two battalions of the US 173rd Airborne Brigade and an element of 1 RAR.[25] 5 RAR deployed from Vung Tau the same day and was tasked with clearing any Viet Cong found in an area 6,000 metres (6,600 yd) east and north-east of Nui Dat.[26] 1 ATF occupied Nui Dat from 5 June, with Jackson flying-in with his tactical headquarters to take command.[25] The plan to operate independently resulted in significant self-protection requirements and 1 ATF's initial priorities were to establish a base and ensure its own security.[27] Meanwhile, Wilton's decision to occupy Nui Dat rather than co-locate 1 ATF with its logistic support at Vung Tau allowed the task force to have a greater impact but resulted in additional manpower demands to secure the base.[16] Indeed, the security requirements of an understrength brigade in an area of strong Viet Cong activity utilised

up to half the force, limiting its freedom of action.[28] As part of the occupation all inhabitants within a 4,000-metre radius had been removed and resettled nearby. A protective security zone was then established, the limit of which was designated Line Alpha, and a free-fire zone declared. Although unusual for allied installations in Vietnam, many of which were located near populated areas, the Australians hoped to deny the Viet Cong observation of Nui Dat and afford greater security to patrols entering and exiting the area.

6th Battalion, Royal Australian Regiment (6 RAR) is a mechanised infantry battalion of the Australian Army. It was originally raised in Brisbane, Queensland, on 6 June 1965 and has since then served in a number of overseas deployments and conflicts including South Vietnam, East Timor, Iraq and Afghanistan. During the Vietnam War, the battalion earned a US Presidential Unit Citation from the United States when members from 'D' Company participated in the Battle of Long Tan on 18–19 August 1966.

- https://en.wikipedia.org/wiki/1st_Australian_Task_Force

CHAPTER

EIGHT

GALATASARAY UNIVERSITY



Galatasaray University (GSU) is a half-Turkish, half-French state university founded in 1992. It is the only university in Turkey that uses the French language for education. Located in Beşiktaş, Istanbul, Turkey, the Galatasaray University uses an old palace as its main building. It is situated on the Bosporus shore, and hence, you can see amazing landscapes even as you're relieving yourself!



The history of the university dates back to 1481, when Bayezid II established a school named “Galata Sarayı”. This translates to “the Palace of the Galata”, where Galata is the name of a neighborhood in Istanbul. The school also served as a university for the Ottoman Empire. Here, officers were trained for state administration. In 1838, the building was reconstructed to serve as a medical institute. In 1868, Galatasaray Mekteb-i Sultanisi was founded, with its main focus on free education. In 1874, three academic branches were created, and their curriculum was designed in line with Sorbonne University. Then, in 1924, with the decision of the Great Atatürk, the school eventually became the Galatasaray High School. In order to be accepted, students must score a total of 500 out of 500 in the entrance exams. This made Galatasaray High School the most difficult high school to enter.



During a ceremony at Galatasaray High School in 1992, President François Mitterrand of France and President Turgut Özal of Turkey signed an agreement establishing Galatasaray University, also known as L'université Galatasaray. The university is part of the Galatasaray Community as Galatasaray High School and Galatasaray Sports Club, which you may be familiar with. It is among the most prestigious, successful universities in Turkey. As founded in its roots, the tradition of secular and free education is deemed important.



Although the primary language for education is French, Galatasaray University is actually a trilingual university. Courses are being offered in three languages: French, Turkish, and English. In order to graduate, students must know how to speak French and English fluently. They are also required to study a third foreign language, which can either be German or Spanish.



Since French is the official language for education, students are required to undergo one year of linguistics training during the preparatory period. However, if you are a student taking up linguistics, the training is extended for up to two years.



As of this writing, there are 5 faculties and 12 programs in the university, as follows:

- Faculty of Economic and Administrative Sciences
    - Department of International Relations
    - Department of Business Administration
    - Department of Economics
    - Department of Political Sciences
- Faculty of Law
- Faculty of Communication
- Faculty of Engineering and Technology
    - Department of Computer Engineering
    - Department of Industrial Engineering
- Faculty of Arts and Sciences
    - Department of Philosophy
    - Department of Sociology
    - Department of Comparative Linguistics and Applied Languages
    - Department of Mathematics

Lastly, there are three ways for students to be accepted into the university. Galatasaray University accepts 50% of its students from entrance exams, 25% from Galatasaray High School, and the remaining 25% from other high schools that offer French education, such as Saint Joseph High School and Saint Benoit High School.

CHAPTER

NINE

HOW TO REALLY ENJOY CASINO GAMING

First things first - Why should you listen to me? I worked on casino floors, in operations, technical, and regulatory positions, talking with gamblers for 21 years. I've heard it (and seen it) all. I know how things work in the business but I was not a manager, so people were quite open with me.

The reality is that you will probably NOT win. You KNOW this! Casinos must make a profit to be able to provide you with all of the atmosphere that you enjoy, so they will take more than they give. But to keep you coming back, they must make that enjoyable atmosphere compelling, so just be aware that the whole idea is to make the experience addictive.

You will be treated to some small wins from time to time, and to lots of exciting sights and sounds, entertainment, Woo Hoo! Good food will be available, and many of the employees will be attractive and charming, whether you are a man or a woman. Some folks will win BIG and there will be lots of noise and employees congratulating them, but in the long run YOU will probably lose. THAT is a fact but the key word is probably. Because you know that, the atmosphere is designed to make you think YOU will be the next winner.

The key for you is to enjoy all that the casino is providing and treat it like any other entertainment experience. Before you leave the house, you normally decide how much you will be spending, right? Are you going to a movie or to a Broadway play, to McDonalds or to a French restaurant with wait staff in dress clothes? Make that spending decision and stick to it.

Since the casino offers a "McDonalds plan" and/or a "Four Seasons plan" you can customize your own experience but YOU must make the decision. You can play nickel slots or dollar slots. You can play Black Jack or sit at a high stakes poker table. The dealer will give you sexy looks possibly. Often you can enjoy live music or a floor show, your choice, but stick to your plan!

Oh yeah, you can drink any grade of alcohol you want as well. Be careful - DUH! If you stick to your plan, well, you'll be able to afford to do it again someday soon. Just keep in mind that what you're enjoying is the ENTERTAINMENT, not a guarantee or even the likelihood of a big win.

I knew a blue collar, hard working motorcycle club member who lost his home, and a very nice, normal, married algebra teacher who lost her home. If it can happen to them, it can happen to you, so decide what you can afford and go out for that kind of evening, lunch, or whatever, but stick to the plan and be happy with the entertainment that you get.

You might even meet other people whose company you enjoy, people who enjoy activities other than gambling. Hey, maybe you can all go water skiing, bowling, or something…

199.1 Logo



199.2 About the Author

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PC MAINTENANCE

Virtually everything I've learned about PC maintenance has been through trial and error over a period of 15 years. We had a PC before 2006, but that year was the beginning of our dependence on a computer for most all of our important business dealings.

There are some different categories of apps that need to be considered for a complete PC maintenance suite. I should mention that any category of app one picks should be thoroughly researched to decide which is best for you.

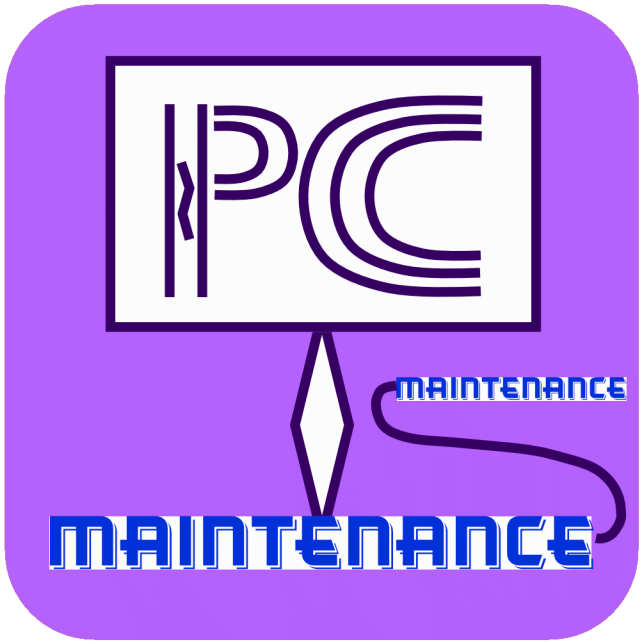
It seems obvious in our current "climate" that "malware" protection is of paramount importance. For that I use a paid "real-time" solution that has excellent ratings and includes a browser add-on. I also have a secondary app that I can use for scans at any time. Be sure that any solution you use is ALWAYS up-to-date. Many anti-virus apps are mutually incompatible, so be careful. Also consider a VPN (Virtual Private Network), especially a browser based VPN, so you can keep your browsing history, and your location hidden from the websites you use and from your ISP. It is none of their business. Research VPNs!

I also think an operating system maintenance tool is quite important. Whether one uses Windows, Mac or any of several other OS's, there is a tool, paid or unpaid for keeping that OS tuned up. Each OS has its own built-in tools but identifying, finding and using them can be pretty confusing. The tool sets built by others can save a great deal of confusion by keeping the individual tools easy to find, use and understand. I use my favorite on an almost daily basis, and it keeps my PC running smoothly, while taking little of my time.

Backup is a pretty huge consideration, and My fav has saved my PC MANY times from all kinds of major and minor disasters. Research this category thoroughly and definitely invest in a backup program, and an external hard drive or other external storage. "Just do it!"

Organizing tools can be very useful as well. Because I'm a graphic designer, and I just keep adding more and more client's designs and more and more tools and even personal fun and interesting articles and "whatnot", I have one little monstrously handy app that can find almost anything and everything (hint) that is on my PC.

There are also tools for updating all your programs and notifying you when you need updates. I have one for my drivers, and my main OS maintenance program tells me when any other programs need updates. Keep in mind that you can set most of your programs to update or to notify you, but not all of them will do this. I also have a program that does an excellent job of UNinstalling other programs completely, along with the other files that are leftover after uninstalling something. Calendars are another very useful category. Almost every PC has multiple calendars available, but some are better than others. In summary, BE CAREFUL and get that BACKUP program (and external storage) and use it OFTEN!



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CHAPTER

ONE

PIZZA

Pizza is, well, everything. Just type "types of pizza" into any browser search box. Use any search engine, and you will see that point illustrated. Basically, pizza is a round (usually but not always by any means) bottom crust, covered with Marinara sauce, and a mixture of other ingredients including cheese and one or more other toppings.

A little investigation will tell you that there are two types of pizza crust, thick and thin. Further investigation will broaden the choices out to five or more styles of crust. The variations seem to be based on location primarily, for example: Chicago Deep Dish, NY Style Pizza, Neapolitan Crust and Sicilian Style.

The cheeses are even more numerous. Usually Mozzarella cheese and often Provolone are standard, but literally any other kind of cheese that sounds good to a person can be found on a pizza SOMEWHERE. Just a quick search yielded Parmesan, Goat cheese, Cheddar, Arugula, Blue, Colby, Edam, Emmental, Ricotta and Gruyere.

The "toppings" are insane. Think of ANYTHING you like in the way of meats, seafood, vegetables, spices and even fruits, and it can be found on top of a pizza. I have even seen Hummus used as a pizza topping. Here's one: "Brown Butter Lobster and Spinach Pizza with Bacon + Fontina". But what's REALLY good on a pizza? How many people are there? That's almost how many opinions there are and of course we are talking about our big round planet. So now we are down to MY opinion because this is MY article.

The best pizza that I have found, and I have traveled some, not widely, but all around the USA and touching Canada and Mexico, is in a small city, Prescott, Arizona. There, downtown, in what was the original capital of Arizona, is the Prescott Brewing Company. The beer is excellent to say the least. There are many styles and even multiple styles (some seasonal) of IPA , my personal favorite.

PBC has some great food, including my favorite burger, the Peppercorn Gorgo Burger. It's encrusted with crushed black peppercorns and topped with onion straws (like breaded onion rings, but not rings), and Gorgonzola cheese spread, served on a Ciabatta roll. I have them add bacon too. YIKES!

OK, now to my favorite food on earth, literally, the PBC BUFFALO CHICKEN PIZZA. The crust is thin, not quite crispy usually. The cheeses are Mozzarella, Gorgonzola Spread and "Gorgo crumbles". The chicken is cooked with Buffalo sauce (a vinegar-based cayenne pepper hot sauce, like Buffalo Wings) and rather than Marinara, they use what they call a Tornado sauce, which is really, you guessed it, Buffalo sauce. Add some little green onion slices, and you have pure bliss in your mouth, IN MY OPINION. You can find the PBC here: https://www.prescottbrewingcompany.com/ ENJOY!

201.1 Logo



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CHAPTER

TWO

SHERIFF RICK GRIMES IS AN IDIOT

Sheriff Rick Grimes, the lead character, is a fuckin moron. Millions of fans are on #TeamGrimes and cheering for Rick.

It says something disturbing that these idiots think he's a hero. the person may be a walking, talking mass of empty rhetoric, bogus moral posturing, flawed logic, and cognitive errors.

Granted, it's always possible that during this season Sheriff Grimes will redeem himself. Hope springs eternal. My comments here only apply to his leadership during the primary four seasons.

But as I watched them, I spotted that you simply could learn a lot from "The Walking Dead. If you wish to succeed, just ask yourself, "What would Rick Grimes do?" - afterward you go and do the entire opposite.

Don't believe me?

Here are some great lessons.

'Busy' doesn't mean 'productive' Rick Grimes is busy. Busy. Always so damn busy!

He's leading a team bursting into an abandoned house in search of food—any food, including pet food. Crash! He's leading his hapless followers into a darkened corridor to flush out the zombies. Zoom! They're demolishing the highway to hide.

The only problem: plenty of the activity is wasted. . . and a number of it's downright counterproductive.

For instance, dark, enclosed spaces are precisely the places you would like to avoid. The undead just likes to lurk within the dark then leap out and bite you, costing you a limb, or even your life.

All this action is great TV—and terrible management. Sheriff Grimes isn't alone in his error. Too many folks confuse mere activity with acting. There aren't any prizes for being busy.

Understand your mission "I'm keeping us safe," boasts Rick Grimes, while people drop around him like flies. "I'm keeping us together," he adds. But to what end?

Rick Grimes lurches between objectives and bounces between crises.

He offers no discernible moral or system. One minute he's fastidiously respecting property rights. The other minute he's torturing a prisoner for no obvious reason.

No wonder such a lot of around him ask why they must even bother staying alive.

Don't overlook the plain If you're searching for a lost child, shouldn't you look inside that big barn across the field?

If you're in an exceedingly big government scientific center jam-choked with dangerous biohazardous materials, and there's a large red punch in the wall counting right down to zero hours, shouldn't you ask the one remaining scientist within the place—a man who seems to be ominously, serenely dead along with his maker—what the fuck is happening?

The devil is within the details, some people say. Really? the small print has its place—but go searching and it's amazing what percentage of people and projects and firms fail because people neglected the few really big, really simple, really obvious decisions. Often, they're too swamped by the main points to seem at the picture. Bad choice.

Learn from the experience Rick Grimes and his followers got too complacent at the farm. They didn't take enough steps to safeguard themselves. They didn't dig ditches, erect fortifications, or maybe pack a go-bag. Bad move. When a herd of zombies suddenly attacked, they'd escape, empty-handed. "We won't make the identical mistakes again," vowed Sheriff Grimes. Soon afterward they moved into an abandoned prison. where they didn't dig ditches, erect fortifications, or pack a go-bag. You'll be amazed at what happened next. So were they. Wall Street traders have a good old saying, as a money manager and financial blogger Barry Ritholtz likes to remind us: "It's alright to be wrong; it's not alright to stay wrong." The key division in life isn't between folks that make mistakes and other people who don't, it's between those that learn from them and people who are too stubborn, foolish, or proud to try and do so.

202.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

THREE

SILVERSMITH

In my youth I was a jeweler, a Silversmith primarily, so most of this article will be written from my own perspective as a designer and producer of small items of jewelry. Some Silversmiths work with large pieces, constructing vases, candelabras, plates, etc, but I stayed with the small stuff.

There are many tools that can be used to construct large or small pieces. Various sizes and shapes of hammers, saws, snips, files, grinders and of course tools for gripping and polishing, as well as anvils come in handy. Solder, torches and fuel are part of the inventory too.

Although I did some "construction", most of my work involved a technique called "Lost Wax Casting", primarily used for small jewelry pieces. There are many ways to create a mold (or in non-American usage, mould), but the lost wax method is most often used for small pieces.

The process, simplified here, is described in detail in the references. First of all a piece must be created out of wax (although other materials are sometimes used). The wax comes in different forms. Some are wires, ribbons or other shapes that are pre-formed commercially. Also wax comes in different hardnesses, so in some cases it can be squeezed and shaped by hand or with small metal tools, or in other cases it can be shaved, cut, or scraped with an engraving type of tool. Wax is available to be dispensed using a heated tool sort of like a pen or small injector. Regardless of how it is shaped, very simple or very intricate wax models of the finished piece are the result. The finished wax model then has a wax "sprue" attached to it. The sprue is funnel shaped, with the small end being attached to a part of the wax model where the resulting metal casting can be smoothed when the metal sprue is removed. The sprue forms a funnel shape within the mold, so that hot, molten silver or other metal can be poured or forced into the mold.

Imagine a "carving" or piece of wax the exact size and shape that the jeweler will duplicate in silver. Then attach the funnel shaped sprue at a point where the flow of molten silver will be the greatest as it enters the mold that will be created. Then that sprue is attached to a rubber base with the widest part resting on that base. A metal cylinder is then attached to that same rubber base (they are designed to fit together to form a perfect tight seal), so one can look into the cylinder and see the wax piece and the rubber bottom. Then fill the cylinder with a plaster like material called "investment" which is very fine grained. A vacuum is then applied to remove any air bubbles. After the investment hardens and dries, the cylinder, investment and wax are separated from the rubber bottom and they are placed in a kiln to melt out the wax (with the sprue facing down of course). There will be a specific schedule for this process, to ensure removal of ALL residual wax and proper temperature for the following…

This next step must be done rapidly and immediately following the wax removal, so that the molten silver will flow easily into the mold that has been created by removing the wax.

The plaster/investment mold and it's cylinder are turned sideways and placed at one end of a pre-balanced centrifuge that will spin at high speed and force molten silver (or other metal) into the mold. The mold, with the sprue facing toward the center of the centrifuge, has a crucible snuggled up to it, so molten silver from the crucible will flow into the sprue and the rest of the empty space in the mold as the centrifuge is spinning. One quickly places the hot mold that has just had the wax melted out, then heats silver in the crucible and releases the spring loaded centrifuge to force the silver into the mold. At that point, The metal is forced into the mold, and the flask, plaster and metal can be dipped into cold water afterward to remove the investment from around the metal (Careful!). From that point on, cut the sprue off of the piece and begin the process of smoothing and polishing. Caution: This process takes some time to learn and perfect, and there will be a significant investment in equipment as well.



- https://en.wikipedia.org/wiki/Silversmith
- https://en.wikipedia.org/wiki/Lost-wax_casting
- https://www.jewelry-tutorials.com/lost-wax-casting-jewelry-process-steps.html

203.1 About the Author

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CHAPTER

FOUR

STEVE IRWIN, AN AUSTRALIAN LEGEND

Steve Irwin's life was cut short when he was impaled through the chest by a stingray in 2006 near the Great Barrier Reef but his legacy remains immense, he was a popular television personality, a zookeeper science educator, and a conservationist.



He would have been 57 years old today, you might be most familiar with Irwin from his Crocodile Hunter television series which documented his very close and dangerous seeming encounters with animals including crocodiles which he co-hosted with his wife Terry from 1996 to 2004.

His shows and television specials were broadcast in over 100 countries and he became a global celebrity loved and sometimes lampooned for his liberal use of the word crikey.

In the eyes of critics his stunts sometimes went too far like the time he fed a crocodile while carrying his infant son in his arms. there was also a time he was investigated for filming too close to humpback whales and penguins possibly putting them at risk. he was never charged with any crime. antics a sight, his devotion to animals and conservation began long before the show ever existed.

His father Bob Irwin is a herpetologist who founded a zoo in Queensland, Australia where Steve grew up.

Steve would come to run the park now called Australia Zoo and promote the educational and conversation efforts there. “my job my mission the reason I’ve been put onto this planet is to save wildlife” he once said.

He had reason to worry, the average vertebrate birds, fish, mammals, amphibians, population’ has declined 60% since 1970 according to the World Wildlife Fund. the future for biodiversity on planet Earth due to human activity looks and they weren’t just words.

His wildlife warrior’s charity bought up hundreds of square miles around the world for wildlife conservation, the charity which is still operating today is also involved in conservation efforts for animals like Sumatran tigers, koalas, Cambodian elephants, and more.

The Australia Zoo even manages a 500 plus square mile reserve in the north of Queensland named after her win whether or not you approved of us has up close an aggressive approach to videotaping animals it’s clear pop culture could use more science and wildlife celebrities

Like urban for too many. the enormous diversity of life on Earth as a remote abstraction something that belongs to another more fantastical world people like urban Jane Goodall and David Attenborough help us appreciate the natural world by bringing it into our homes and selling us on its importance and vulnerability with their care, Wonder, thoughtfulness, and, enthusiasm.

204.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel’s whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

FIVE

THE ORIGIN OF CINEMA

The beginnings of the history of cinema go back to the Greeks, Egyptians and Romans, where these civilizations were able to show the idea of movement through successive drawings. However, in Asia they began to play with light and shadow on the surface of a white cloth. This event was able to inspire what was known in the 17th century as the "magic lantern", which consisted of a box capable of capturing images from the outside, projecting them inside the box and later working in reverse to project them again.

New inventions such as the steam engine arrived in Great Britain already in the 19th century, and along with the industrial revolution, new forms of transport were also invented, the light bulb and the most important of all for the subject that concerns us, which was photography. At this time Charles Louis Chevalier son of Vincent Jacques Louis Chevaler were French opticians by profession and in 1823 they associated with the Quai de l'horloge store to market their objectives created for microscopes, which prevented chromatic aberration.

Then they dedicated themselves to perfecting the lenses for the "camera lucida" that had its applications in painting. In 1825 Niepce used the services of Charles Chevaliere to perfect his experimental cameras and by 1831 Charles became independent from his father and created his own company where he had Louis Daguerre as a client, where this painter and theatrical decorator managed to go down in history for invent the diorama.

The diorama was a complete visual spectacle in which images of natural landscapes or other iconographies were shown through elaborate scenographic techniques, where movements were applied to the clouds or a sun that, when moving, changed the tonalities of the scene. By means of transparencies, play of lights, relief elements and sound effects, he could recreate different types of environments with magical realism. Louise Daguerre patented her diorama in 1823 and turned the Paris stages into a spectacle, where images of up to 21 by 14 meters could be displayed that were only 12 meters from the viewer. In this way he achieved success for around 20 years for a box with more than 300 people, where the public area was made up of seats that were on a rotating platform and once the first stage was shown, the spectators turned to watch the second scene. Daguerre was able to move the public of the time and got them used to seeing shows like that.



As if that were not enough, Louise Daguerre became interested in photography, which she called "The eyes of the academy" and continued her advances in this field, she followed all the discoveries in this regard with great interest and began to use the camera obscura when make the models of his great compositions, he also dedicated himself to

reproducing his works. She carried out multiple tests with phosphorescent substances but only achieved a fleeting image that was only visible in the dark. When he began to work together with Charles Chevalier, he put him in contact with Joseph Niepce, who was conducting experiments to fix images from the camera obscura, and on December 5, 1829, Daguerre signed a partnership contract, where he recognized that Niepce managed to find a novel procedure to fix the image and without the need for drawing. Both worked hard with sensitive plates of copper, silver and glass, in addition to making use of vapors in order to blacken the image.

Niepce dies in 1833, but Daguerre continues to investigate and a couple of years later (1835) she makes a very important accidental discovery. She placed a plate inside her chemical cabinet and realized after a few days that a latent image had taken shape, thanks to the evaporation effects of the mercury that came to act as a developer. It was not until 1838 that she managed to perfect the daguerreotype, because the exposure times had to be very long and the effects of mercury vapor were very toxic to health. However, Ella Daguerre managed to perfect the procedure with copper plates previously sensitized in iodine vapors, to later reveal them by means of mercury vapors. To fix the images, she used salt water at high temperatures and after all these innovations, she managed to obtain extremely sharp, quality and permanent images.

Later Thomas Alva Edison invented the Kinetoscope which was the forerunner of the movie projector, although it is true that it was not exactly a movie projector, it did introduce the fundamental approach that would later become the standard device for cinematographic projections before the appearance of the video. It carried a strip of film with sequential images that were over a light source and a high-speed shutter.



The Kinetoscope inspired the Lumiere brothers to create their own cinematographic device based on a record where a tape rotated at 16 frames per second and managed to project the movement of people in December 1895. The success spread not only in France but throughout Europe and North America.

The Lumière brothers made more than 10 films lacking natural sets and actors. Of course, the lack of editing, the haste and the fixed camera were part of the faults committed by the beginners of cinema.

The first person to make a film was Alice Guy, considered the founder of narrative cinema and who came to surpass the demonstration made by the Lumiere brothers. Alice managed to lay the foundations for fiction and she was also the first person to achieve her financial support through this profession. Therefore, the first film that was generated in the history of cinema was La Fée aux Choux in 1896, which translates as "The Cabbage Fairy" and later made other films such as Sage Femme de Premiere Classe in 1902 and in 1905 made the Emerald.

After the success of Guy, director Georges Meliés entered this magical profession, whose fantastic sets and fascinating

stories captivated the viewer. Films such as “Bluebeard” and “Faust” created in 1901 generated new cinematographic techniques, especially with “Journey to the Moon” (1902) and also with “Journey through the impossible” made in 1904, managed to implement the technique of the theater before the cameras and made the first special effects, thus achieving science fiction films. Since then the cinema has evolved by leaps and bounds to the present day. Important directors such as Erich Von Stroheim, Murnau and Charles Chaplin emerged. Adventure films in the United States were not long in coming, such as those made by Douglas Fairbanks or the romantic dramas of Valentino. Then the American comic school that was born from the comedy made by Mack Sennet and these films were cataloged as the most beautiful and were based on stereotyping social characters such as the fat man, the policeman, the mustachioed bourgeois and the miser.

We cannot forget the cinema made by Charles Chaplin and Buster Keaton, but it was not until 1927 when the first sound film called “The Jazz Singer” was released and since then, the cinema ceased to exist as it was known, a greater plot fluidity and continuity of the story, for that same year the dubbing appeared and by 1935 with the film “The vanity fair” is that the cinema appears in Technicolor, but it really reaches color perfection in 1939 with “What the wind took away”.



205.1 About the Author

Idais, Graduated in Mechanical Engineering, and a master’s degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

SIX

WORKING OUT (YOU KNOW, WITH WEIGHTS)

I'm certainly NOT an expert at working out, but I've been doing it for about 24 years. It all started when I was working in my first casino job and after a year or so I mentioned at work one day that I had developed a VERY sore shoulder, and I could barely lift my right arm above a position parallel to the ground. It seems that pulling 22 lb. Quarter fill bags off the cashier counter and just letting them drop while holding on to them was pulling my shoulder just a tiny bit out of socket each time. OUCH!

A young woman coworker said "Why don't you try exercise?", and I said "NO, that's what hurts!" I had just started daily walks about two months before that, and my wife went out on a limb and bought me a couple of 10 lb. Dumbbells for Fathers Day. I married a smart woman!

That's how it started and now I've been working out for all that time. I have found out a few things.

Do NOT start throwing weights around. Those weights can cause a lot of strain on connective tissue if one does not use proper form, kind of like when I pulled the fill bags off the counter. Using proper form is essential. What that generally means is moving in a controlled way, in a motion that does not put a strain on those connective tissues from assuming unnatural positions, and moving at a controlled rate of speed in order to avoid strain on those tissues at the beginning and end of the move. One can increase strength and muscle mass by increasing the number of reps and by increasing the weight, but don't try to toss them around (with the exception of some kettle ball moves, again, very controlled). The greater the weight, the more important that form is.

I've found stretches to be very helpful in order to keep flexible and of course there are a number of aerobic moves without weights that are very useful. So far, I have not found a way to injure myself with those, with one exception. I was doing push-ups, fast, and at the top of a push-up my left shoulder came out of socket. Man did that hurt when I came down!!! I guess the lesson is to BE CAREFUL.

Now that I'm old (75), I don't even think about running. I hurt my lower back one day after about a half a block of running. A little light jogging seems to be OK though.

I try to get in at least two work-outs a week and three is better. The hard part is just starting the workout. When I was going to the gym before COVID-19, it was just walking in the door. But I do it because the evidence that one will live longer with a regular exercise routine is overwhelming, and I KNOW that I will always feel better after my workout. Every single time..... And the strangest thing of all is that I seem to hear better after a workout (I have severe hearing loss). Who would have thought?

206.1 Logo



206.2 About the Author

Harley Armentrout is a happy husband and father, former silversmith, aerospace electronics prototype assembler, test, calibration & repair technician, also writing test procedures at BallAerospace. Then 21 years in the gaming industry, in a range of positions, culminated as a Gaming Inspector, observing and reporting on rules violations, safety issues and criminal activities for the Yavapai Prescott Indian Tribe. After "retiring" Harley taught himself a few graphic design skills and he works as a freelance designer.

CHAPTER

SEVEN

CODEWARS GO COLLY CLI SCRAPER

```
$ ./codewars
Usage: ./codewars [options]
Options:
  -u, --username string   Codewars profile username
```

CHAPTER

EIGHT

CONNECT USING JAVA FROM A CLIENT TO IBM SYSTEM I - AS400 USING JTOPEN

- Date: "March 2021"

In this opportunity I want to share with you a personal experience that I hope can be useful if you come to experience it.

In mid-2020 I was contacted by a client with a specific request. He asked me to help him write a Script to be able to connect to an IBM db2 database residing on an IBM System i - AS/400 Server.

Said script, had to be developed in Java and had to use a connection through JDBC. Actually, I had never written a Script in Java, I had no experience in this programming language, in fact, it is not my favorite programming language, however, I could not refuse my client's request.

Next, I did extensive research on the best way to connect with Java to an IBM System i - AS/400 Server, using best practices.

I had to ensure that this connection was fast, secure and dynamic. There are many Java connection methods to this type of Server, however, this will depend on what we want to do.

If what we want is to make a connection via FTP (File Transfer Protocol) there is a connection method, if we want to send and receive data frames, there is another method to do it. If we want to connect to a database there are other mechanisms and so on.

I thought, wow, it won't be easy but I sure will. I had a double challenge, learn a little Java and at the same time guarantee a secure and fast connection.

Consulting a wide range of sources, which became a very tedious task, I finally came to an article that caught my attention, said article talked about JTOpen Toolboox for Java, with which I decided to try.

JTOpen is an open source version of the IBM Toolbox for Java that is updated more frequently than the IBM System i - AS/400 version of the licensed program.

The IBM Toolbox for Java JDBC driver is included with both versions of IBM Toolbox for Java. This JDBC driver supports JDBC 3.0

The IBM Toolbox for Java is a set of Java classes that allow you to access IBM i, i5/OS, or OS/400 data through a Java program.

With these classes, you can write client/server applications, applets, and servlets that work with data on your IBM i, i5/OS, or OS/400 system. You can also run Java applications that use the IBM Toolbox for Java on the IBM i, i5/OS, or OS/400 Java Virtual Machine.

Here is just a sampling of the many IBM i resources you can access using JTOpen:

- Database – JDBC (SQL) and record-level access (DDM)
- Integrated File System

- Program calls (RPG, COBOL, service programs, etc)
- Commands
- Data queues
- Data areas
- Print/spool resources
- Product and PTF information
- Jobs and job logs
- Messages, message queues, message files
- Users and groups
- User spaces
- System values
- System status

To download and install JTOpen please visit the following link:

https://sourceforge.net/projects/jt400/

JTOpen is comprised of the following files:

Jar file Contents

---

jtopen_x_x_source.zip This is a zip file of all the source files in the repository. Note: It is not a Java jar file.

jt400.jar(*) This is the main JTOpen jar file. It contains almost all open source code (except for the few Toolbox classes that could not be open-sourced), including the utilities package, and the JDBC driver (JDBC 3.0).

Once your .zip file is unzipped, go to the lib folder, run the jt400.jar file, which will create the com, ibm and as400 folders. Ready! you have everything you need to connect your Java Script to your IBM System i - AS/400 Server.

Don't forget to compile your Java Script on top of the previously installed folders.

Note: If the database host server is not started. You can start this by running the following command on the AS/400 command line: STRHOSTSVR

*DATABASE

Then, you can verify if the database host server is running by running the NETSTAT *CNN command.

When the work with TCP/IP Connection Status screen is displayed, look for entry as-database under the Local Port heading and ensure it is in Listen status.

The first instruction in your Java Script should look something like this:

import com.ibm.as400.access.AS400JDBCDriver;

Please visit the following link to download my Java connection prototype - IBM System i -AS/400:

https://github.com/ClayLanzino/IBM-System-i_AS400/tree/master/Java_Scripts

Hoping it will be of some help to the community.

208.1 About the Author

Clay Lanzino is a passionate former surfer, father of three children, husband and a 33-year-old IT professional who loves programming. In his spare time, he loves being in nature, hugging the trees, walking barefoot to take in the energy of the earth and doing meditations in the open air. If time permits, he does some Yoga, in his exclusive meditation room.

CHAPTER

NINE

DIFFS

209.1 Animated PDF differencing

pdftocairo

More to come.

209.2 Colordiff

Text differencing of two PDF files in the `terminal` using:

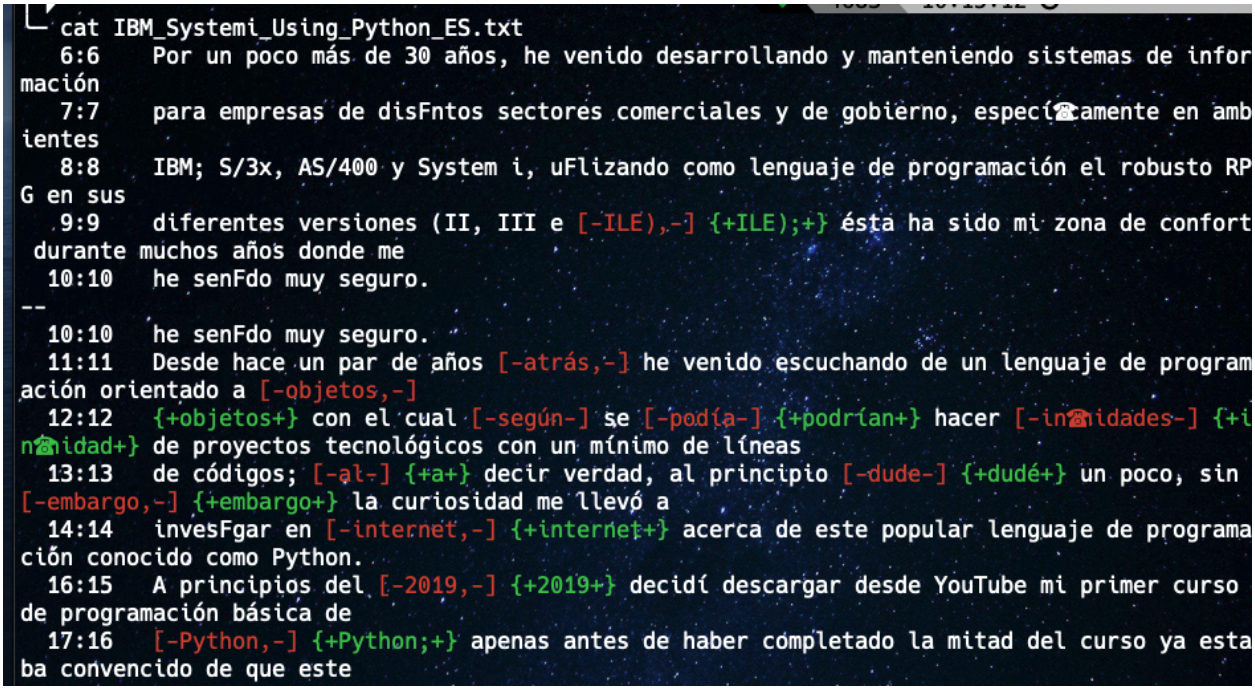
- dwdiff
- GNU wdiff
- pdftotext
- colordiff
- GNU Grep

Red text is from the `old` PDF and green text is from the `new` PDF. Currently `dwdiff` provides a slightly better output than `wdiff`.

Commands used to create the `colordiff`:

```
cd test_files\pdf
dwdiff <(pdftotext old/filename.pdf -) <(pdftotext new/filename.pdf -) | colordiff |␣
↪grep -C 3 '\[-' > dwdiff-colordiff-output.txt
```

```
cd test_files\pdf
wdiff <(pdftotext old/filename.pdf -) <(pdftotext new/filename.pdf -) | colordiff | grep␣
↪-C 3 '\[-' > colordiff-output.txt
```


cat IBM_Systemi_Using_Python_ES.txt
6:6 Por un poco más de 30 años, he venido desarrollando y manteniendo sistemas de infor
mación
7:7 para empresas de disFntos sectores comerciales y de gobierno, especí☎amente en amb
ientes
8:8 IBM; S/3x, AS/400 y System i, uFlizando como lenguaje de programación el robusto RP
G en sus
9:9 diferentes versiones (II, III e [-ILE),-] {+ILE);+} ésta ha sido mi zona de confort
durante muchos años donde me
10:10 he senFdo muy seguro.
--
10:10 he senFdo muy seguro.
11:11 Desde hace un par de años [-atrás,-] he venido escuchando de un lenguaje de program
ación orientado a [-objetos,-]
12:12 {+objetos+} con el cual [-según-] se [-podía-] {+podrían+} hacer [-in☎idades-] {+i
n☎idad+} de proyectos tecnológicos con un mínimo de líneas
13:13 de códigos; [-al-] {+a+} decir verdad, al principio [-dude-] {+dudé+} un poco, sin
[-embargo,-] {+embargo+} la curiosidad me llevó a
14:14 invesFgar en [-internet,-] {+internet+} acerca de este popular lenguaje de programa
ción conocido como Python.
16:15 A principios del [-2019,-] {+2019+} decidí descargar desde YouTube mi primer curso
de programación básica de
17:16 [-Python,-] {+Python;+} apenas antes de haber completado la mitad del curso ya esta
ba convencido de que este

DITA TO PDF WITH ECLIPSE

210.1 Overview

This program runs inside Eclipse, an integrated development environment (IDE) and is mainly a Java based project in that all the code libraries use Java (Apache FOP, Saxon, DITA Open Toolkit, Apache ANT) and it also uses XSL and XML heavily. Development was originally done in oXygen XML Editor then ported to Eclipse. Java is now ranked first on the TIOBE Index.

This project takes DITA XML as input and transforms it to PDF with the DITA Open Toolkit and a custom-made plugin using Apache Ant. Using PDF allows us to print a nicely formatted documents on paper. Using Eclipse generating the PDF output can be done in one click by building the project and this creates a publishing pipeline making all the different PDF's one after the other.

Darwin Information Typing Architecture (DITA) is an XML data model for authoring and using DITA-OT you can publish those ideas. The DITA standard is maintained by the OASIS DITA Technical Committee. Some of the largest and most successful companies in the world use DITA. The next link is an informal list of companies using DITA.

The Roadmap for this project is to make this into an easy to follow tutorial on how to build and customize DITA-OT PDF plugins and publish your DITA content using Eclipse. I am currently using DITA-OT 2.2.2 and I am aiming at keeping the 'info.debrief' plugin compatible with the current version of DITA-OT.

210.2 How DITA-OT PDF Plugins work

Plugins are placed in the DITA-OT plugins directory. You can see the plugin I built in this directory named 'info.debrief' and the auto built vanilla plugin named 'sample'.

When ready a plugin must be integrated into DITA-OT using Apache Ant. I built this project using OS X and I installed Ant through Homebrew.

To integrate a new plugin on the command line from inside the root DITA-OT folder it would be -> ant -f integrator.xml

You can also run the integrator inside Eclipse as an Ant build by right clicking on '/libs/dita-ot-2.2.2/integrator.xml' and selecting -> Run As -> Ant Build and this should integrate the plugin with the toolkit.

Every plugin has a 'transtype' -> the two transtype's are 'debrief' and 'sample'

PDF Plugins are comprised of some XML config files, some artwork and some custom XSL (XSLT/XSL-FO/XPath) code DITA-OT provides that base XSL code that you 'override' with your custom work.

The two main files that configure plugins are plugin.xml and integrator.xml which should be in the root of the plugin folder. The 'cfg' folder contains the rest of the customization.

Custom XSL can be placed in two XSL files both named custom.xsl. I placed all the custom code at 'libs/dita-ot-2.2.2/plugins/info.debrief/cfg/fo/xsl/custom.xsl' for this project. The other file is seen in the adjacent 'attrs' directory.

Placing the custom code only in these two files follows best practice techniques on how to build a DITA-OT PDF plugin.

210.3 List of resources and technologies used on this GitHub project

Eclipse - https://eclipse.org/

The Apache Software Foundation - http://www.apache.org/

Apache FOP - https://xmlgraphics.apache.org/fop/

Apache ANT - http://ant.apache.org

Saxon XSLT - https://en.wikipedia.org/wiki/Saxon_XSLT

Saxon - http://saxon.sourceforge.net/

Saxonica - http://www.saxonica.com/welcome/welcome.xml

Online community for the Darwin Information Typing Architecture OASIS Standard - http://dita.xml.org/

DITA - https://en.wikipedia.org/wiki/Darwin_Information_Typing_Architecture

DITA-Open Toolkit - http://www.dita-ot.org/

W3C - The Extensible Stylesheet Language Family (XSL) - http://www.w3.org/Style/XSL/

W3C XSLT 2.0 - http://www.w3.org/TR/xslt20/

XSL Formatting Objects - https://en.wikipedia.org/wiki/XSL_Formatting_Objects

XSL-FO Processors - http://www.w3.org/community/ppl/wiki/XSL-FO_Processors

XML - https://en.wikipedia.org/wiki/XML

Adobe PDF - https://en.wikipedia.org/wiki/Portable_Document_Format

The Organization for the Advancement of Structured Information Standards (OASIS) - https://en.wikipedia.org/wiki/OASIS_(organization)

oXygen XML Editor - http://www.oxygenxml.com

DITA-OT installing plugins - https://dita-ot.sourceforge.net/

Generate sample DITA-OT plugin - https://dita-generator.elovirta.com/

Creating DITA-OT plugins - https://sourceforge.net/projects/dita-ot/

Customizing PDF output - http://www.dita-ot.org/1.8/readme/dita2pdf-customization.html

Homebrew — The missing package manager for OS X - http://brew.sh/

Apache Ant Wikipedia - https://en.wikipedia.org/wiki/Apache_Ant

Install Ant with Homebrew - https://formulae.brew.sh/formula/ant#default

Installing Apache Ant - http://ant.apache.org/manual/install.html

Codecademy - Learn the Command Line - https://www.codecademy.com/courses/learn-the-command-line

Codecademy - Learn Java - https://www.codecademy.com/learn/learn-java

Got 15 minutes and want to learn Git? https://try.github.io/levels/1/challenges/1

Ruby regular expression editor - http://rubular.com/

Essential programmer training - http://www.codewars.com/

Mastering Markdown - https://guides.github.com/features/mastering-markdown/

GitHub Desktop - https://desktop.github.com/

TechSmith Camtasia - https://www.techsmith.com/camtasia.html

MD5 - https://en.wikipedia.org/wiki/MD5

sha1sum - https://en.wikipedia.org/wiki/Sha1sum

IDE - Integrated Development Environment - https://en.wikipedia.org/wiki/Integrated_development_environment

Git (software) - https://en.wikipedia.org/wiki/Git_(software) man page - https://en.wikipedia.org/wiki/Man_page

Terminal (OS X) - https://en.wikipedia.org/wiki/Terminal_(OS_X)

CHAPTER

ONE

ECLIPSE CHEAT SHEETS TO DITA TO PDF

The original project created a set of DITA XML files and one highly customized PDF and there are a couple of example PDFs that can be seen in the root of this repository. Recently I added support for other output formats that are not customized including HTMLHelp, TocJS and XHTML.

This program runs inside Eclipse, an integrated development environment (IDE) and is mainly a Java based project in that all the code libraries use Java (Apache FOP, Saxon, DITA Open Toolkit, Apache ANT, Eclipse) and it also uses XSL and XML heavily. Using Eclipse allows us to create a publishing pipeline creating all the working output formats one after the other, in one click by building the project. Development was originally done in oXygen XML Editor then ported to Eclipse.

Since Java is now ranked number two on the TIOBE Index, this project aims to be an easy to follow tutorial on all the technologies listed.

The roadmap for this project is to keep the "info.debrief" custom DITA-OT plugin up to date with the latest current version of DITA-OT, in depth instructions on how to get up and running inside Eclipse and lots more.

When built and run this project takes a set of Eclipse cheat sheets and transforms them to PDF. Eclipse cheat sheets are obviously best viewed inside Eclipse. Using PDF allows us to print nicely formatted cheat sheets on paper which allows the user to work through the cheat sheets with a pen and check off each item as they go. Using cheat sheets physically on paper was seen as a new way to learn and was the original concept of the Debrief cheat sheets publishing project I worked on.

Darwin Information Typing Architecture (DITA) is an XML data model for authoring and using DITA-OT you can publish those ideas. The DITA standard is maintained by the OASIS DITA Technical Committee. Some of the largest and most successful companies in the world use DITA. The next link is an informal list of companies using DITA.

The running Ant Build is a two-step process, first the DITA XML is created from the Eclipse cheat sheets (XML files) and then you use the DITA-Open Toolkit to create the PDF from the auto created DITA files.

The two parts of the transformation and rendering consist of:

1.
   - This is the transformation step, and it uses cheatsheet-to-dita.xsl which requires an XSLT 2.0 compliant processor.
   - I used the open source product Saxon from Saxonica which came included with the DITA-OT 2.2.1 library.
   - This file takes as input a collection on XML files (Eclipse cheat sheets) and creates multiple output files - a parent DITA Map and some associated tasks.
   - The "output/debrief" and sub "dita" folder contains the dynamically created (transformed) DITA files from this step.
2.
   - This is the rendering (printing) step, and the 'info.debrief' custom DITA-OT plugin produces the PDF via the DITA-OT base libraries, and a XSL - Formatting Objects Processor (FO Processor)
   - The "output/debrief/pdf" folder contains the resulting PDF output from this step
   - I used Apache FOP 2.1 for the FO Processor

211.1 How DITA-OT PDF Plugins work

Plugins are placed in the DITA-OT plugins directory. You can see the plugin I built in this directory named "info.debrief".

When ready a plugin must be integrated into DITA-OT using **Apache Ant**. I built this project using OS X, and I installed Ant through **Homebrew**.

On the command line from inside the root DITA-OT folder it would be -> ant -f integrator.xml

You can also run the integrator inside Eclipse as an Ant build by right clicking on "src/libs/DITA-OT1.8.5/integrator.xml" and selecting -> Run As -> Ant Build (first one) and this should integrate the plugin with the toolkit.

Every DITA-OT PDF plugin has a file name plugin.xml at its root where you set the configuration values. The plugin id must match the folder name of the plugin. Every plugin has a "transtype" -> this plugins transtype is "debrief". You can see the plugin.xml file and where to set the plugin id and transtype in the next image:

PDF Plugins are comprised of some XML config files, some artwork and some custom XSL (XSLT/XSL-FO/XPath) code DITA-OT provides that base XSL code that you 'override' with your custom work.

The two main files that configure plugins are plugin.xml and integrator.xml which should be in the root of the plugin folder. The "cfg" folder contains the rest of the customization.

Custom XSL can be placed in two XSL files both named "custom.xsl". I placed all the custom code at "src/libs/DITA-OT1.8.5/plugins/info.debrief/cfg/fo/xsl/custom.xsl" for this project. The other file is seen in the adjacent "attrs" directory.

Placing the custom code only in these two files follows best practice techniques on how to build a DITA-OT PDF plugin.

CHAPTER

TWO

FIREBASE BEST PRACTICES

Firebase is the name of a mobile platform from Google that makes it easy to build a back-end that is both scalable and efficient. In other words, it is a platform that allows the rapid development of mobile and web applications.

Firebase itself, however, is more than just a database. It's a complete product with API interfaces, an integrated auth platform, and associated cloud functions to leverage micro-service, back-end construction for things that need to be hidden on a server, such as payment processing.

212.1 What is Firebase Cloud Firestore?

The Firebase Cloud Firestore is a NoSQL database provided by Google Firebase. It provides real-time syncing between the cloud database and the client app, it stores data in hierarchical data structures which are documents organized into collections.

212.2 Firestore Best Practices

212.2.1 Add Rules

When you create your Firebase Firestore Database it's by default open to the internet on test mode, make sure to add the required Firestore Rules to secure your data and your app.

212.2.2 Denormalize Data

When you need deep nesting functionality, consider adding a couple of different collections, even when you need to add some data duplication and use more than one request to retrieve what you need.

212.2.3 Document IDs

Avoid the document IDs like " . ", "…", and "/", also do not use monotonically increasing document IDs such as: "Customer1, Customer2, Customer3, …". Do use auto-generated IDs.

212.2.4 Field Names

Avoid the following characters in field names because they require extra escaping: "", "[,]", "*", "`"

212.3 What is Firebase Authentication?

With Firebase Authentication, building secure authentication systems is a snap. This tool also gives your end users a better onboarding and signing-in experience.

212.4 Authentication best practices

212.4.1 Combine Firestore with Auth

As your app will grow and you will have to handle an important number of users it is required to add a new collection to Firestore "Users" to save your user's data.

212.4.2 Verify Your Users

To make sure your app is secured, and not vulnerable, you must implement email verification to users signed up with email/password.

212.4.3 Keep Users Data Safe

When we use Firestore to store our app users' data make sure to never save your user's passwords! Also saving their e-mails is a bad practice.

212.5 What is Firebase Storage?

Firebase Storage allows you to share or store content produced by your users such as images, videos, or even audio files. It is a powerful object storage solution that stands out for its simplicity and cost-efficiency. Storage Best Practices

212.5.1 Add Your Rules

Just like securing Firestore Database with rules, we can secure Storage with rules, they are here for a reason, so do add them!

212.5.2 Limit Bandwidth Usage

If your users have the access to share and deploy pictures or videos in your app, make sure to compress and resize the files before or after they get uploaded, or you risk paying dearly.

CHAPTER

THREE

GNU ASPELL

We use GNU Aspell to check the spelling of our Markdown files. We test on CircleCI using a shell script and a custom dictionary.

- http://aspell.net/
- https://en.wikipedia.org/wiki/GNU_Aspell
- https://github.com/GNUAspell/aspell

CHAPTER

FOUR

GOLANG

214.1 Links

- Golang - Go is a statically typed, compiled programming language designed at Google
- Getting Started on Heroku with Go
- govendor - Go vendor tool that works with the standard vendor file.
- Gin - Gin is a HTTP web framework written in Go (Golang). It features a Martini-like API with much better performance – up to 40 times faster. If you need smashing performance, get yourself some Gin.
- GoLand - A Clever IDE to Go
- Colly - Fast and Elegant Scraping Framework for Gophers
- que-go - An interoperable Golang port of the Ruby Que queuing library for PostgreSQL
- pgx - PostgreSQL driver and toolkit for Go
- ratago - Go implementation of an XSLT 1.0 processor
- pflag - Drop-in replacement for Go's flag package, implementing POSIX/GNU-style –flags.
- etree - parse and generate XML easily in go
- gofpdf - A PDF document generator with high level support for text, drawing and images
- xmlquery - xmlquery, is an XPath query package for XML in Go.

CHAPTER

FIVE

LINKS

215.1 Guides

- CSS 3
- HTML5
- JavaScript
- jQuery
- JSON
- Open Graph protocol
- XML
- XML Schema
- YAML
- Git
- GitHub Desktop
- Syncing a fork
- RexEgg - The world's most tyrannosaurical regex tutorial

215.2 GitHub Cheat Sheets

- Awesome
- Tower

215.3 Git GUI clients

- GitHub Desktop
- Sourcetree
- GitKraken
- Tower

215.4 Database

- Postgres
- Heroku Dev Center

215.5 Advanced Links

- GitHub Pages
- Linode
- DigitalOcean
- Google Cloud
- Oracle VirtualBox
- Vagrant
- Docker

215.6 Free short courses

- Welcome to Codecademy! - We recommend starting with this course
- Learn HTML
- Learn CSS
- Make a Website
- Introduction to Git for Data Science
- Learn Git
- Learn the Command Line
- Deploy a Website
- Introduction to Shell for Data Science
- Intro to SQL for Data Science
- Learn SQL
- SQL: Table Transformation
- SQL: Analyzing Business Metrics
- Introduction To JavaScript
- Introduction to jQuery
- Spreadsheet Basics
- Data Analysis with Spreadsheets
- Learn ReactJS: Part I
- Learn ReactJS: Part II
- Learn Sass

215.7 Good Tunes

- ABGT
- International Departures

CHAPTER

SIX

OPEN SOURCE XML

216.1 Editors

IntelliJ community - some support for mainly XSLT and XPath

PyCharm community - some support for mainly XSLT and XPath

216.2 Tools

xsltproc - command line xslt processor

xmllint - command line XML tool

saxon-xslt - Wrap Saxon 9.X HE XSLT 2.0 processor for use in JRuby

Saxon - Saxon processor for XSLT, XQuery, and XML Schema, including the only XSLT 3.0 conformant toolset.

Apache FOP - Formatting Objects Processor is a Java application that converts XSL Formatting Objects files to PDF or other printable formats.

Apache Xalan - Apache Xalan Project develops and maintains libraries and programs that transform XML documents using XSLT standard stylesheets.

eXist - eXist-db is an open source software project for NoSQL databases built on XML technology. It is classified as both a NoSQL document-oriented database system and a native XML database.

BaseX - BaseX is a robust, high-performance XML database engine and a highly compliant XQuery 3.1 processor with full support of the W3C Update and Full Text extensions. It serves as excellent framework for building complex data-intensive web applications.

ratago - Go implementation of an XSLT 1.0 processor

lxml - the most feature-rich and easy-to-use library for processing XML and HTML in the Python language.

Both *xsltproc* and *xmllint* come in handy if you like the command line.

216.2.1 Links

https://www.jetbrains.com/idea/

https://www.jetbrains.com/pycharm/

http://xmlsoft.org/XSLT/xsltproc.html

http://xmlsoft.org/xmllint.html

https://github.com/fidothe/saxon-xslt

https://www.saxonica.com/welcome/welcome.xml

https://xmlgraphics.apache.org/fop/

https://xalan.apache.org/

http://exist-db.org/

http://basex.org/

CHAPTER

SEVEN

RST2MD

217.1 Pandoc

Pandoc is a swiss army knife, if you need to convert files from one markup format into another.

It supports conversion to and from following formats:

- Markdown
- reStructuredText
- HTML
- Ebooks
- TeX
- XML
- CSV
- Ms-Office docx
- ipynb
- PDF
- Wiki

217.2 Converting a file

```
pandoc inputfile -s -o outputfile
```

Pandoc makes converting a `.rst` file to `.md` file easier. Use following command to convert reStructuredText into Markdown format.

```
pandoc file.rst -s -o file.md
```

CHAPTER

EIGHT

TOP 4 VS CODE EXTENSIONS EVERY DEVELOPER SHOULD USE

218.1 What is VS Code?

Visual Studio Code is a text editor which is open source i.e., free to use, and it is made by Microsoft. VS Code's simplicity and easy to use features makes itself favourite choice for the developers. It has a feature through which you can install the extensions according to your needs. Therefore, these extensions are also open source and are made by the developers for the community. Here are some of the extensions which are going to increase your productivity as a developer:

218.2 1. Live Server

This is an extension which makes a local server enabling the user to see all the characteristics of the app. It works perfectly for both dynamic and static web pages. We can open the live server by right-clicking on the mouse while VS Code is running behind and then selecting the Open with Live Server option.

218.3 2. Prettier

Prettier is a code formatting extension therefore it helps you to clean and format the code automatically. It does the work every time whenever someone saves the work in VS code and therefore reduces the time of formatting. It is very useful whenever a team is working on some project as it leads to better and clear understanding of the code.

218.4 3. JavaScript Code Snippets

As the name suggests this extension gives you many JavaScript code snippets thus reducing time to set up the code. It provides different types of ES6 Snippets including arrays, DOM manipulation, etc.

218.5 4. Bracket Pair Colorizer

This is one of the personal favourite extensions of mine. It includes simple functioning i.e, it matches starting and ending brackets in VS Code which eventually helps you to resolve the errors faster.

I think these much are extensions are enough for you to explore after this blog. I hope I am helping the community through this blog.

218.6 About the Author

Pulkit Govrani is an aspiring Web Developer who loves to share his knowledge through various blogs and tutorials. He has solved lots of programming problems which has given him enormous amount of learning.

CHAPTER

NINE

WHAT PROGRAMMING LANGUAGE TO CHOOSE AS A BEGINNER?

According to myself Pulkit Govrani, you should choose Python over any other language if you are just starting to learn programming. Let me tell you the reasons that why should you choose it.

Python was developed around 1980s as a language which can be more readable, intuitive and easily. It has a pretty easy syntax (syntax means the way how a programming language is written). Python does a lot of complex functions inside it to make things easier for the user. It can be used in Machine Learning, Data Science and Web development as well. So it can be termed as an allrounder programming language. Let's look at the below example for understanding why Python is easier to learn.

This is how we can print "Hello World" in C++ :

```cpp
#include<iostream>
using namespace std;

int main(){
    cout<<"Hello World";
    return 0;
}
```

This is how we can print "Hello World" in Java:

```java
import java.util.*;
public class Linkedlist {

    public static void main(String[] args) {

        System.out.println("Hello World");


    }
}
```

This is how we can print "Hello World" in Python:

```python
print("Hello World")
```

So I am pretty sure you must have made your mind till now that learning Python is both easy and beneficial for you.

219.1 About the Author

Pulkit Govrani is an aspiring Web Developer who loves to share his knowledge through various blogs and tutorials. He has solved lots of programming problems which has given him an enormous amount of learning. Now he is sharing it through various medium.

COREL DRAW

CorelDraw is a Windows environment application for graphic design which uses vectors to represent shapes instead of bitmaps. It was created in 1989 and has been evolving through 21 versions to this day. The current version is CorelDraw 2019, and it includes a bitmap editing application, Corel Photopaint, a very complete program to work with photos or any other bitmap image, as well as some other apps. Corel 2019 was released, for the very first time, for Apple macOS as well as for Windows.

Vectors: digital images can be stored as grids of colored points (pixels) known as bitmaps, so even the best quality picture, when you expand it or take a very close look, will show these colored pixels and smooth lines will become saw lines that look like stairs. Vectors do not use bitmaps, but mathematical functions to represent shapes. A function can work with very small numbers or very big numbers all the same and will always be precise, so you can look at a vector image from a distance or very close, and it will always look perfect, no pixels, smooth lines all the time, and has the advantage of requiring far less memory to be stored than bitmaps.

Another good point for vectors is that images can be translated into bitmaps with as much quality as needed, while the inverse conversion is far less efficient and will produce worse results. CorelDraw has become a very professional tool for the graphic designer, including a huge variety of working alternatives like basic shape drawing (lines, squares, circles and ovals, polygons, stars, spirals, grids, curves), shape editing (weld, trim, intersect shapes), text tool, text into curves conversion, node editing, interactive fills (flat color fill, gradient fill, pattern fill, bitmap fill), translucent shadows and glows, translucent shapes, and basic bitmap editing.

CorelDraw has the capability to manage bitmaps together with text and vectors to produce complex compositions like magazine pages, so it's a great alternative for publishing composition, multi-page files, bitmap tracing, effects like perspective or shape distorting, and dozens of other tools.

The user interface of CorelDraw is very intuitive and friendly, and digitizing tablets can be used with the program, allowing the designers to produce artistic and lively images. To help users, there is a wide support net which includes blogs, videos, tutorials and chat communities. These are some links:

220.1 Links

CorelDRAW

CorelDRAW Community

Corel Blogs

CorelDRAW YouTube

CorelDRAW 2018 - Full Tutorial for Beginners

220.2 About the Author

Jorge Araica is a Graphic Designer with technical background, an old school pro with some knowledge in the engineering and programming fields and also a promotor of critical and rational thinking as a way to spread a scientific attitude towards knowledge. Freedom is his other passion, and he will stand for it at every opportunity he gets.

CHAPTER

ONE

SERIF SOFTWARE

221.1 Image editing

221.1.1 Overview

I'm perhaps the Fuchsia Team member with the shortest relevant work history. I'm a newcomer to the world of graphic design, having spent most of my life working in the aerospace electronics and gaming industries, which both demand precise adherence to rules and proper work procedures. So when I decided I wanted to be a graphic designer, I did some research and I chose Serif Software for my design work. Serif Software is published in England and provides comprehensive and extremely capable suites of apps that include design, photo and publishing programs at prices, and with upgrade policies, far better than Adobe software.

I originally used Serif DrawPlus, PhotoPlus, PagePlus and Web Plus (yes, specifically for website design) on my Windows PC and then Serif introduced the award winning Affinity line of design apps: Affinity Designer, Affinity Photo and Affinity Publisher. Affinity was originally introduced for use on Macs and iPads and then Serif expanded Affinity to include apps for Windows (all file format outputs are interchangeable).

I find that there are some features of the older Plus line (the LEGACY apps) that I prefer and many features of the Affinity line that I prefer. In the course of my design work, I'm even able to use a mixture of the older legacy Plus apps and the newer Affinity apps. In addition, the Affinity apps can all seamlessly switch from one to the other, so that the different functions are ALL available when working on any design without any interruption in work flow.

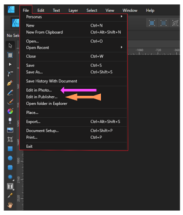
These excellent apps let me choose the projects I apply for, with a degree of confidence that is very reassuring. Since I'm not an expert, I seek to expand my capabilities in a controlled and thoughtful way, so I can learn and yet not get "in over my head". The point is, I want to learn, but never fail to give my clients all they deserve and ask for. And from the reviews I have read, the learning curve with Serif Software is not as steep as with Adobe. That's a plus for this old guy!

221.1.2 About Affinity apps from Serif Software

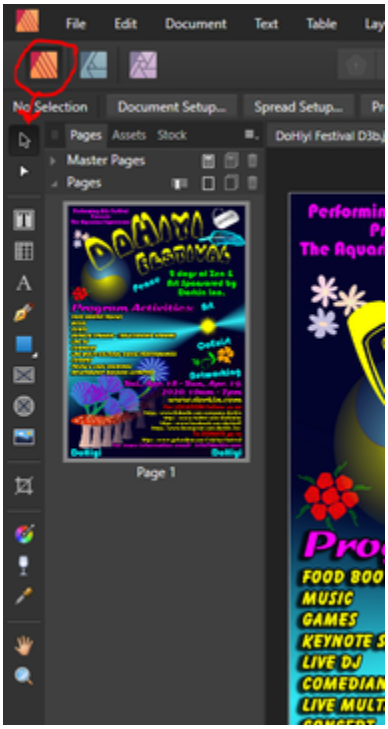
I will be sending myself to school (tutorials) for the apparently massive capabilities of the Affinity apps. I have known for some time that these apps were more capable than the very good line of legacy apps from Serif, but in researching Affinity for this short article, I discovered that I have an incredible amount to learn. I'm the kind of person who likes to learn by doing.

When it comes to software I just play with it, poke around and see what I can do, but with Affinity, that isn't enough for me. Since I have never taken classes in graphic design, and I have only read a little on basic design principles, with the older legacy, Plus line of apps, I needed just a few [tutorials. But Affinity is amazing. The point I would like to make is that Affinity is tremendously capable and worth investigating and it's NOT a subscription service. At the end of this article I will include some links to several wepages relevant to both Affinity apps and the Serif legacy apps.

The thing I like most about Affinity is that all of the apps, Publisher, Designer and Photo are seamlessly connected, so that when working on any document, one can switch between designing, photo editing and publishing with just a couple mouse clicks and without saving and exporting. There is a screenshot attached that shows this:

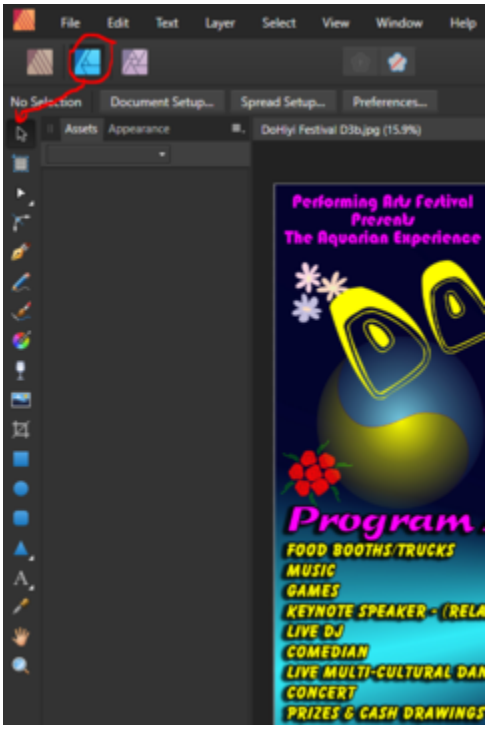


Affinity Publisher is the most connected and comprehensive app when it comes to its range of capabilities. All of the apps use “Personas” that each bring up different toolbars and functions within that app. Select the Persona and then you will see all the functions for that Persona in a toolbar on the left. See the screenshots that illustrate the Personas that are available within Affinity Publisher. You can work in the Publisher Persona or the Photo Persona or the Designer Persona and have most of the essential functions of all the apps available within just the Publisher app.



For more detailed and thoroughly comprehensive capabilities, the individual apps are easy to switch to seamlessly.

The Designer app has the Designer Persona for vector drawing, the Pixel Persona for bitmap work, and the Export Persona for, you guessed it, exporting designs. It’s really easy and quick to switch between the Personas and your design file is automatically and non-destructively updated as you go.



The Photo app has a Photo Persona, a Liquefy Persona for mesh warping images and text, a Develop Persona for detailed photo adjustments, a Tone Mapping Persona for more detailed adjustments (I need to learn much more about this), and again, an Export Persona with multiple choices for your exports. OK, check out the screenshots and then check out Affinity.



- Affinity tutorials
- AffinitybySerif Twitter

- Affinitybyserif Facebook
- Affinity home page
- Affinity Forums, all apps
- All Affinity product tutorials
- Legacy products forum and tutorials
- Serif legacy products support
- Reviews and comparisons on Capterra, of Affinity products to other design software

221.2 About the Author

Harley Armentrout is a happy husband and father, former silversmith, aerospace electronics prototype assembler, test, calibration & repair technician, also writing test procedures at BallAerospace. Then 21 years in the gaming industry, in a range of positions, culminated as a Gaming Inspector, observing and reporting on rules violations, safety issues and criminal activities for the Yavapai Prescott Indian Tribe. After "retiring" Harley taught himself a few graphic design skills and he works as a freelance designer.

CHAPTER

TWO

ECLIPSE CHEAT SHEETS (XML) TO DITA WITH PYTHON

222.1 Overview

The motivation for this project comes from my mate Phil, who loves his Python…he even was talking up Java over Ruby - a programmer's best friend - and I forgot to mention to Phil something that is even better than Java and Ruby combined is JRuby.

This projects originates from a Java based Project, where I built an Apache Ant based publishing pipeline inside Eclipse.

This project will hopefully transform Eclipse cheat sheets to DITA with Python.

CHAPTER

THREE

PYTHON IS A USEFUL AND VERSATILE PROGRAMMING LANGUAGE

Although it is true that depending on the source there are between 700 and 9000 programming languages, currently the most used are only 50 of them, among which is Python. This programming language is used to develop all kinds of applications and since it is an interpreted language, it is not required to compile it to execute the instructions that are written in Python, but through a program called an interpreter, the instructions are executed directly by the Python script. computer, that is, it is not necessary to convert it to machine language.

On the other hand, Python is very similar to human language and therefore very easy to read and write. Another of its great advantages is that it is a multiplatform language, so that it can be used in any of the different operating systems and it is open source, which means that it is completely free. Thanks to its wide possibilities and its simplicity, Python has been gaining more and more followers in recent years.

This programming language has a general purpose, so that its instructions, procedures and data structures are designed to solve any type of problem. This is why big technology companies such as Facebook, Google and Instagram build parts of their technology packages with Python. However, this programming language is also used to build any type of projects that are in between points and basic programs.

With Python, endless fields get along well, not only because of its simplicity, but also because of its great power when it comes to processing data. That is why every day more companies request Python experts and this language has resurfaced in the workplace. Let's name some of its main applications:

223.1 Big data and data analysis:

Python has a large number of data processing libraries and that is why it can both analyze and manage a large volume of data in real time, so it can transform a large amount of data into useful information, being especially advantageous in these two areas.

223.2 Data mining:

Analyzing large databases to predict future trends is what data mining does, where Python can be very beneficial when it comes to organization, data cleaning and the use of machine learning algorithms, greatly simplifying this type of analysis.

223.3 Data science:

Previously scientists used Matlab when working with a large number of data, but after the creation of numerical engines such as "NumPy" or "Pandas", they make Python the programming language par excellence for this type of tasks.

223.4 Artificial intelligence:

Much of the advancement of artificial intelligence is due precisely to this programming language, since Python has the ability to carry out complex ideas in very few lines, together with the large number of existing frameworks.

223.5 Blockchain:

The Blockchain database known worldwide for being the one that supports cryptocurrencies works quite well with Python, since this language is characterized by its versatility, speed and security, being very useful when forming block chains, in addition to allows developers to generate a simple blockchain in just a few lines of code, thus making a very complex process simple.

223.6 Machine learning:

Machine learning, as well as robotics and artificial intelligence, are capable of learning by themselves as they process data. This is how they acquire increasingly important information when making the right decisions and Python is very effective in this area, so that it has become essential in data processing.

223.7 Web development:

This programming language allows you to develop very complex websites but with fewer lines of code, as well as being optimized and lighter. For example, Django is part of the Python frameworks and has now become one of the most popular, as it can be very useful when creating secure and dynamic websites. On the other hand, Python is widely used to obtain information from all kinds of websites, just like Instagram, Pinterest or Netflix do.

223.8 3D graphics and games:

Another of the strengths of this programming language is its enormous capacity when it comes to handling 3D graphics, since they have a large number of existing tools and frameworks, with Blender, PyGame or Arcade being some of the More popular. For example, Battlefield 2, which is one of the best-known war action games, both the animations, the graphics engine and its different functionalities, were made using Python.

223.9 Python includes an interactive mode

The Python interpreter has an interactive mode where instructions can be typed. There you will be able to enter the instructions one by one and be able to see the result of your evaluation immediately, so that you can test parts of the code interactively, before adding it as part of the program. This of course is very useful when it comes to finding possible errors, without having to wait for the entire program to run to see if that small portion works or not.

Another of its advantages is that the programs can be designed in a modular way and only one of the modules can be reused in other projects, being very easy to export or import. Also, being an open source language, anyone can create extensions or make modifications to this language, have libraries, frameworks and other tools that allow the language to adapt to needs over time. If there is a community of users who are committed to the language, open source will always live up to its full potential.

The Python Software Foundation has a forum on its website, capable of linking to various community groups and there you can find endless peers to receive tutorials, advice or inspiration.

223.10 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

FOUR

GETTING STARED WITH PYTHON ON IBM SYSTEM I

224.1 October 2020

For a little more than 30 years, I have been developing and maintaining information systems for companies in different commercial and government sectors, specifically in IBM environments; S/3x, AS/400 and Systems i, using as a programming language the robust RPG in its different versions (II, III and ILE), this has been my comfort zone for many years where I have felt very safe.

For a couple of years now, I have been hearing about an object-oriented programming language, with which, according to what could be done infinities of technological projects with a minimum of lines of code; to tell the truth, at first I hesitated a bit, however, curiosity led me to research on the internet, about this popular programming language known as Python.

At the beginning of 2019, I decided to download my first Python basic programming course from YouTube, just before I had completed half of the course I was already convinced that this programming language had conquered my heart.

For years I had tried to learn other programming languages, with the idea of leaving my comfort zone and entering other technological platforms; however, I found many of them boring or tedious in their coding style, not to mention the number of lines of code that must be used to execute a business rule or function.

Without a doubt, the Python programming language is not going to replace my favorite programming language, which is IBM's RPGILE, however, I am already using it as my alternative programming language.

Python not only synthesizes in one or a few lines of program code, which in other programming languages would take many lines, but it is a multiplatform language, its syntax is very fun and simple because it is closer to the natural language of the human beings and as an added value, it is much more understandable for learners due to its simplicity, versatility and popularity.

Going back a bit, Guido van Rossum devised the Python language in the late 1980s and began implementing it in December 1989. In February 1991 he published the first public version, version 0.9.0. Version 1.0 was released in January 1994, version 2.0 was released in October 2000, and version 3.0 was released in December 2008.

Until July 2018, Python development was personally led by Guido van Rossum and under the umbrella of the Python Software Foundation. As of 2019, Python development is chaired by a five-member board of directors elected from among Python developers, which is renewed annually.

To download the latest version of Python, please visit its official download site: https://www.python.org/downloads/

Now, how do you enter the world of IBM System i (AS / 400) using the powerful Python programming language, resorting to best practices and not die trying?

There is very little documentation on the internet about this and what you find says almost nothing. Obviously, connecting to an IBM System i Server using Python as the programming language will depend on what you want to do.

The following is how to connect to an IBM System i server, using the ftp.connect and ftp.login methods using a Python script. In the following link you can see a simple example of how to use these methods:

https://github.com/ClayLanzino/IBM-System-i_AS400/blob/master/Python_Scripts/Ftp_IBM_System_i.py

Another way could be, writing a Script that runs on the client and connects to an IBM db2 database that resides on an IBM System i server, and execute certain SQL statements.

There are two ways to do this, it could be using an iSeries Access ODBC Driver connection and importing the pyodbc library (import pyodbc). Personally, I very seldom use the ODBC Driver to connect to IBM System i Databases, due to the vulnerability it represents and the nature of the connection, which I will not delve into at this time.

The other way would be to use the ibm_db.connect and ibm_db.pconnect functions respectively. For information on how to connect to an IBM DB2 database using a Python Script please visit the following link:

https://www.ibm.com/support/knowledgecenter/es/SSEPGG_10.5.0/com.ibm.swg.im.dbclient.python.doc/doc/t0054368.html

Finally, the other way to connect could be, writing the Python code or Script within the IBM System i server itself; considering that IBM incorporated the Python programming language into its range of programming languages starting with version 7R1 or higher of the iSeries Operating System.

The prerequisites for installing Python on an IBM System i are:

Python requires Portable Application Solutions Environment (PASE) to be installed on the IBM i computer, which is available through product numbers 5770SS1 option 33 and 5733SC1.

It is recommended by IBM that you get the latest Program Temporary Fixes (PTFs) for product number 5733SC1. For more information, go to the IBM i OpenSSH & OpenSSL Community web page and search for 5733-SC1 PTFs.

Verify that the latest cumulative PTFs are installed on the IBM i computer.

Install Python 3.6 on the IBM i computer by using the new RPM method provided by IBM because the open source product 5733OPS is no longer available for download. For more information about the RPM method, go to the IBM i Open Source web page.

Following are some of the installation commands:

All software provided by the RPMs are installed in the /QOpenSys/pkgs prefixed directory. To use the software, you can fully qualify the path to the program, or you can add /QOpenSys/pkgs/bin to your PATH by using the following command:

```
PATH=/QOpenSys/pkgs/bin:$PATH
```

```
export PATH
```

Install Python 3 and other useful Python packages.

```
yum install python3-pip python3-ibm_db python3-itoolkit
```

Install the Python 3 Machine Learning packages.

```
yum install python3-numpy python3-pandas python3-scikit-learn python3-scipy
```

Install Node.js.

```
yum install nodejs10
```

Install the GCC and development tools.

```
yum group install "Development tools"
```

Run the following command to test Python installation.

```
python3 --version
```

Install the dependent package pycryptodomex by using the following command:

```
python3 -m pip install pycryptodomex
```

It will then result in the Python software being installed on the IBM i computer along with dependent packages.

To get Python examples on IBM i, visit the following link: http://ibm.biz/pythonexamplesonibmi

224.2 About the Author

Clay Lanzino is a passionate former surfer, father of three children, husband and a 33-year-old IT professional who loves programming. In his spare time, he loves being in nature, hugging the trees, walking barefoot to take in the energy of the earth and doing meditations in the open air. If time permits, he does some Yoga, in his exclusive meditation room.

CHAPTER

FIVE

PYLINT

Just as you wouldn't go to a black tie dinner without using a lint roller on your tux or dress before walking into the venue, or, in the old days, going over your suit before that all-important interview, you want your Python code to be clean before you let it out into the world for professionals to see. you want to catch bugs before they bite. This is why you would use a linting tool. Pylint is one of the more popular linting tools. This post tells what it is, how to set it up, and how to get started using it.

225.1 The Difference Between What Happens When The Python Interpreter Catches Errors And What Happens When You Run A Linter

When you use the Python interpreter to run a Python program, it may not run your program because it catches errors that Python cannot understand. The kinds of errors that keep your Python file from running are called Syntax errors. Once you remove the syntax errors from your program, the Python interpreter runs it, and it begins to do its processing. If it has errors that prevent it from running correctly, these are called run-time errors.

Linting tools inspect your Python files for both kinds of errors plus coding conventions accepted by the Python community. Using a linting tool makes it easier for both the Python interpreter to run your programs and for anyone who works on projects with you to read your code, since they help you follow agreed upon standards.

225.2 How Pylint Helps Further

Pylint looks for "code smells," any characteristics in the source code of a program that possibly indicate deeper problems. In human interactions, you might look for proper grammar when someone is speaking to you, or you might be looking for deeper meaning indicated by the words they use and their voice inflections.

225.3 Pylint Environment

You can run Pylint from the command line or from an editor, such as PyCharm or Visual Studio Code. It works on Linux, Windows, and Mac. We will concentrate on using it from the command line, since using it from an editor uses its command line options. You can experiment with its configurations and easily see more directly how they affect how it runs.

225.4 Installing it

You would want to install Pylint into your default Python environment, since you would want to check all of your Python code with it. Assuming that you have Python installed, from the command line, type:

```
pip install pylint
```

To run Pylint, type:

```
pylint myprogram.py
```

Where `myprogram.py` is the Python file you want it to check.

225.5 Default options

By default, Pylint has all error checks and messages enabled. You can configure it to look for and report on five classes of errors:

- (C) convention, for programming standard violation
- (R) refactor, for bad code smell
- (W) warning, for python specific problems
- (E) error, for likely bugs in the code
- (F) fatal, for errors occurred that prevent pylint from doing further Processing.

225.6 Further Resources

- Pylint home page
- Pylint User Manual
- PEP8, the Python Style Guide
- Readable Messages
- Linting Python In Visual Studio Code
- PyCharm plug-in for Pylint
- Pylint technical reference
- Python support in Emacs
- Pylint plug-in for Vim
- Pylint support for Eclipse
- A Beginner's Guide in Python - Pylint Tutorial

225.7 About the Author

Jim Homme is a former professional musician, father of three, husband, and a 32-year veteran in Information Technology. He loves to read and play chess. He leads a team of accessibility testers at Bender Consulting Services. He is the owner of jimhomme.com, where he writes about Python and related technologies.

CHAPTER

SIX

SPHINX, THE CODE DOCUMENTATION TOOL, AN INTRODUCTION

- Date: "2020-10-31"

226.1 How to set up the Sphinx code documentation tool and get started with it

You've just finished your latest development masterpiece. Now you have to go back and document it or find someone who likes to write way more than you do to do that job. What are the chances that your documentation is going to happen, let alone happen well? Not good?

Have you tried to learn to use a code library or had to maintain someone else's code and cursed the lack of documentation, when good documentation would have saved you hours of trial and error writing and re-writing code to figure out how the software works? Worse yet, have you ever failed to document code properly, forgot you wrote that code, then cursed yourself for not writing good documentation?

I have the cure.

On your next development project, take much of the pain out of documentation. Use Sphinx.

226.2 What Is Sphinx

According to its home page, Sphinx is a tool that makes it easy to create intelligent and beautiful documentation. It eliminates the need for you to create and maintain separate documentation source files. No more getting documentation out of sync with your code. Sphinx can read your source code and automatically produce documentation. With a little self-education, you can learn to make the documentation even better. Read on to learn how to install it and start learning to write documentation with it.

226.3 Languages Sphinx Can Document

Languages Sphinx can document include:

- Python
- C
- C++

226.4 Output Formats

Sphinx originally documented code in HTML format, but it can also produce output in other formats including PDF and Windows Help.

226.5 Installing Sphinx

Sphinx is written in Python, which means that you already need to have Python installed on your system. specifically, Python 3.

The Sphinx Installation instructions explains how to obtain and install it on Mac and Linux.

226.5.1 Installing Sphinx On Windows

To install on Windows, I recommend that you follow this procedure:

226.5.2 Install Chocolaty

Installing Chocolaty will allow you to easily install and upgrade a lot more programs. You need to run either PowerShell or Cmd as an administrator to do that.

- See this page on how to run PowerShell as an administrator.
- See this page on how to install The Chocolaty Package Manager.

226.5.3 How To Install Python

If Python isn't on your Windows system, you can install it after you've installed Chocolaty. Get a PowerShell or command prompt as an administrator and type this command.

```
choco install python
```

226.5.4 Sphinx Installation

Now that you have Python installed, from the command line, type this command to install Sphinx.

```
pip install -U sphinx
```

This installs Sphinx on your computer for only your user ID.

After you've installed sphinx, you can use this command to verify that you have installed it correctly.

```
sphinx-build --version
```

If the version number appears on your screen, you've installed everything correctly. You can now start using Sphinx to document your code.

226.6 Using Sphinx To Write Documentation

I mentioned that Sphinx can read your code and produce documentation. To fully use its potential, though, you need to learn reStructuredText. See this full restructuredText reference.

226.6.1 Using Markdown For Documentation

If you prefer to use Markdown to document your code, Check out this page to find out how.

226.7 Things To Try

If learning restructuredText or Markdown stops you from experimenting with Sphinx, you could try the following to encourage you to go deeper into learning it:

- Read the Getting Started and try some of the sample code there on your code. Check out the resulting documentation
- Run it against a file on your system produced by the makers of Python, then look at the source and compare that to the documentation to see what tricks you can pick up to add to your own code documentation.
- Play with producing a static website on your local computer with it.

226.8 One More Piece Of Encouragement

Let me encourage you with a workflow suggestion. When you know some piece of code you're working on does what it's supposed to do, use your newly-acquired knowledge about Sphinx to take that final step of documenting it. Your teammates will thank you. The development world will thank you. You will thank yourself if you ever need to maintain your own code.

226.9 About the Author

Jim Homme is a former professional musician, father of three, husband, and a 32-year veteran in Information Technology. He loves to read and play chess. He leads a team of accessibility testers at Bender Consulting Services. He is the owner of jimhomme.com, where he writes about Python and related technologies.

CHAPTER

SEVEN

USING FLAKE8, AN INTRODUCTION - "A TOOL FOR CLEANING YOUR PYTHON CODE"

- Tags: ["Beginner"]
- Categories: ["Python"]
- Date: "2020-09-29"

227.1 Introduction

Flake8 is one of the more popular linting tools. This post tells what it is, how to set it up, and how to get started using it.

227.2 The Difference Between What Happens When The Python Interpreter Catches Errors And What Happens When You Run A Linter

When you use the Python interpreter to run a Python program, it may not run your program because it catches errors that Python cannot understand. The kinds of errors that keep your Python file from running are called Syntax errors. Once you remove the syntax errors from your program, the Python interpreter runs it, and it begins to do its processing. If it has errors that prevent it from running correctly, these are called run-time errors.

Linting tools inspect your Python files for both kinds of errors plus coding conventions accepted by the Python community. Using a linting tool makes it easier for both the Python interpreter to run your programs and for anyone who works on projects with you to read your code, since they help you follow agreed upon standards.

227.3 How Flake8 Helps Further

Flake8 looks for code that does not follow accepted Python practices according to PEP8.

227.4 Flake8 Environment

You can run Flake8 from the command line or from an editor, such as PyCharm or Visual Studio Code. It works on Linux, Windows, and Mac. You can also integrate it with your GitHub projects. We will concentrate on using it from the command line, since using it from an editor uses its command line options. You can experiment with its configurations and easily see more directly how they affect how it runs.

227.5 Installing Flake8

You would want to install Flake8 into your default Python environment, since you would want to check all of your Python code with it, but you can also install it for every version of Python you have on your system. Assuming that you have Python installed, to install into your default environment, from the command line, type:

```
pip install flake8
```

To install Flake8 for a particular version of Python, type:

```
python<version> -m pip install flake8
```

Where <version> is any version of Python on your system.

227.6 Running Flake8

To run Flake8, type:

```
Flake8
```

This starts Flake8.

You can run it against a version other than the default. For example:

```
python2.7 -m flake8
```

Where `python2.7` is one version of Python, and `-m` runs Flake8 as a standalone module.

You can also run Flake8 against individual Python files and entire directories. To do that, add the name of the Python file or folder to the command line.

Finally, you can run Flake8 using any of its command line options, and it has a very comprehensive configuration scheme that uses configuration files.

227.7 Getting Help

To get help with Flake8, type:

```
flake8 --help
```

227.8 Further Resources

- Flake8 documentation home page
- Flake8 User Manual
- Complete list of Flake8 options
- PEP8, the Python style guide
- Linting Python In Visual Studio Code
- PyCharm plug-in for Flake8
- Python support in Emacs
- Flake8 support in Vim

227.9 About the Author

Jim Homme is a former professional musician, father of three, husband, and a 32-year veteran in Information Technology. He loves to read and play chess. He leads a team of accessibility testers at Bender Consulting Services. He is the owner of jimhomme.com, where he writes about Python and related technologies.

CHAPTER

EIGHT

BUILT IN DATATYPES

Command line Ruby script that checks if XML schema files are using the correct built-in data types.

228.1 Built with

- Ruby
- Nokogiri
- OptionParser
- Paint
- XPath

```
$ ruby built_in_datatypes.rb -h
Usage: built_in_datatypes.rb

Specific options:
    -p, --path path                  Path to schema
        --delay N                    Delay N seconds before executing
    -t, --time [TIME]                Begin execution at given time

Common options:
    -h, --help                       Show this message
        --version                    Show version
```

CHAPTER

NINE

ECLIPSE CHEAT SHEETS (XML) TO DITA WITH RUBY, XSL, NOKOGIRI

229.1 From Java, XSLT 2.0 with Saxon to Ruby, XSLT 1.0 with the Nokogiri Ruby gem

Using Ruby on this project allows us to harness the power of RubyGems particularly the Nokogiri gem along with XSLT 1.0 / XPath 1.0 to create the DITA XML files. Using Ruby eliminates the need to use Eclipse and Apache Ant and can be run standalone from the command line as long as you have Ruby installed.

The Ruby file: `ruby-cheatsheets-to-dita.rb` builds the output parent Ditamap `map.ditamap` (output/map.ditamap), and the 4 sub DITA tasks in the `output/dita` folder.

229.2 DITA Background

Darwin Information Typing Architecture (DITA) is an XML data model for authoring and using the DITA Open Toolkit (DITA-OT) you can publish those ideas.

The DITA standard is maintained by the OASIS DITA Technical Committee.

229.3 The Project

The Ruby code in `ruby-cheatsheets-to-dita.rb` has some XSL code embedded, as well as some XML markup in a interpolated string literal syntax.

The Eclipse cheat sheets test data folder - `cheatsheets-xml-test-data` is best viewed inside Eclipse, and is used as input when `ruby-cheatsheets-to-dita.rb` runs.

```
$ ruby ruby-cheatsheets-to-dita.rb -h
Usage: ruby-cheatsheets-to-dita.rb [options]

Specific options:
    -p, --path path                  Enter the directory or path relative to this
                                     directory to the cheatsheets XML test data:
        --delay N                    Delay N seconds before executing
    -t, --time [TIME]                Begin execution at given time

Common options:
    -h, --help                       Show this message
        --version                    Show version
```

229.4 Resources

- Nokogiri
- JetBrains RubyMine
- Eclipse
- Eclipse cheat sheets
- DITA
- W3C - The Extensible Stylesheet Language Family (XSL)
- The Organization for the Advancement of Structured Information Standards (OASIS)

HASHCHECK

230.1 Ruby script to check file checksums with the Windows CertUtil Command

hashcheck.rb is a Ruby based command line program that checks file checksums with the Windows CertUtil Command.

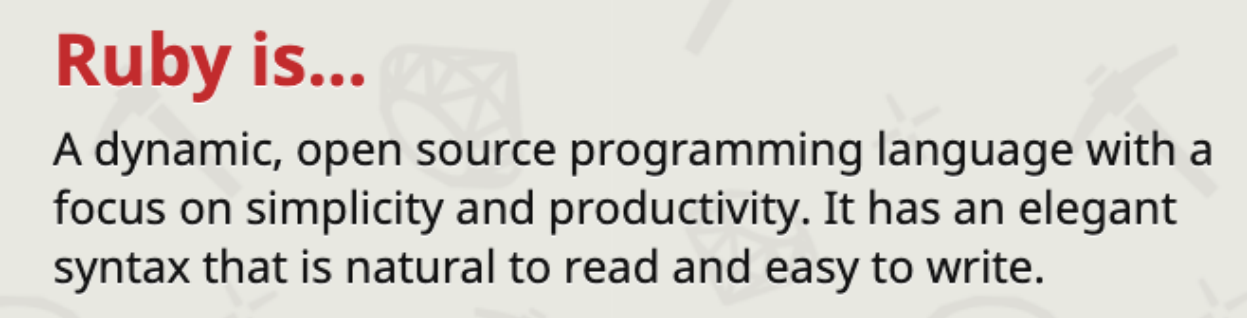
The secure hash algorithm choices are: md2 md4 md5 sha1 sha256 sha384 sha512

```
$ ruby hashcheck.rb -h
 Usage: hashcheck.rb [options]

 Specific options:
     -f, --file file                  Path to file
     -a, --algorithm algorithm        Algorithm
         --delay N                    Delay N seconds before executing
     -t, --time [TIME]                Begin execution at given time

 Common options:
     -h, --help                       Show this message
         --version                    Show version
```

CHAPTER

ONE

RUBY



231.1 Ruby a programmer's best friend

Some of our projects use Ruby so this page tries to be an easy to use tutorial on all things Ruby.

Ruby dates back to the 1990's and was first created by a Japanese man named Yukihiro "Matz" Matsumoto.

Hey come and check out the Ruby in 4 seconds video.

Ruby is very powerful, is growing in popularity and is currently ranked in the top 20 on the TIOBE Index.

There are two types of Ruby files: .rb, .rbw

Matz made run Ruby fun and easy to learn, so don't be scared and first check out a short Ruby YouTube video I created.

Ruby in 29 seconds

231.2 Links

- Ruby
- Ruby Best Practice
- Ruby Syntax Checker
- Introduction to Test Driven Development in Ruby
- Ruby Gems
- Alternative Ruby Shell, Pry, With More Features
- Ruby Productivity with Vim and TMUX
- Refactoring Ruby
- Practical Object Oriented Design - An Agile Primer Using Ruby

CHAPTER

TWO

RUBY STRIP

232.1 Ruby white space strip command line application

This program uses **Ruby Power** to strip whitespace from files, and the accompanying documentation provided aims at being an easy to follow tutorial on all things **Ruby**.

This program runs on the command line and accepts a single parameter, a folder path name.

It checks this folder recursively through all sub folders and files for leading and trailing whitespace.

It removes all the excess leading and trailing whitespace and copies the folder contents to this projects `output` directory.

So far it has been checked against these file formats:

- *.c
- *.xml
- *.xsl
- *.txt
- *.php
- *.html
- *.py
- *.css
- *.rb

Simply run:

```
$ ruby ruby-strip.rb -h
Usage: ruby-strip.rb [options]

Specific options:
    -p, --path path                  Directory or path relative to this
                                     directory to check for excess whitespace.
        --delay N                    Delay N seconds before executing
    -t, --time [TIME]                Begin execution at given time

Common options:
    -h, --help                       Show this message
        --version                    Show version
```

This should copy the folder to the `output` directory.

CHAPTER

THREE

SEEK



233.1 When you need those jobs hypersonic -> seek

seek is a command line script that builds `CSV` results of job searches. Check out the `jobs` folder for some recent ***seek****s*.

seek is built with:

- Ruby
- Mechanize
- OptionParser
- FileUtils
- Paint
- CSV class
- XPath
- CSV

Hey Wow :) looks like there are still `jobs` COBOL

233.2 Seek

Large Australian employment marketplace:

https://www.seek.com.au/

```
$ ruby seek.rb -h
Usage: seek.rb [options]

Specific options:
    -k, --keyword keyword            Keywords to search
                                              separators include:
                                              and, or, not
    -l, --location location          Suburb, city or region
    -r, --range range                Listed time in days
                                                    999 (default) or
                                                    1, 3, 7, 14, 31 or
                                                    any positive number
    -w, --worktype worktype          Work type
                                                all (default)
                                                full or 242 (full time)
                                                part or 243 (part time)
                                                contract or 244 (contract/temp)
                                                casual or 245 (casual/vacation)
        --delay N                    Delay N seconds before executing
    -t, --time [TIME]                Begin execution at given time

Common options:
    -h, --help                       Show this message
        --version                    Show version
```

Or to enter interactive mode

```
$ ruby seek.rb
Enter keywords: git and python
Enter suburb, city or region: sydney
Listed time in days: 30
Work type: full
41 jobs found
```

CHAPTER

FOUR

WELL FORMED

Ruby script used to check the well formedness of XML files: `xml, xsd, xsl`

```
$ ruby well_formed.rb -h
  Usage: well-formed.rb [options]

  Specific options:
      -p, --path path                  Path to check for well formedness
          --delay N                    Delay N seconds before executing
      -t, --time [TIME]                Begin execution at given time

  Common options:
      -h, --help                       Show this message
          --version                    Show version
```

CHAPTER

FIVE

AICF ANNOUNCES INDIAN SQUAD FOR 44TH CHESS OLYMPIAD

All India Chess Federation (AICF) on Monday announced India's 20 member squad which is the biggest ever Olympiad squad, for the 44th Chess Olympiad as India prepares to host the prestigious tournament of Chess in Chennai, India. Olympiad will be held from 28th July to 10th August.

India being the host are eligible to field two teams each in the Open category as well as women's section for the first time ever. Being able to play with two teams each in both fields has certainly increased the chances of winning medals for India. The event is the biggest chess event and likely to witness participation of whooping 150 countries and more.

India A team consist of GM Vidit Gujrathi, who led India in the 2020 online chess Olympiad to win Gold alongside GM Pentala Harikrishna the top Indian, GM Krishnan Sasikiran, young star Arjun Erigaisi and S L Narayanan in the open section.

The last one year was an impressive for Arjun Erigaisi winning and competing in top events and he will be the player to watch out for as he makes debut. Also it will be debut event for S L Narayanan.



Team India A; credits: AICF India

India B team consist of young Indian guns performing consistently who are the topic of discussion in chess world, Nihal Sarin, R Praggnanandhaa, D Gukesh and Raunak Sadhwani. All are under 20 and will be making their debut in this event. Along with them we also have experienced player Adhiban Baskaran who has also won the bronze in team in 2014 chess Olympiad.



Team India B; credits: AICF India

AICF Secretary Bharat Singh Chauhan said "Opportunity to field two teams at the Chess Olympiad opens the door for many young Indian talents to showcase their game at the biggest stage which otherwise would only have been possible after a wait of probably another couple of years. It's a huge opportunity for them so early in their careers. Teams look strong and have a good mix of experience as well as young talents and I'm confident that they will make the most of this once-in-a-lifetime opportunity. I wish all the members the best luck for the event and their preparations,"

The Indian women teams will have extremely experienced and talented Koneru Humpy and World no. 10 Harika Dronavalli, who have showcased their world class play in many international tournaments. Tania Sachdev included in the first team along with Vaishali R and Bhakti Kulkarni, who will be making their debuts.



Team India A women's section; credits: AICF India

The second team, in the women's section, will consist of national champions Soumya Swaminathan, Mary Ann Gomes and Padmini Rout along with Vantika Agrawal and 16-year-old Divya Deshmukh.



Team India B women's section; credits: AICF India

The five-time World Champion and Indian star legendary Viswanathan Anand, who decided not to play in the upcoming Chess Olympiad, will be very much in action as the mentor of the Indian teams. "I am playing very few events these days and after playing many Olympiads, I thought it was time for the younger ones to play. India has many talented youngsters like Nihal, Praggnanandhaa, Gukesh, Arjun and a few more," Anand said.

Interesting fact, Praggnanandhaa and Vaishali will be the second set of siblings to represent the country at the same Olympiad after N Saritha and N Sudhakar Babu, who played in 1988's edition held in Greece. GM Pravin Thipsay will be the Head of the Indian Delegation.

235.1 About the Author

Jashwaneel Patil is a student pursuing Bachelor of Engineering and a young mind who likes to explore and research in different areas. His vision lies in making Earth to make a better place to live with taking small steps towards sustainability and making best use of technology available to make easier life for mankind.

CHAPTER

SIX

BOBBY FISCHER, YEAH?



Check. Mate.

Today we're going to talk about Bobby Fischer, King of the Chess People.

It's 1972. Bobby Fischer is, like, 29 years old, and at the time, he had won the U.S. Open Championship and was an International Grandmaster.

But he wasn't just a normal chess player. He was always going like boom boom boom, check!

Woot, woot, woot, checkmate!

That was when he felt most comfortable in life. And yet, Russia had won the World Championship for the last 24 years.

And Russia used that as sort of a PR campaign, like, we are the kings! We're so good at this, we rule this game! We are not only Communists, but we are the intellectuals of the world because we do chess.

The World Championships are in Iceland, and Boris Spassky, backed by the Russian government,

was like, Bobby Fischer is too young and inexperienced for someone like me, the World Champion.

Here's the thing, Fischer hated Russians, and he called them filthy pigs. So, it was much more than just a chess match.

The Cold War is happening. Life Magazine called it the match of the century, and in the retrospect it was, because it was the match of the century.

And then Fischer didn't show up.

He was still in, uh, New York, and he said, I don't want to play in this match 'cause it's not enough prize money! Can you believe this!

It's not enough!

He was all talk. He wasn't, like, ready to perform for, like, commies and shit. But he gets a phone call from Henry Kissinger, the Secretary of State, and he said:

This is Henry Kissinger

saying that you need to get your ass over to Iceland now.

So, he finally shows up in Iceland, and Spassky's like, fine, great, let's get started.

But Fischer was like, there's too many cameras.

There's, uh– the audience is too close.

The chess board is too shiny.

The lights are shiny.

But Fischer finally agreed to play, and in America it was shown on bars throughout the country. So, you would go into a bar, you'd see chess and not the New York Mets,

The first game was weird because there's cameras everywhere. And Fischer made a rookie move,

like, he went and got an outlier pawn with his bishop, and Spassky surrounded it with his bishops.

And he lost big time.

The second match came around, and Spassky was there, and he goes, where is he?

Fischer was staying in his room and saying, I will not go out unless the cameras change.

And he was thinking that they would do it,

but they didn't.

And then Fischer forfeits the match.

And he's down two-nothing,



which is pretty messed up. And then finally for the third game Fischer said, look, let's go to a back room with no cameras, please.

And Spassky said yes. Fischer felt comfortable and won. He won! The first time he'd ever beaten Spassky.

Once he won, it just changed. It's like a turnaround It happened.

So, Fischer won the third game, the fifth game, the sixth game, the eighth game, the tenth game. It was so brilliant,

Spassky actually stood up, he gave a standing ovation!

And after the 13th game, the Soviets were like, what do we do? They went to the officials and said, Bobby Fischer is using electronic devices to wane Spassky's energy through electronic zap page.

So, the Reykjavik police from Iceland came in and took apart everything. They took apart Bobby Fischer's chair, Bobby Fischer's, uh. . . peanuts. And they were thinking, oh, this is going to fluster Fischer, because Fischer's very tumultuous.

It didn't at all.

He loved it. And he won after that, and won and won, and pretty much after the 21st match, it became impossible for Spassky to win. And it was like, oh, my God! Fischer wins! Fischer wins!

he's, the World Chess Champion, and he's from the U.S. He walks out in Reykjavik, there's people everywhere. He's mobbed. Fischer was huge, and he became a Cold War hero!

236.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

SEVEN

BORIS SPASSKY



Born on January 30, 1937 in Leningrad (ST Petersburg). He was a child prodigy of chess who had a universal style as he could combine the aggressive style of Mikhail Tal or the prophylaxis game of Petrosian. He learned to play chess at age 5 (his sister was USSR female champion). During the Second World War he and his family had to leave the city. Boris spent several years of his childhood in an orphanage, surrounded by hunger and misery.

After the war at the age of 9, he was accepted into the Leningrad Palace of the Pioneers (a space where creative work and sports training were encouraged) where he was helped by other chess players. His progress was remarkable, at 12 he was a candidate for teacher and at 19 he obtained the title of Grand Master. In 1955 at the age of 18 he participated in the candidate's tournament in which he had a creditable 3rd place.

In the following years he alternated between good and bad tournaments, until in 1964/65 at the age of 27, he achieved first place in the strong tournaments in Belgrade and Moscow, added to obtaining the candidate tournament, defeating illustrious players such as Paul keres the "champion without a crown", the distinguished Geller and in the final the "magician of Riga" Mikhail Tal.

In this way he earned the right to contest the world title. In 1966 after a close match against Petrosian, he ended up losing 12 ½ to 11 ½. The theoretical knowledge and experience of the Armenian made the difference.

In 1969 Spassky-Petrosian met once again to contest the crown, but unlike the first match, Boris had prepared more rigorously under the guidance of his coaches Igor Bondarevsky and Nikolai Krogius. Another fight between two greats was taking place, and as expected it was an even match, but from game 17 there was a turning point, where he was able to break the wall of the Armenian who could not recover, and the great Spassky he prevailed with a 12 ½ to 10 ½ to be the new world champion.

Match of the Century

In 1972, he put his title on the line against American star Bobby Fischer, who had just crushed his rivals, in the final stage of the candidates' tournament. This match is perhaps the one that had the greatest importance worldwide due to the historical context, in which there was a great difference between the two countries on a political, economic and social level.



In this climate, this confrontation took place, where Spassky started up 2-0 (the second due to the absence of Fischer), but in the third game Bobby showed his game in all its splendor in which Boris could do nothing and ended up defeated 12 ½ a 8 ½, in this way the North American ended 24 years of Soviet rule in the world championship. Notably, Fischer had never beaten Spassky up to this point.

After this meeting Boris was highly criticized, as if the achievements that he had made up to that moment were worthless.

In 1973 he managed to win the magisterial championship of the USSR. That same year when he looked like he could win the candidate tournament, he lost in the semi-final to promising new Soviet Anatoly Karpov (7-4). In 1977 he tried again reaching the final, but was defeated by Viktor Korchnoi 10 ½ to 7 ½.

"We can compare classical chess and rapid chess with theater and cinema - some actors do not like the latter and prefer to work in the theater."

-Boris Spassky

237.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

EIGHT

CHESS AND MATHEMATICS

238.1 The Close Relationship between Chess and Mathematics

238.2 The Legend Of The Origin Of Chess

It all begins with the deep sadness of a king of India named Sheram, who had lost his son in of the battles and there was nothing that could make him happy.

One day someone named Sissa appeared at his court and requested an audience with the king, where he presented a game in which he assured him he would succeed in cheering him up again and amusing him: **Chess.** After introducing him to the board and explaining the rules, the king began to play feeling absolutely in awe and after playing many games, he realized that his grief had been largely mitigated, so Sissa had succeeded. Sheram was very grateful for such a wonderful gift, so he wanted to reward Sissa and suggested that she ask for whatever he wanted, since the king was rich enough to fulfill the most burdensome wish.

Sissa made a wish that left the king shocked by his infinite modesty, she wanted them to place a grain of wheat in the first box of the chess set and two in the second, four for the third box and double the grains of wheat for each of the squares on the chessboard.

The king's mathematicians were taking too long to perform the calculations, and the kingdom understood the reason for their delay, until they finally came up with the answer. They explained to Sheram that fulfilling Sissa's wish did not depend solely on his will, since in all the barns that existed in the world there was not such a large quantity of wheat.

We are going to mathematically calculate the amount of wheat required by Sissa, the first thing to know is that it corresponds to the sum of a geometric series of 64 terms, since this number represents the number of squares that a chessboard has and the series can be expressed as follows: `T_(64=) 2^0+2^1+2^2++2^63 T_64= _(i=0)^632^i`

The easiest way to solve this sum is with a little mathematical trick, if we multiply the equation on both sides by 2 we have that:

```
2T_64 =2^1+2^2++2^63+ 2^64
```

Now we subtract T_64 from both sides of this equation:

```
T_64- T_64 =2^1+2^2++2^63+ 2^64-(2^0+2^1++2^63 )  T_64= -2^0+ 2^64  T_64= 2^64-1  T_64= 18.
446.744.073.709.551.615
```

To get an idea of how much wheat is that amount, since of course it is not easy to relate it to anything known, we can estimate that there are 20,000 grains of wheat for each kilogram, if we divide the total amount of grains required by Sissa by the 20,000 grains, we will obtain approximately the number of kilos that this large number represents

```
(18.446.744.073.709.551.615 grain/kg)/(20000 grain)=922.337.203.685.477 kg
```

Which are approximately 922,337,203,685 metric tons (Tm) and according to the FAO for the year 2017 the world wheat production was:

If we take the total value as the annual average wheat harvest worldwide, we can say that:

```
(922.337.203.685.477 Tm)/(771.718.579 Tm/year) = 1195,7 años
```

It would take that many years to be able to gather the wheat that is produced all over the world and to be able to pay the king's debt to Sissa.

238.3 Chess and Mathematics

The reasoning used to play chess is very similar to the reasoning used in mathematics and that is why this magnanimous sport can become an exceptional pedagogical tool when it comes to stimulating the skills and abilities of students in this area.

In a game of chess, multiple resolutions are applied within a complex puzzle and there are a large number of possible ways to solve the problems that arise during the game. It is necessary to calculate an endless number of possible variants for each movement and it is also composed of a cluster of successful movements to decipher the solution of the game and be victorious.



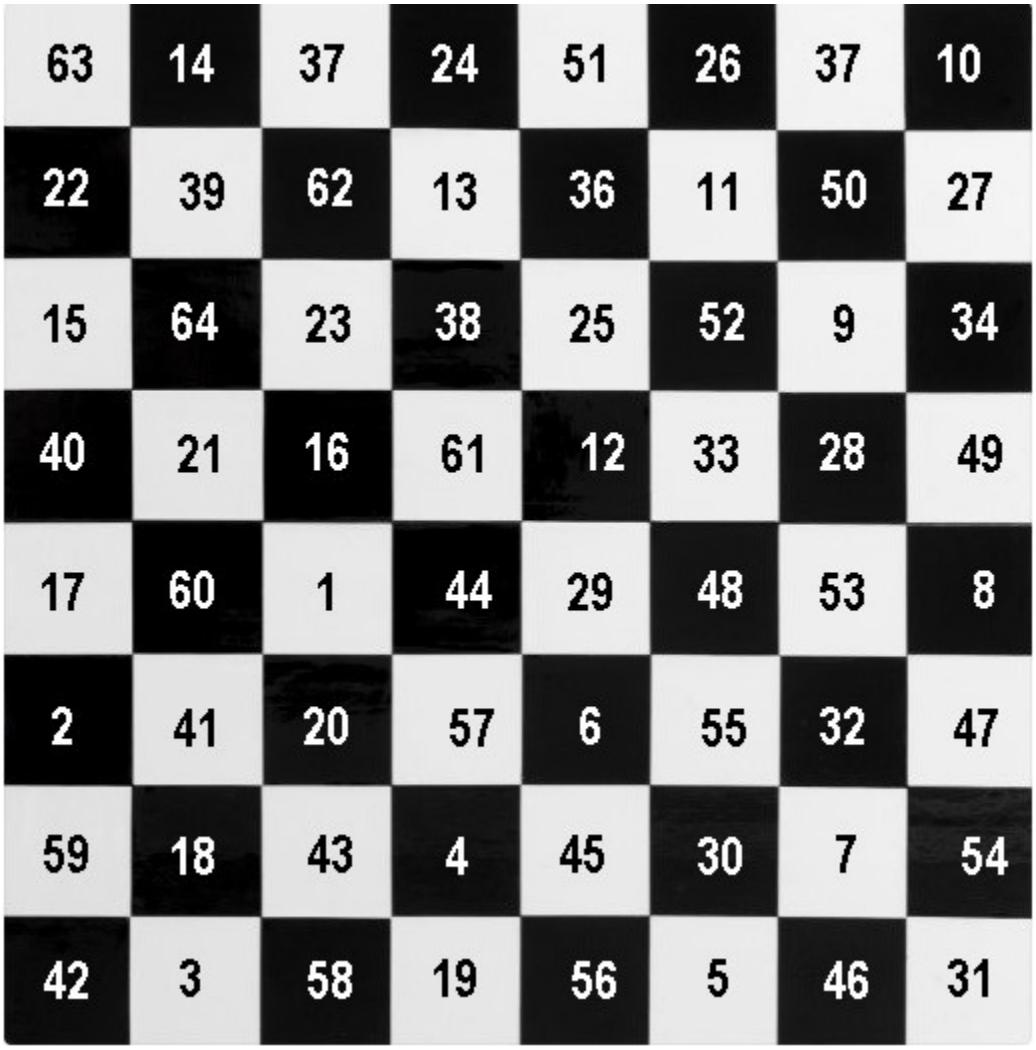
The proofs, the theorems, the axioms and the mathematical models are ultimately very similar to the fundamental principles of chess, both in the opening, the rules of the game and the theory of endings, to name some of its most important aspects.

Experts say that for any movement that can occur within the board, there is a mathematical function that can evaluate this position and that is why chess has attracted the attention of many famous mathematicians over time.

238.4 The Horse Problem

Since time immemorial, mathematicians have posed various problems around the game of chess. One of the best known examples of this type is "the horse problem" which consists of finding a sequence of the horse's movement within the chessboard, where the horse begins its movement in a square on the board and must go through all the squares , but going through each of them only once.

In the following image we can see one of the solutions to this problem, where the horse starts from square number 1 and moves through each of the subsequent numbers, that is, 2, 3, 4 and so on.



The mathematician Leonard Euler solved the horse problem and was also approached by many other great mathematicians. This problem, known since ancient times, focuses on a branch of mathematics that is commonly known as "graph theory" and specifically this problem, it would be a variant of what they call the "Hamiltonian cycle problem", the latter is focused on find a certain Hamiltonian path but circumscribed within a certain graph. The answer to the number of possible runs of the horse is 33,439,123,484,294.

238.5 Mathematical Curiosities In Chess

There are many curious data around the mathematics applied in this game, among which is the Shannon number that indicates an estimate of how complex chess can be, in this case it establishes the number of possible moves in a game.

This number was estimated by Claude Shannon through a statistical average, where it is established that each player has an average of 30 choices in each movement and must be calculated for two players. We also start from the average of 40 moves in each game, so the Shannon number is calculated as follows:

```
(30*30)^40= 900^4010^120
```

Today the approximations to the Shannon number are close to the value 10123, to get an idea of how immense this number we can take into account that the number of atoms in the universe is estimated at a number around 1080, therefore, it is shocking to know that there is a greater possibility of obtaining different and unique chess games, than atoms in the universe.

238.6 Game Theory And Chess

There is a branch of mathematics that is dedicated to studying games and is known as "game theory", this area is responsible for representing and modeling games as mathematical structures, also having applications in other areas such as economics and finance.

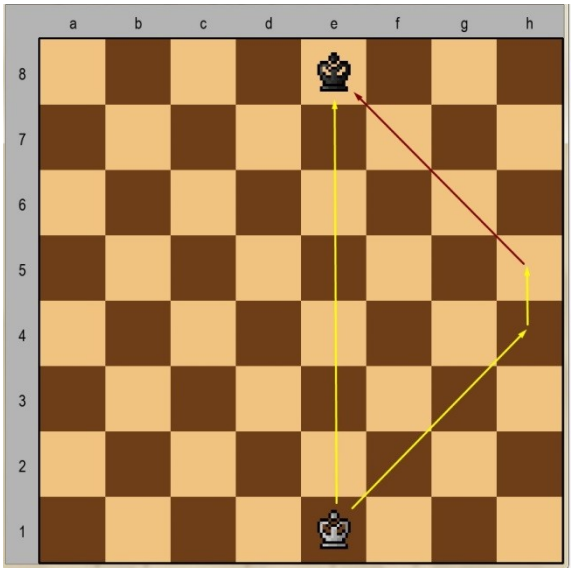
If we study chess within game theory, it would be classified as a non-cooperative game, since each player chooses according to his personal benefit. It is also considered a game whose sum is zero, this means that the losses of one player are balanced with the gains of the other, for example, when an opponent has an advantage piece, this material value not only implies his advantage, but the disadvantage of your adversary for that gain.

On the other hand, it is a game in which you can notice an absolute absence of chance.

238.7 Certain Geometric Aspects To Take Into Account In Chess

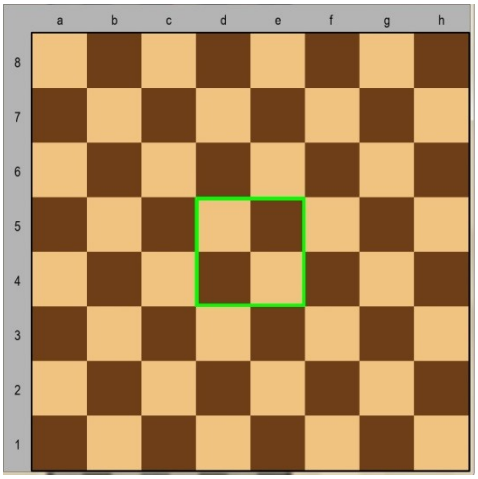
As we all know, this game is developed on a board consisting of eight rows by eight columns that generate a total of 64 squares. Each piece has specific rules of movement, for example, bishops move diagonally, while rooks in straight lines.

Each of these features mentioned above, provide chess with certain geometric properties that can be seen reflected on the board. When we talk about the Cartesian plane, we can say that the shortest distance between two points is of course a straight line. However in chess, we can notice that the movement of some pieces does not agree with this rule. Let's set an example with the king's movement on the board.



As we can see in the image, the king can be moved from square E1 to square E8 in seven movements if it follows a straight line. But we can also observe that the king, in the same way, would take seven movements diagonally, so in this case the shortest distance is not the straight line, since it is the same for both movements.

Another relevant aspect regarding the geometry of the chessboard is the importance of its center, which we can see in the following image:



Those four boxes that are within the green square indicate exactly the center of the board and their importance lies in trying to dominate these four boxes, in order to obtain a positional and strategic advantage, in order to substantially dominate the game throughout the match.

In the game of chess there are some situations that coincide with certain mathematical theorems, it is the case of the remarkable rule of the square, which is based on applying the Pythagorean theorem to the famous game.

The rule of the square is used when a pawn that is close to king but cannot be defended by its own king, with the circumstance that there are no other pieces on the board other than the opponent's king. Using mathematics to know if the pawn has a chance of winning or not can be of great help in this type of situation.

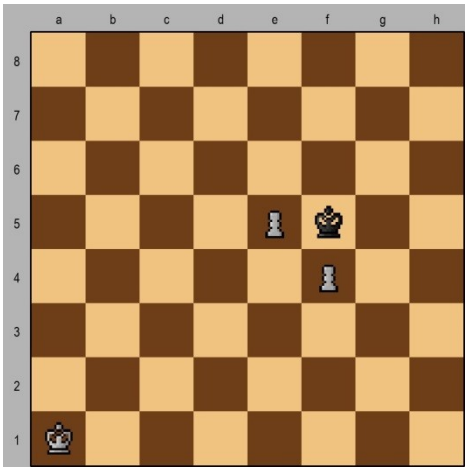
The rule of the square some say that the pawn reaches the crown when the number of rows between the pawn and the square to crown is less than the number of columns between the pawn and the king of the opposing player.

It is best to make a square that includes the pawn whose side is equal to the number that corresponds to the rows that the pawn is missing to reach the crown. If the opponent's king is inside this square, the distance indicates that he gets

to capture the pawn, if on the contrary, the king is outside this square, the king pawn.

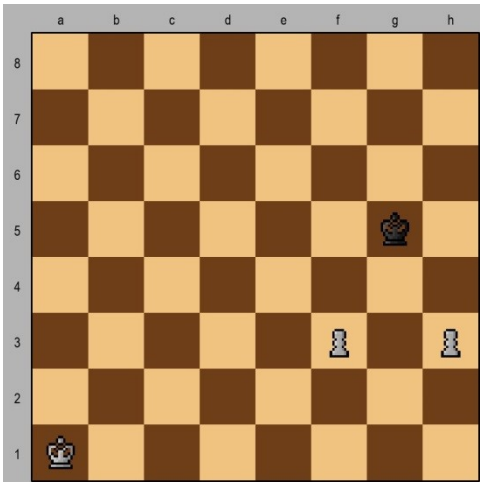
238.8 A Chain Of Pawns Against The Rule Of The Square

In the next game Black plays and we can see that the king cannot capture the pawn that is in position e5 because he is defended by the white pawn that is in position f4. But what if the king captures the f4 pawn? At that point he would cease to be inside the square and the other pawn would crown.



Isolated pawns and the rule of the square

In the next game presented below, Black plays



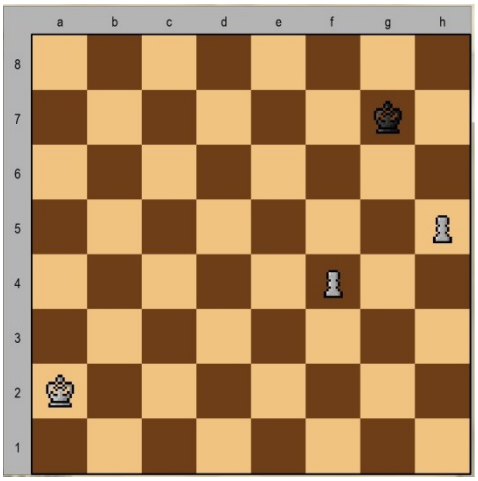
The king tries to get closer to capture one of the pawns with the Rf4 move, then the white pawn moves to position h4, this move forces the king to retreat, since If he captured the pawn on f3, the king would be outside the square rule and the pawn on the h-file would crown.

So the king goes back to Rf5, the white king advances to Ra2, since if the pawn advances 3 advances to the position f4, the black king would capture the pawn 3 and also would remain inside the square to capture the other pawn, in this way he would win the game, but let's go back and assume that the white king is the one who advances.

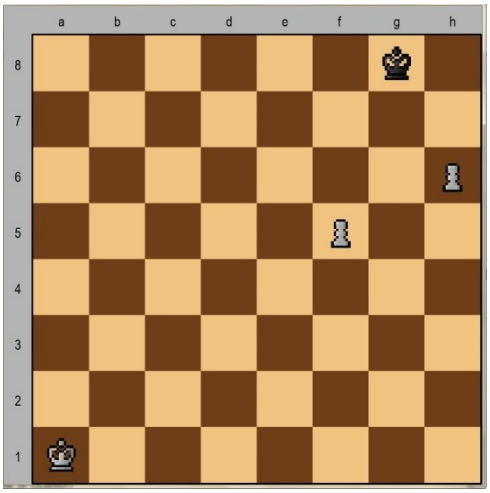
Then the following movements are performed:

1. Rg6 and f4
2. Rf5

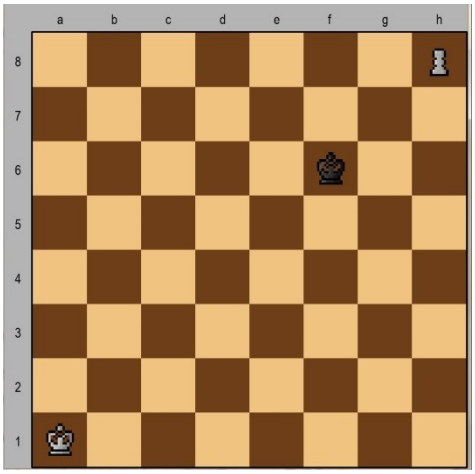
3. h5 and Rf6
4. Ra2 and Rg7



5. f5 and Rf6
6. h6 and Rf7
7. Ra1 and Rg8



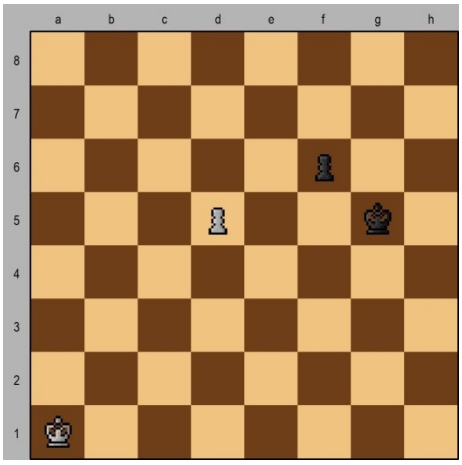
8. f6; Rf7
9. h7; Rf6
10. h8 and the pawn crowns a queen



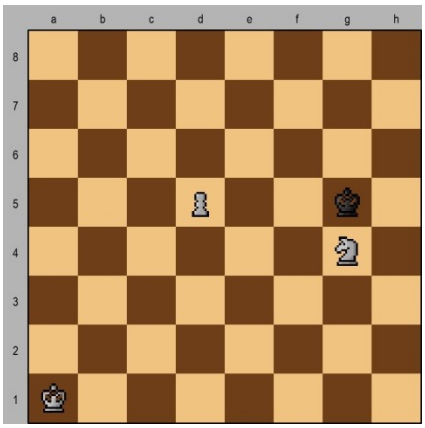
It is important to note that the more columns there are between the two isolated pawns, of course it will be much easier to leave the king out of the square.

238.9 Exceptions to the rule of the square

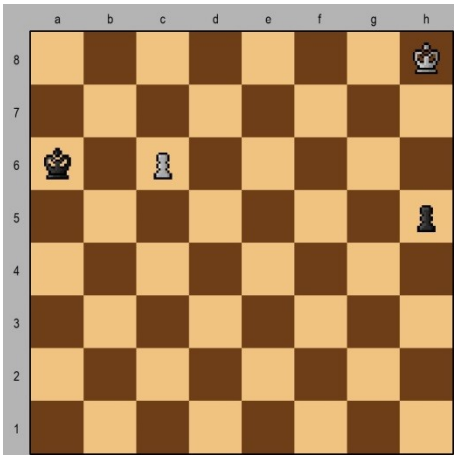
In the next game, the king has only one way to capture the pawn that he is going to crown, but first we must make sure that there is no obstacle that could prevent the king from approaching. So if we look at the next board, the only way the king can approach is through the diagonal, but there is a pawn of the same color that is blocking it and the time it takes to move the pawn and clear the way, lets the king out of the square and therefore the opposing pawn kings.



In the next chess game if the black king manages to capture the pawn instead of capturing the knight, the game would be drawn. The problem is that the only way to approach the pawn is through the diagonal and that square is threatened by the knight, so that if the king approaches the pawn from the f5 position, the king is then out of the square and not achieves its objective of preventing the opponent's pawn from crowning.

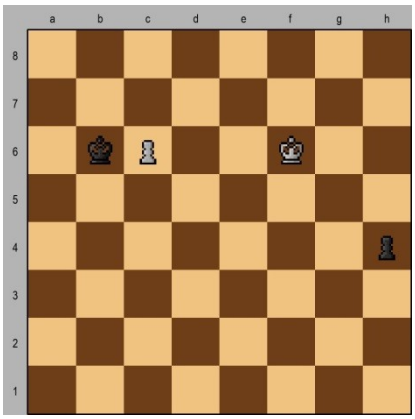


The following image presents a problem that can be solved thanks to the rule of the square, in the next chess game everything indicates that White loses since the black king is inside the square, which can lead him to capture the pawn white before it crowns.



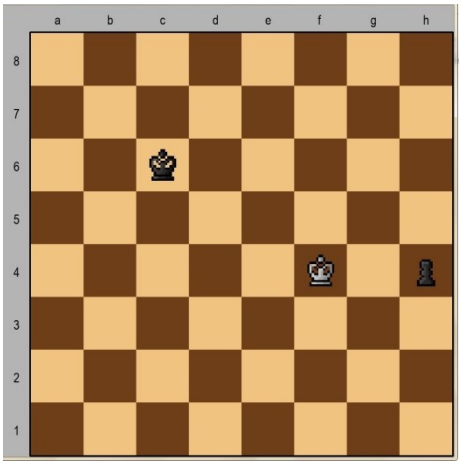
However, thanks to the geometry of the chessboard, the white king can approach from the diagonal and change the fate of the game, since if the black king has the purpose of capturing the white pawn, the movements would be as follows following:

1. Rg7; h4
2. Rf6; Rb6



If the black king is to prevent the white king from defending his pawn, he must try to capture it.

3. Re5 and the black king captures the white pawn with Rxc6
4. With this strategy of the opponent who represents the white pieces, he moves his king to Rf4 and in this way he is already inside the square, with which he will capture the black pawn and achieve a draw in a match, which at the beginning had all of miss.



238.10 Avoid Checkmate Against A King And Knight

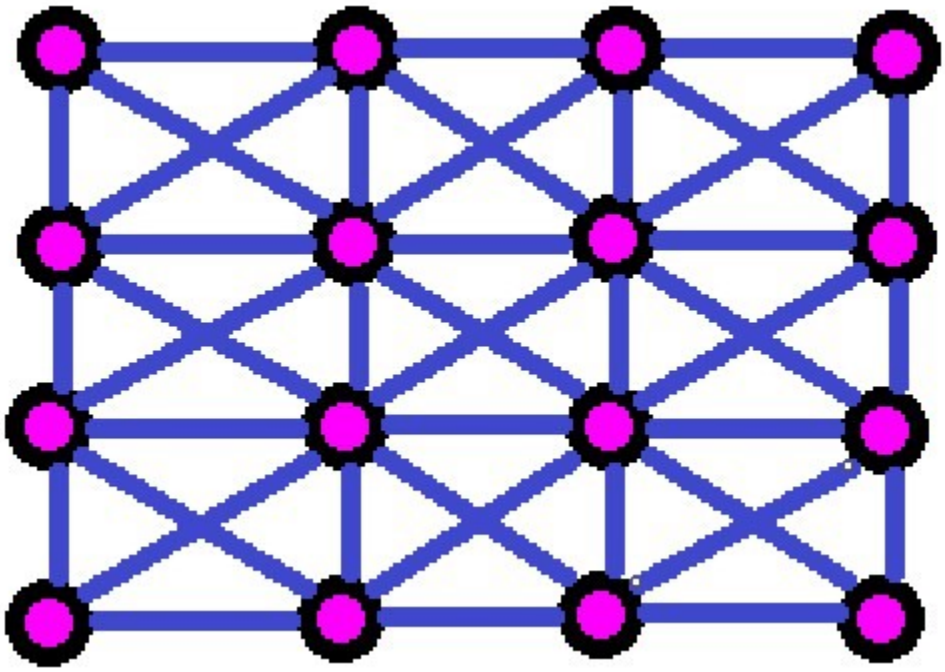
The checkmate with these two pieces can be avoided as long as one wants, while the king is directed to the center of the board and the most important recommendation is that the king should occupy the squares of a different color from the knight. This is because the squares that the knight occupies always change color with each jump, so that if the king and the knight occupy different colored squares, the knight will never be able to have the king within reach of him. The only danger that exists in this situation is to get trapped in a corner where they can force the king to move diagonally and in this way he will suffer a check on the next play, which is why it is necessary to go to the center of the board.

238.11 The Problem Of The Kings

How many kings can be arranged within a chessboard without succeeding in threatening each other?

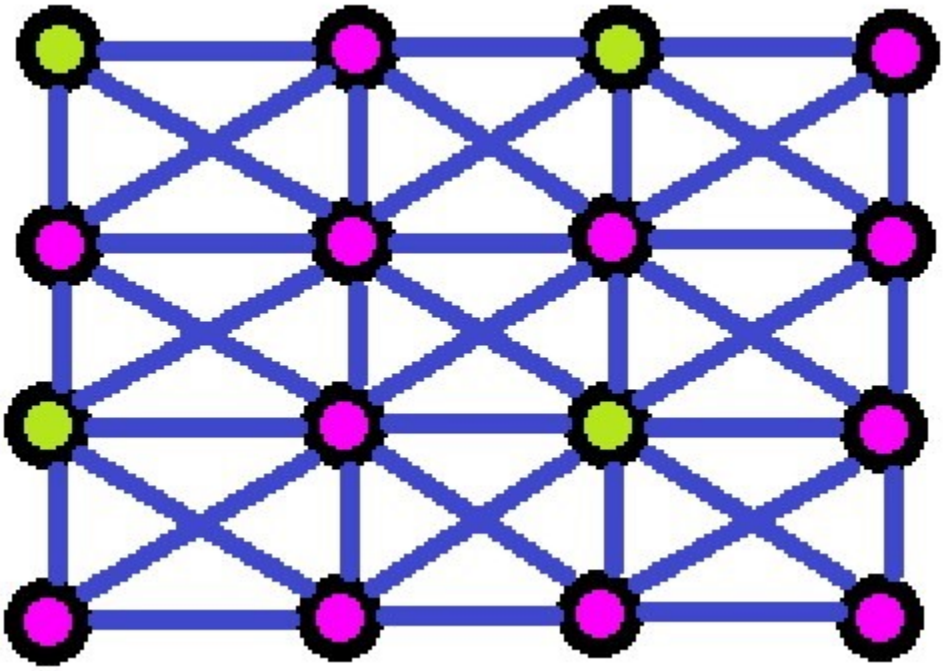
The easiest way is using graph theory, let's think that each graph represents a vertex for each square of the board and as we know, the king can move from one vertex to another with one movement. Let's start by drawing the squares or vertices for a 4 × 4 board.

To solve the problem of having the maximum number of Kings possible, both on this board and on others of different dimensions, the idea is to find the largest number of independent vertices found in the graph. When we talk about a set of independent vertices, it is that none of them is directly connected to another vertex, that is, for this specific case it is that no king is threatened by another king.



The reality is that finding the independent vertices within a graph through an algorithm that solves it can take too long to find the answer. However, for this case associated with chess it can be solved directly.

If those vertices that do not have a direct connection with the next vertex are colored with another color, it can be seen with the naked eye that no more than four kings can be placed, even starting from different squares the same conclusion can be reached.



The mathematical formula to solve this problem on a board of n x n dimensions, given the case that n is an even number, is:

```
Number of kings = n^2/4
```

The formula for when n is odd:

```
Number of Kings = (n+1)^2/4
```

This implies that for a chessboard such as the 8 x 8 we are used to, the maximum number of kings that can be placed without threatening each other is:

```
8^2/4 = 16
```

238.12 The International Game Classification System(FIDE)

Chess has an international classification system that is based on mathematics.

The international organization that governs chess is FIDE, whose name comes from its French acronym that stands for Federation International des Echecs. This federation works with an international ranking or classification system better known specifically as the ELO ranking (in honor of Arpad Elo its creator). In this system each opponent has a score that depends on the development of his strength within the game.

The ELO ranking is based on mathematics and is closely related to the logistics function, in this way the first player has an ELO P_A score, while the second opponent has an ELO P_B score, we can then conclude that the first player has a higher probability and is represented mathematically through the following formula:

```
E_1= 1/(1+ 10^((P_1-P_2)/400) )
```

Regarding the second player

```
E_2= 1/(1+ 10^((P_2-P_1)/400) )
```

Suppose that the first player has 2000 points in the ELO, while the second player has 1600 points, we can calculate the formula and establish that the first player has a probability of:

```
E_1= 1/(1+ 10^((1600-2000)/400) )
```

```
E_1= 1/(1+ 10^(-1) )= 0,9090
```

According to this ranking, the first player has a probability of approximately 90.91% that is in his favor and we can see that the system used by FIDE is based on mathematics when classifying the chess players that make up the various national federations around the world.

238.13 Find The Position Of 8 Queens On The Board

The problem of the 8 queens was first raised by a German chess player named Max Bezzel. The idea is to try to place eight queens on the chessboard arranged in such a way that none of them threatens another queen in the position they occupy.

As we all know, the lady can move horizontally, vertically or diagonally. The first step is to place each of the eight checkers, so that no two of them exist in the same column, row or diagonal.

This problem was analyzed by multiple mathematicians, including Gauss, who was able to find 76 of the possible 92 solutions. However, the first to find all the solutions was a friend of Gauus named Franz Nauck, a mathematician in 1850 who was also blind.

Fundamentally, there are only 12 basic solutions, while the rest of the 80 possible solutions can be obtained through symmetrical positions or turns, in addition, 11 of these basic solutions end up each of them equalling 8 more solutions, since turning any of these 90 °, 180 ° or 270 ° solutions are obtained 3 new alternatives and the other four remaining to arrive at 8, are obtained by specular symmetry.

On the other hand, the twelfth solution found in placing the queens in the following squares on the board: a3, b5, c2, d8, e1, f7, g4 and h6, is equivalent to only four more solutions, since it has a central symmetry . If we calculate the number of solutions generated by the 12 basic resolutions we will obtain: 11x 8 + 4 = 92 different solutions in total.

Since we know that only one queen can be located per column, we can simply express the numerical solutions from left to right that the number in the column represents, and the number that is expressed in that position is the row that the queen occupies in each column. For example, suppose in a solution as expressed in the following vector: 3, 5, 2, 8, 1, 7, 4, 6. This means that in the first column the queen is in row 3, while that in the second column another queen is in row 5 and following the same pattern we can deduce that there is a third queen in the third column and row 2.

Once we have the notion of permuting all the digits from 1 to 8 and knowing that they are located in different columns, we can realize that we still have a long way to go on the way to the solution. Since an eight-digit permutation is equal to:

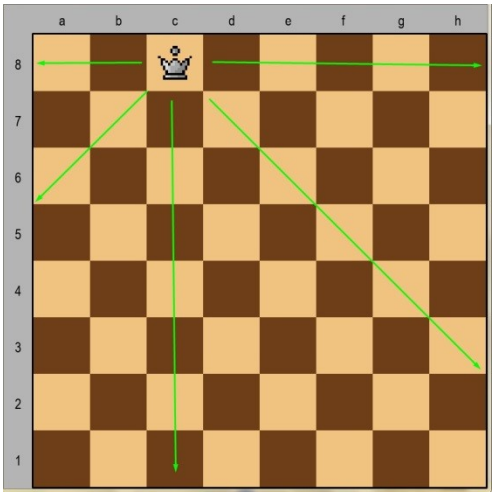
```
8! = 8.7.6.5.4.3.2.1 = 40320
```

This number tells us the number of possible solutions restricting only the rows and columns (they must be different for each queen), but as we already know there are only two 92 that meet all the conditions.

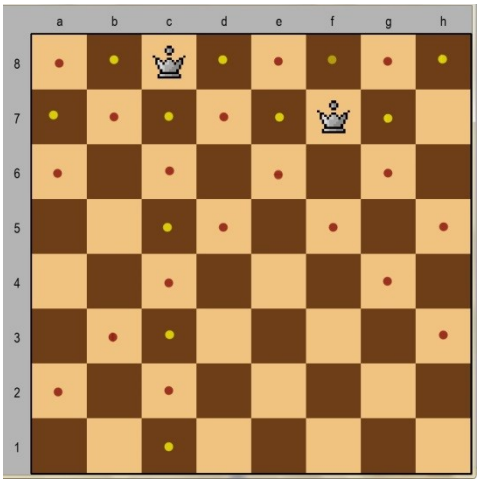
Of course, they still need to restrict the diagonals where each queen can also threaten the other queens. While it is true that there are some analytical solutions where you can generate an explicit formula to locate the queens. Backtracking used in game theory can very well solve a problem of this type.

Computer programs solve the number of iterations that would take too long to be able to corroborate at a manual level, so not only is Backtracking used, others have applied genetic algorithms to solve this problem and have also modified a Hopfiel model using neural network algorithms. Even algorithms for minimizing conflicts with local search.

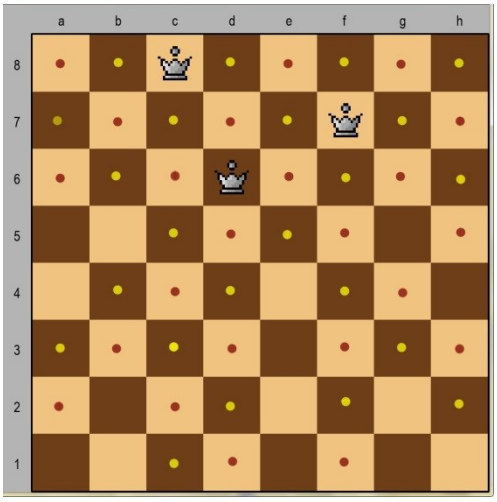
Suppose we place the first queen, we must generate an algorithm that avoids placing the next queen in any square that is in the path of any of these directions or arrows.



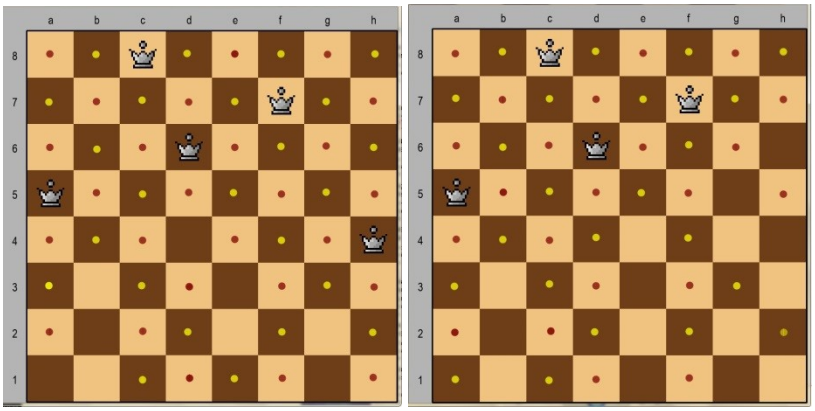
When placing the second queen, we will mark with points those boxes that are restricted by both queens, since they represent the rows, columns and diagonals that must be avoided so that another queen can be threatened, by one of the two previously located.

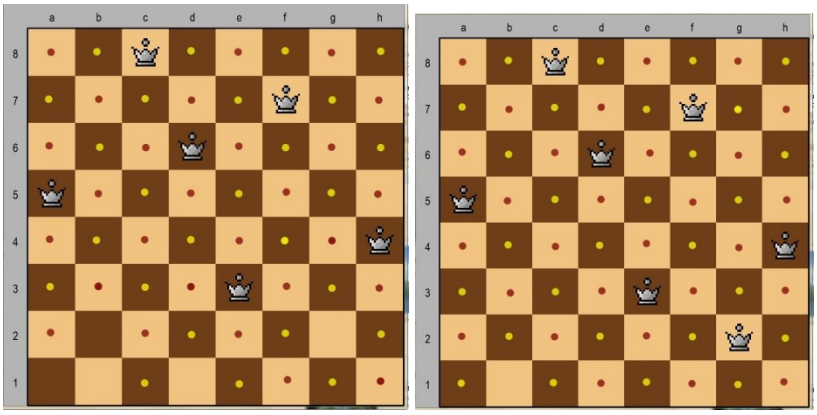


But placing the third queen should avoid some of the points that eliminate the boxes that correspond to the horizontal, diagonal and vertical lines that are in the environment of both queens.

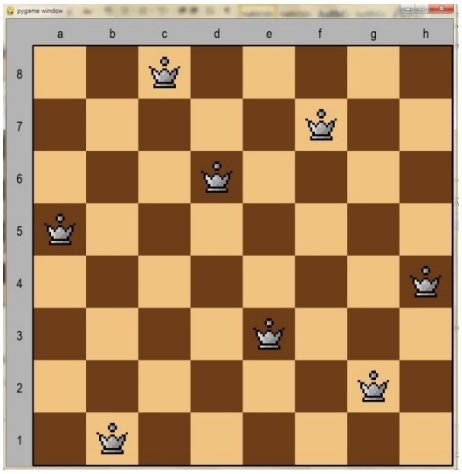


In this way we will be locating queens and our possibilities will diminish according to the sum of restrictions imposed by each one of them.





The last queen has only one chance to locate it and it is in the only empty square left on the board.



That is why computer programs must intervene, to establish a trial and error method, until we can iterate all the possibilities and find some of the solutions or being a little more ambitious, with each and every one of the possible solutions.

The solution to the problem of the 8 queens is considered as a model to follow for other applications, thanks to its maximum coverage. This implies that each element is observed and measured from all its neighbouring directions, that is, 2 horizontal directions, 2 vertical and 4 diagonals.

This is very useful when it comes to avoiding conflicts of an element with the rest of the objects in its environment, therefore a world of possibilities opens up for us in terms of its application and here we will name some of them:

- In communications to control air traffic
- In understanding data
- Communications systems
- In the programming of computational tasks
- For parallel optical processing
- In load balancing on multiprocessors
- Routing of data or messages in multiprocessors

Another important application is to locate the transistors and avoid that they do not interfere with each other, to achieve a directional communication system and thus achieve a greater bandwidth. In this way, each transistor can achieve greater communication with the outside world, if it can be released in its eight directions that are around it, that is, without being inhibited by any other transistor.

238.14 Can A Chess Game Be Infinite?

One of the great dilemmas regarding chess is whether a game can become infinite, this implies that there can be a series of valid moves, so that the game never ends. Regarding this question, the International Chess Federation (FIDE) established two rules that limit the number of moves and therefore the duration of the game. These rules are as follows:

1. It is established that a game ends in a draw, when after 50 movements completed by both opponents none of the pawns has moved and that neither piece has been captured
2. It is established that a chess game ends in a draw, if one of the players who is in play, claims when the same movement is repeated for the third consecutive time.

These two rules lead to chess games having a maximum limit of moves and therefore, the game becomes finite.



The latest advances in science have attempted to solve the endings of chess games up to a limit of seven pieces, including the two kings. This is a major step towards the resolution of generating a perfect game. As we already know that chess is a finite game, given the case that the 64 regulatory squares are not expanded and the 32 pieces are not changed or reclassified, it is possible some distant day we will get to see this type of feat. What we are sure of is that reaching that conclusion will take the experts a great deal of time.

What is most surprising about this game is that with a moderate amount of chips, not even the most powerful NASA computers are capable of generating the perfect game today. Although it is true that chess is not infinite, it definitely lacks very little to become so and we hope it continues to be this way, so that they do not end the magic of this great sport of Kings.

238.15 About the Author

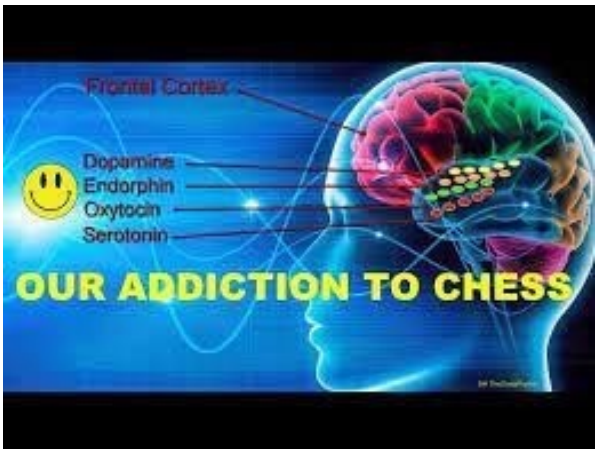
Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

NINE

CHESS ADDICTION

Chess is the game which is played across the globe with parents pursuing their children to play and get better at chess. As the chess player starts playing chess and get better dopamine starts to kick in and effects chess player to get urge of getting more better and better at it. After giving significant amount to chess person starts to develop addiction to play more. Chess addiction is no different than any other video game addiction. Some positions of chess are so aesthetic to watch and play there is always an unconscious thought back of the mind of player that he is doing something smart.



Addiction to chess is not only related to playing chess but one can get so pleased by the richness of the game that most of the time of addict can be spending most of his time in reading chess books, following top players game, solving puzzles, and so much more. There is always a feeling of smartness in one's mind that addict will not realize that he is addicted to chess. Chess has so many factors associated with it that one can spend hours on chess but still cannot be satisfied.

Chess addiction cannot be compared with any other addiction which causes serious health issues. It's up to a person that how he handles the urge to play and spend more time on chess. Chess game will surely help to improve the pattern recognition, creative thinking, analytical skills, decision making, etc. of the one spending time on chess, therefore we can say that the problem of chess addiction is solved on its own as the person gets mature.

Chess in many cases is used as therapy for addiction, this becomes paradox here! After all, what decisions are taken by one affect him in short term or long term. But we can conclude that chess addiction cannot affect a person physically and long term there are no damage done in long run. Chess is a fun game to play and controlled play of it can not cause any effect on one rather it will only help. If playing chess does not affect your social life and career you can safely play chess without even worrying to getting addicted to it. Everyone would agree that playing chess is always great than getting involved in bad habits which causes serious destruction to one's health and wealth.

239.1 About the Author

Jashwaneel Patil is a student pursuing Bachelor of Engineering in Electrical and a young mind who likes to explore and research in different areas. His vision lies in making Earth to make a better place to live with taking small steps towards sustainability and making best use of technology available to make easier life for mankind.

EFFECT OF MODERN CHESS ENGINES ON PROFESSIONAL CHESS PLAYERS

As the technology is impacting world in every field possible that mankind can think of the game of chess is no exception. Chess has evolved a lot and developed lot of theory with the help of chess engines and Artificial Intelligence. Chess engines are there for a while, the first chess playing program was by Bernstein (1957) and ran on an IBM 704 computer, capable of performing approximately 42,000 operations per second but it only selected the best seven moves for consideration using heuristics based on chess lore. As the time passed more powerful engines started to develop and today, we see engines like Stockfish, Alpha-Zero, Komodo, Leela0, etc. and new terms like Neural network, Artificial Intelligence, etc. has kept making these engines more and more strong. These modern unbelievably strong engines have become the tool in the hands of new generations professional chess players which made the human chess more exciting, brilliant and sophisticated. As Vladimir Tukmakov says "The engine has become the "Holy Cow" to which all chess players now pray regardless of their religious convictions or rating. Far from being a foe or rival it has become an invaluable helper, consultant and the highest of authorities. Since the highest of all oracles is soulless and cynical it is ready to help anyone ignoring opinions and preferences."



Stockfish 14.1 (Strongest chess engine with rated elo of 3566)8th Feb,2022

With the assistance of modern chess engines top professionals got the element to surprise their opponents in the opening by playing odd looking moves which is objectively good and has the potential ability that opponent blunders or misplays position giving edge to surpriser. The preparation has become so important in chess that sometimes we witness a preparation by both players which goes 35-40 moves deep preparation with both the players blitzing out there moves in a classical time control game which was never witnessed before the introduction of engines. Modern engines revolutionized how the game is played in all three phases of game that is opening, middlegame and endgame.

The benefits that modern chess engines give to chess world are immense but there comes the factor of cheating in online tournaments. Any layman with no knowledge of chess can beat the top-rated players of chess with the help of engines. But there are advances in detection technology of different chess platforms which with their AI powered system and huge database of games track the cheaters and take necessary action on them. FIDE has already approved a complex

cheat detection system with a behavior-tracking module for FIDE Online Arena games.



Former world champion Garry Kasparov playing against Deep Blue. CREDIT: Sovfoto / Universal Images Group Rights Managed / For Education Use Only

This modern chess engines have given new prospective to look at chess. Deep Blue's victory over Kasparov in 1997 declared a new era of chess. Even though problem exists in the form of cheating, but the advantages chess engines and AI programs provides to the Chess world definitely outweighs it. With the people locked inside their home due to global pandemic chess saw a huge boom in 2020 with millions of people getting newly interested in chess and needless to say Netflix series 'The Queens Gambit' was one of the reasons for chess boom. With all these things happening all at once we can say without hesitation the good days for chess have come.

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240.2 About the Author

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CHAPTER

ONE

ELO RATING

You're here because you want to know a little bit more about Elo, well let's find out where and how it comes about and then move on to how it works!



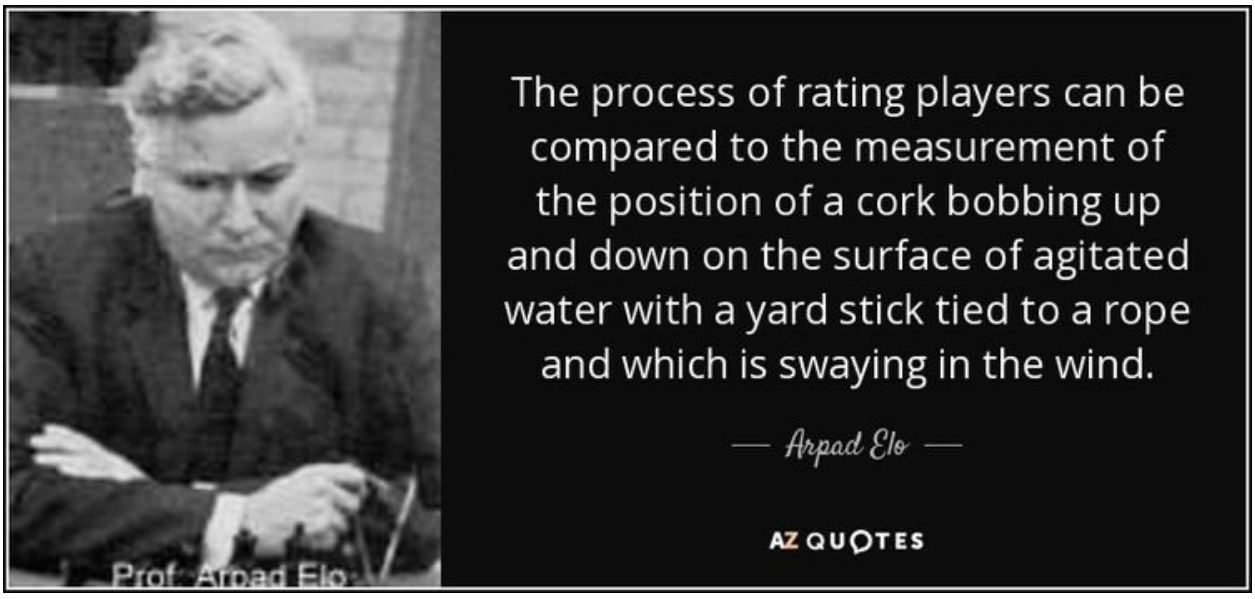
the Elo rating system was created by a Hungarian physics professor by the name of our ped Emmerich Elo who was a master-level player and active participant in the United States Chess Federation from its founding in 1939. The US CF was used in a miracle rating system devised by Kenneth Harkness the Harkness system was used between the 1950s and the 1960s it was a reasonably fair but, in some cases, increased rate in which the observers considered inaccurate. so, on behalf of the US CF Elo devised a new system with a sounder statistical basis which was then implemented in the 1960s.

which is kind of funny because Harkness was the USCS business manager between 1952 and 1959.

could there be a connection there that Harkness leaving? and then a year later a new system comes in. then in the 1970s Elo system was also adopted by the World Chess Federation Elo central assumption was that the performance of each player in each game is a normal distribution of random variables, although a player might perform slightly better or slightly worse from one game to the next

the performances of any given player change only slowly over time he then went on to add that further assumption is necessary because chess performance in that sense is still not measurable, you can't look at a sequence of moves and say that's the performance of 2035

performances can only be the rightful wins draws and losses so the player wins a game he's assumed to have performed at a higher level than his opponent that game on the other hand if he loses he would have performed a lower level and the draw means they performed equally now we got all that out the way what does it all mean?



basically, the rating system will work out who it thinks should win and lose each game during the placement your wins and losses set the range of your skill your wins to be in the bottom end and the losses being the top end now you're placed you will want to start working up the ranks the Elo rating will pick you up against an opponent and it will also know which player should win before the match even starts if the person the Elo system predicts will win doesn't affect win, they're only going to gain a small amount of rating as it's a game they should have won anyway.

The same goes for the loser they're only going to lose a small amount - now this is where the upset kicks in if the predicted winner loses this is where they lose a large amount of writing and the predicted loser on the hover hand gains a lot this is basically where the higher rated player has played at a lower skill than their rating suggests or they've simply just had a bad game we've all been there or the lower-rated player is either a bit of player working slowly up the ranks had a blinding game or just managed to capitalize on the mistakes of the other player the Elo rating is pretty flawless

241.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

TWO

FIDE GRAND PRIX 2022

FIDE Grand Prix is elite level chess tournament which is a part of World Championship cycle. 24 world class GMs will fight to win the spot at Candidates 2022. The top two finishers win spot at Candidate Tournament 2022.

This tournament is bifurcated in three legs (Berlin and Belgrade will host these three tournaments with Berlin hosting first and final leg whereas Belgrade hosting second leg) where each of 24 players will compete in two legs with 16 players in each leg. The three legs will be further classified in 4 pools with 4 players in each pool playing double round robin format and group winner advance to two game knockout match. The FIDE Grand Prix will kick off from 3rd February, 2022.

242.1 -PLAYERS

***Each player will earn points for their individual performance which will be added to decide the final standings.**

242.2 -Time Control

The time control throughout the Grand Prix (except in tiebreaks) is 90 minutes for the first 40 moves, with 30 minutes for the rest of the game after move 40. There is a 30-second increment starting from move one.

Any ties, either in the group or knockout stage, are broken in rapid games (15 minutes plus 10-second increment) and, if still tied, in blitz games (three minutes plus two-second increment**

242.3 -FIRST LEG

The first leg of the event takes place from February 3 to February 17 at Berlin. Rounds start at 6 a.m. PST/15:00 CET.



(16 Participants of FIDE Grand Prix Berlin. Image credits: FIDE)

242.4 -SECOND LEG

The Second leg will be held in Belgrade.

242.5 -THIRD LEG

Third leg will be held in Berlin, Germany.

242.6 -Prize Fund

Each tournament has a monetary prize fund of 150,000 Euros which will be distributed as tabulated below.

CHAPTER

THREE

GARRY KASPAROV A CHESS PLAYER

Get ready to meet the strongest chess player in the world and forgetting the strongest player in the history of the game he's going to be taking us on an emotional trip throughout the highlights of his career holding up for a critical examination and some of his most cherished memories forged in nerve racking hours of mental combat behind.



Destined to become world champion Kasparov did not appear to choose chess, it seems to have chosen him. at the age of five he suddenly told his parents the answer to a chess problem on the table in front of him even though he never yet been taught the rules of the game. At the age of seven he was enrolled at a chess class in Baku and made quick progress, aged nine the Botvinnik school sought him out the tiny boy began elite training by the age of 12, he was already the junior champion of the mighty USSR

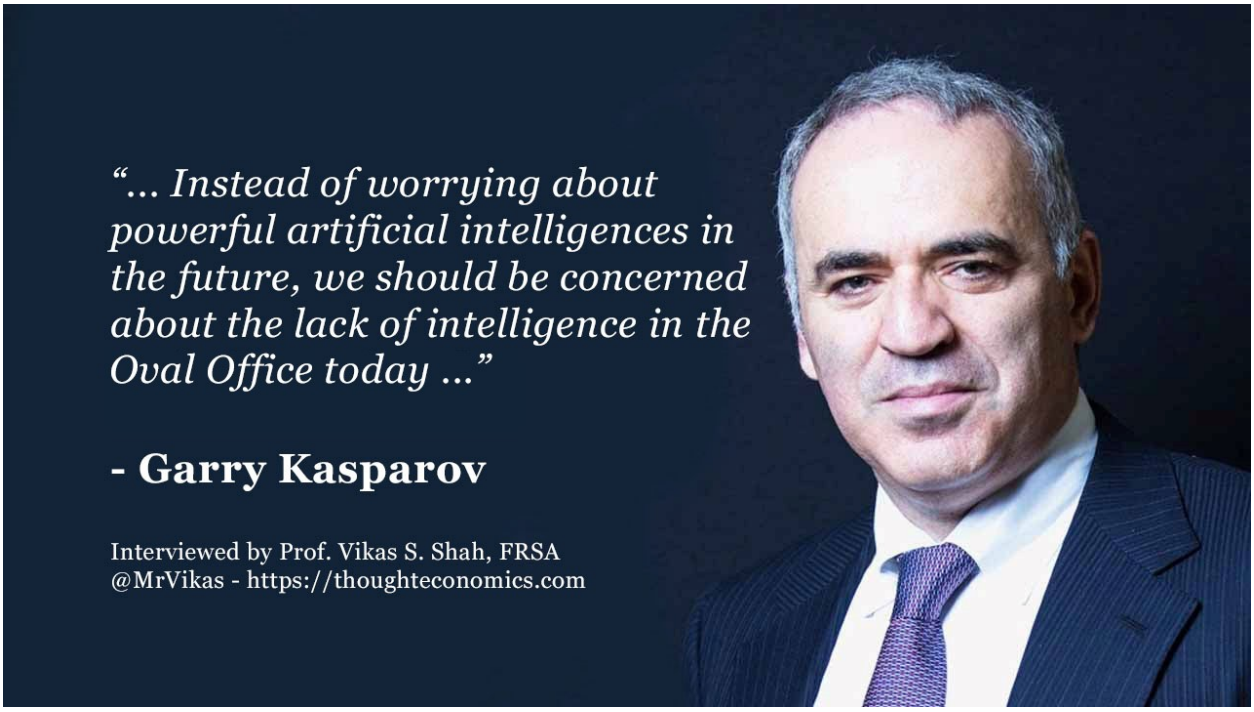
the youngest ever! it was the first step on a journey that we characterized by almost uninterrupted success he was to become the youngest ever champion of the Soviet Union and then the youngest ever champion of the world.

in his early years he was busy enough building success! he was a top student who spent his free time winning tournaments and selling records

Garry was young when his father died. his mother became the power center of his life and a sense of family has always been very strong. his personal life will become a remarkable blend of close family ties and whirlwind public commitments.

what kind of challenge then did it take to make an impression on him?

well clearly one needs to get inside his head to learn the story behind the scenes and behind the games statistically a few things are harder for a successful junior player to win the junior tournaments with a string of recent successes and have been promoted to the status of Soviet team member at the European team championships.



Garry Kasparov is considered by many to be the greatest chess player of all time. From 1986 until his retirement in 2005, he dominated the chess world, ranking world number 1 for most of those 19 years. While he has many historic matches against human chess players, in the long arc of history he may be remembered for his match against a machine, IBM's Deep Blue. His initial victories and eventual loss to Deep Blue captivated the imagination of the world of what role Artificial Intelligence systems may play in our civilization's future.

That excitement inspired an entire generation of AI researchers, to get into the field. Garry is also a pro-democracy political thinker and leader, a fearless human-rights activist, and author of several books including How Life Imitates Chess which is a book on strategy and decision-making, Winter Is Coming which is a book articulating his opposition to the Putin regime, and Deep Thinking which is a book the role of both artificial intelligence and human intelligence in defining our future.

243.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

CHAPTER

FOUR

HANS NIEMANN WINS 27TH TEPE SIGEMAN & CO TOURNAMENT, ARJUN ERIGAISI SECOND

Recently, the tournament organised in Sweden in Malmo featured a round-robin among eight players of different ages and backgrounds. Once again, this mixed field led to lots of interesting games.



Image credit: Lars OA Hedlund/TePe Sigeman & Co Tournament 2022

The American prodigy GM Hans Niemann drew his last round game against the defending champion, Jorden van Foreest from The Netherlands to win 27th edition of Tepe Sigeman & Co Chess Tournament 2022. Niemann finished a full point ahead of the field at 5.0/7. This is Hans' second consecutive tournament triumph within the span of around 20 days. With a live rating of 2673.8 Hans is now World no.68 in classical time format. Arjun Erigaisi from India, Nils Grandelius from Sweden and Michael Adams from England scored 4.0/7 each. They were placed second, third and fourth respectively according to their tie-break score in final standings. The maximum number of decisive games were played by UAE no.1 Salem Saleh-six.



Niemann vs. Erigaisi. Image credits: Lars OA Hedlund/Tepe Sigeman & Co Tournament.

Niemann started with two draws and ended with two draws, and won three games in the middle. In a clash of upcoming generation players, he with a good technique outplayed Indian star GM Arjun Erigaisi in an endgame. This win was the real separator between winner and runner up.

Upcoming task for Niemann is the Bundesliga, the Sharjah Masters, the Prague Masters, after that a tournament in Armenia, and again the Bundesliga. In one of the previous year he played whooping 259 classical rated games and this year he expects to play 150, which he considers less than what he wants to actually play.

It seems obvious that his first goal would be to cross 2700, but Niemann didn't want to reveal anything regarding his future ambitions when interviewed by GM Erwin l'Ami he said "Let's just say I will be continuing to work very hard and try to improve."

After winning the tournament Niemann said "If you're organizing any strong tournaments, please invite me. I would like to play nonstop!" which clearly says it all about his ambitions to cross 2700.

244.1 About the Author

Jashwaneel Patil is a student pursuing Bachelor of Engineering and a young mind who likes to explore and research in different areas. His vision lies in making Earth a better place to live with taking small steps towards sustainability and making best use of technology available to make easier life for mankind.

CHAPTER

FIVE

HIKARU WINS FIRST LEG OF GRAND PRIX: LEVON STUNNED

Hikaru Nakamura won the first leg of Grand Prix series organized at Berlin in a spectacular way against Levon Aronian in tie breaks. With this win Nakamura pocketed 13 point and became one of the favorites to win spot in Candidates. Hikaru Nakamura won €24,000 in prize money.

Chess fans witnessed the dramatic fight between US grandmaster and streamer Hikaru Nakamura and top professional Levon Aronian. In a first tie break game Hikaru caught Levon off-guard and got out of opening with better position. Levon fought resiliently and got some chances to hold position but as Levon's time was getting low mistake happened and Hikaru won by flagging Aronian anyways Levon was having lost position. In second game Aronian was white and played a slow Italian opening and got some edge out-off opening heading towards middle game. Levon was forced to go all in to force Armageddon, Even draw means losing in this situation. In this tough spot Levon over-pressed and gave advantage to Hikaru. Hikaru ultimately converted won position with great technique. And Hikaru won tiebreaks with sheer dominance on full time top professional chess player Levon Aronian.



Levon Aronian and Hikaru Nakamura. Photo: World Chess

Immediately after the final game of the tiebreak at the playing venue closing ceremony was conducted in which the winner and runner-up were awarded their winners medals by Ilya Merenzon, CEO Of World Chess and Ivan Syrovy, Chief Arbiter of the event.

Grand Prix point after completion of first leg are as follows;

1. Hikaru Nakamura, (USA), 2736 — 13 points

2. Levon Aronian (USA), 2772 — 10 points
3. Leinier Dominguez (USA), 2752 — 7 points
4. Richard Rapport (Hungary), 2763 — 7points
5. Wesley So (USA), 2772 — 4 points
6. Radoslaw Wojtaszek (Poland), 2686 — 4 points
7. Andrey Esipenko (Russia), 2714 — 4 points
8. Vidit Gujrathi (India), 2727 — 3 points
9. Daniil Dubov (Russia), 2720 — 3 points
10. Alexander Grischuk (Russia), 2764 — 2 points
11. Vladimir Fedoseev (Russia), 2704 — 2 points
12. Pentala Harikrishna (India), 2717 — 2 points
13. Grigoriy Oparin (Russia), 2681 — 0 points
14. Etienne Bacrot (France), 2642 — 0 points
15. Vincent Keymer (Germany), 2664 — 0 points
16. Alexei Shirov (Spain), 2704 — 0 points

The winner of first leg and streamer Hikaru said in interview “Definitely I didn’t prepare anything because I was not expecting to win. First of all I would like to thank the organizers and arbiters. I want to thank the fans. They are very interested in chess and Germany has a long history with this great game and seeing them coming was very nice. And of course to Levon he played really well, he came a bit short to the last games but I hope we both have chances to qualify for the Candidates. It was generally a great experience and looking forward to be back in Berlin in about 3 weeks. Thank you!”

245.1 Reference

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245.2 About the Author

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CHAPTER

SIX

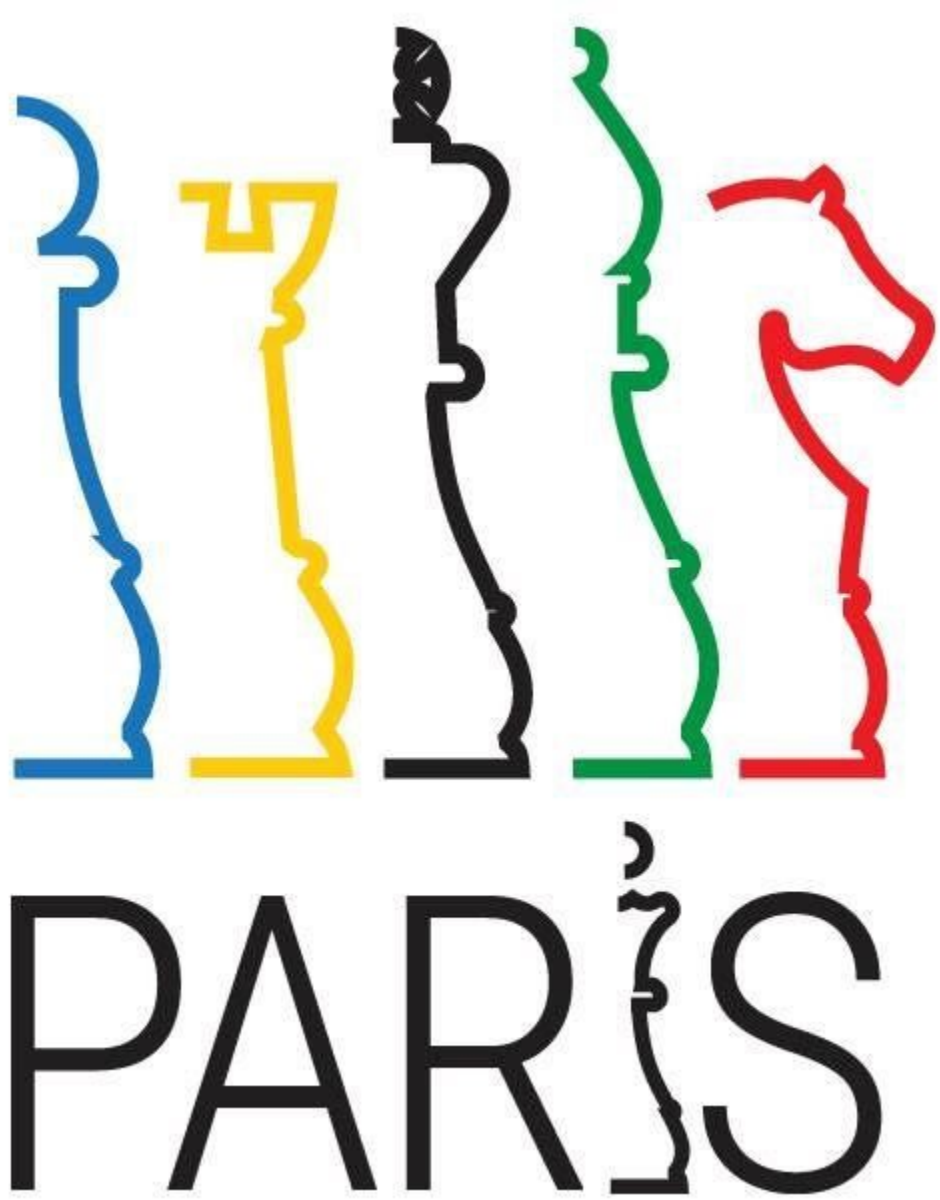
INCLUSION OF CHESS IN OLYMPICS

Chess is oldest game known to mankind and played since ancient times. A single game of chess to play requires different qualities and skills like calculation of complex positions, concentration, decision making, pattern recognition, etc. which requires serious mental strength. In a classical game of chess which normally goes on for 5 to 7 hours drains the energy of the players. Also, chess is considered as most intellectual game. It is most played game across the globe still it is still not included in Olympics despite of the attempts made by FIDE.

One of the main reasons for non-inclusion of chess in Olympics is Chess is not recognized as sport by International Olympic Committee (IOC) before 1920 while governing body of chess which is FIDE is recognized by IOC. Chess today is recognized as sport and almost every country in the World has Chess athletes. In chess Olympiad which is totally different event from Olympics around 170 nations participate. But, after so much struggle still chess is yet to be featured in Olympics.

FIDE and different nations committee are running campaigns for inclusion of chess in 2024 Paris Olympics. Chess fans across the world are hoping that after the chess boom in 2020 the Paris Olympics can be the perfect timing of witnessing chess in Olympics. France also has good culture of chess now the decision is in the court of France that shall France be the first country to include chess.

The official notice of FIDE on Facebook posted “Chess becomes a candidate to join Paris 2024 Olympic Games. The official launch of the campaign took place on the 12th of February in Paris. FIDE President Arkady Dvorkovich and French Chess Federation President Bachar Kouatly met with the French press to promote the vision of chess as a sport. Rapid and blitz are the formats of play considered for the Paris 2024 competitions. Chess is played by millions of people every day and is also growing in France, where 67% of the members of the French Chess Federation are aged under 18 years old. FIDE was created in Paris in 1924. Inclusion of chess in the Olympic program of Paris-2024 would be an outstanding symbolic gift for FIDE’s 100th anniversary.”



Chess at the Paris Olympic Games 2024? | Photo: FIDE Facebook page

After all this struggle we can assume that it is not far that we will witness chess action in Olympics. If countries with large number of chess enthusiast and serious chess environment get the chance to host Olympics in future that country can surely flex about its achievement of pushing and finally including chess in Olympics.

246.1 About the Author

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CHAPTER

SEVEN

INDIA WINS BID FOR HOSTING CHESS OLYMPIAD, ALL SET TO HOST MOST AWAITED CHESS EVENT

The 44th FIDE Chess Olympiad will be held in Chennai, Tamil Nadu, India. This news was announced at a press conference in Chennai on Wednesday, after the FIDE Council had announced that India won bid the night before. The event was originally to be held in Russia but the war in Ukraine made it impossible. The Olympiad will take place in July/August, "not very far off from the dates originally planned," FIDE said. The original dates were 26 July-August 8, 2022.

It will be the first time ever that India will host Chess Olympiad. Bharat Singh Chauhan, the secretary of the All Indian Chess Federation(AICF) and the tournament director, called it a "historic press conference" and "big moment for all of us." He talked about how fast everything happened, from the moment FIDE decided to cancel Moscow until Chennai won the bid. "It was very quick. We met the Tamil Nadu's CM, M. K. Stalin, and within five minutes he agreed." The official approval letter was sent in a few hours later, and on the very same day, 1,200 rooms were booked in hotels in Mamallapuram. "Now we have booked nearly 3,000 rooms, so things are moving very quickly," Bharat Singh exclaimed. The venue will be the Four Points by Sheraton Mahabalipuram Resort & Convention Center, 60 kilometers south from central Chennai. It is located in Mamallapuram, one of the famous tourist sites in India and a UNESCO World Heritage Site of seventh- and eighth-century Hindu monuments.

Dr. Sanjay Kapoor, the president of the All India Chess Federation and the president of the organizing committee, called Chennai "the Mecca of chess in India" and said it was a "matter of pride" for Chennai and Tamil Nadu and overall India to have the Olympiad. Located in the south eastern Indian state of Tamil Nadu, Chennai has the legendary 15th world champion, Vishy Anand, among its seven million inhabitants, as well as the talented GM Praggananda R.



India for FIDE chess Olympiad 2022

The chess tradition of Chennai goes even further back, as the first Indian chess player to ever achieve the international master title, Manuel Aaron, also was from city of Chennai. It will be the first time ever that an Olympiad is held in India and the biggest chess event India has ever hosted, after the 2013 world championship between GM Vishwanathan Anand and GM Magnus Carlsen.

The last Olympiad, the 43rd edition, was held in Batumi, Georgia in 2018. The 2020 Olympiad was originally awarded

to Minsk, but the city withdrew its candidacy following the political issues in Belarus. Online Olympiads were held in 2020 and 2021 during the Covid pandemic, while the new OTB Olympiad was postponed and was set to happen in Moscow, Russia. The war in Ukraine forced FIDE to take action and move the event another time. The Indians have set the major task of pulling off a historic task: preparing an Olympiad in just four months. Bharat Singh: "The experience with Delhi Chess Open, the largest event of its kind in the world, will be a big help, as we have already dealt with large numbers. But Olympiad is a big game. I am sure we will make it the best."

247.1 About the Author

Jashwaneel Patil is a student pursuing Bachelor of Engineering in Electrical and a young mind who likes to explore and research in different areas. His vision lies in making Earth to make a better place to live with taking small steps towards sustainability and making best use of technology available to make easier life for mankind.

CHAPTER

EIGHT

JAN-KRZYSZTOF DUDA WINS OSLO ESPORTS CUP AHEAD OF MAGNUS AND OTHER TOP GRANDMASTERS

Polish no. 1 Jan-Krzysztof Duda is the winner of the Oslo Esports Cup after his last round victory over Eric Hansen which was proved sufficient to claim the title when Magnus Carlsen and R. Praggnanandhaa crashed to defeat in their last round. Both leaders before the last round, lost two games, with Magnus falling to Shakhriyar Mamedyarov while Anish Giri defeated young Indian star Praggnanandhaa. Liem Le could still have won the title ahead of Duda, but fell just short of the 3 points he needed when Jorden van Foreest defeated Liem Le in the tiebreaker of their last round.



Image Credits; Chess24

Three matches in the final round of the Oslo Esports Cup were decided after minimum numbers of games that is three rapid games. While it was not unexpected that Jan-Krzysztof Duda defeated a Canadian streamer and Grandmaster Eric Hansen by a 2½-½ score, the quick losses suffered by coleaders Magnus Carlsen and Praggnanandhaa were rather shocking.

Duda and Le Quang Liem were trailing Carlsen and Praggnanandhaa by a single point before last round. In this tournament, victory in the 4-game rapid portion of the match granted 3 points to the winner, while a match decided in blitz tiebreakers granted 2 points to the winner and 1 point to the loser.

The eventual champion's crushing victory over Hansen gave him clear victory, while Le also overtook Carlsen and Pragg, but only managed to collect 2 points, as he defeated Jorden van Foreest in tiebreaks.

For Duda, this triumph will be a great confidence booster, as we are less than two months away from the start of the Candidates Tournament in Madrid, Spain. The Polish star, grandmaster Duda will be one of eight players fighting for the spot to challenge Magnus Carlsen in the next World Championship match — if the Norwegian decides to defend his crown.

248.1 About the Author

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CHAPTER

NINE

THE GREATEST ATTACKING PLAYER IN CHESS HISTORY



He was known by many names; the magician from Riga, the pirate of Latvia, Fortunes favorite, the hypnotist and so on.

Mikhail Tal was born on 9th of November 1936. He was a Soviet Latvian chess grandmaster and the eighth world champions from 1960 - 1961. Widely regarded as a creative genius and the best attacking player of all time Tal played in a daring combinatorial style. His play was well known above all for improvisation and unpredictability. Every game, he once said, was as inimitable and invaluable as a poem.

The Mikhail Tal memorial has been held in Moscow annually since 2006 to honor Tal's memory.

He was born in Riga, Latvia into a Jewish family. According to his friend Gennadi Sosonko, his true father was a family friend identified only as uncle Robert. From the very beginning of his life he suffered from illness. Tal learned to read at the age of three and was allowed to start university studies while only 15.

At the age of 8 Tal learned to play chess while watching his father, a doctor and a medical researcher.

shortly thereafter he joined the Riga palace for Young Pioneers chess club. His play was not exceptional at first but you worked hard to improve. Alexander Koblenz began tutoring Tal in 1949 after which Tal's game rapidly improved and by 1951 he had qualified for the Latvian championship. In the 1952 Latvian championship Tal finished ahead of his trainer. Tal won his first Latvian title in 1953 and was awarded the title of candidate master.

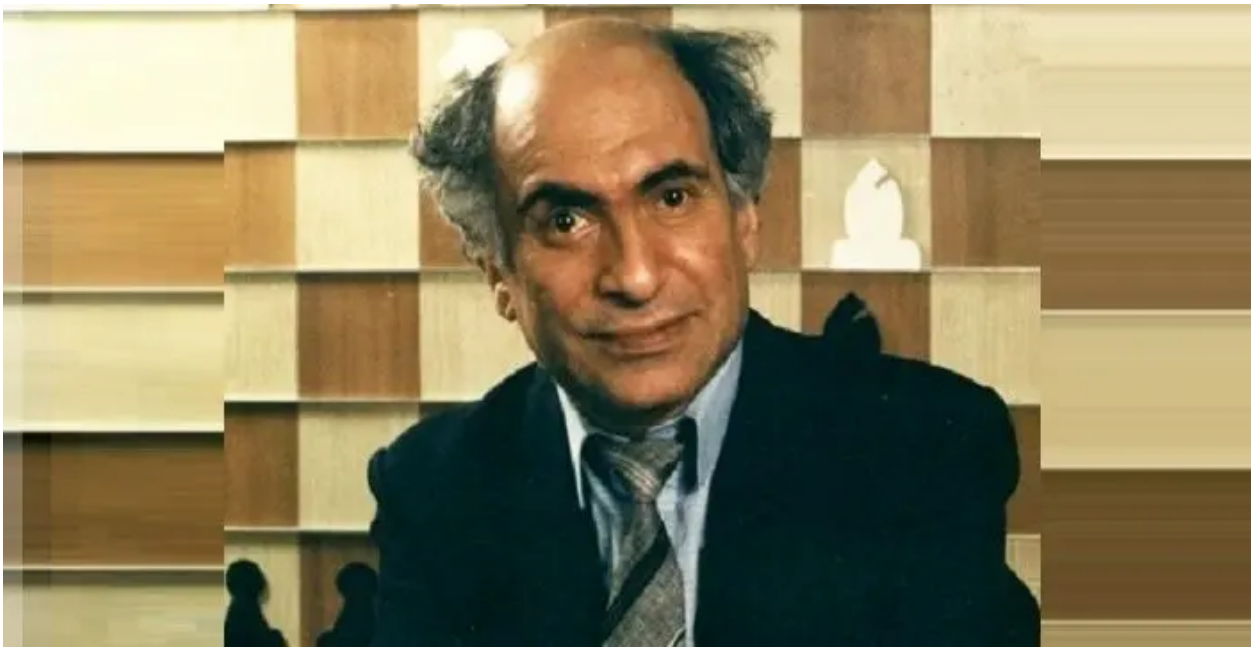
He became a Soviet master in 1954 by defeating Vladimir Saigin in a qualifying match. That same year he also scored his first win over a grandmaster when Yuri Averbakh lost on time in a drawn position.

Tal won a very strong tournament at Zurich in 1959. Following the internal zonal the top players carried out to the candidate's tournament, Yugoslavia, 1959.

Tal showed superior form by winning with 20 out of 28 points ahead of Paul Kares with 18,5 followed by Tigran Petrosian, Vasily Smislov, the sixteen-year-old Bobby Fischer, Svetozar Gligorić, Friedrich Olafson and Paul Benco.

Tal's victory was attributed to his dominance over the lower half of the field while scoring only one win and three losses vs Keres. He won all four individual games against Fisher and took three and a half points out of four from each Gligorić, Olafson and Benko.

Tal was absolutely unique. His playing style was of course unrepeatable. He was a man in whose presence others sensed their mediocrity.



Tal was playing against grandmaster Vasiukov. They reached a very complicated position and Tal was considering a knight sacrifice (I know what you're thinking… What else would Tal be considering :) But, to his horror, he couldn't find any good continuations.

Suddenly, he started to think about a Hippopotamus drowning in a swamp. He tried to figure out how to save the poor hypo. After 40 minutes of thinking about this problem, Tal realized that he couldn't save the poor hypo and that some things simply can't be calculated.

He realized that the knight sacrifice was purely intuitive and it promised an interesting game. The following day, the newspapers wrote how Tal, after thinking for 40 minutes about the position, managed to calculate all the variations and win the game with a great knight sacrifice. Little did they know that a poor hypo had to drown for Tal to win the game.

Mikhail Tal married three times. In 1959, he married 19-year-old Russian actress Salli Landau. This marriage lasted for 11 years and ended in divorce in 1970. His second marriage too did not last long. He later on married Angelina Petukhov who worked in the Riga Shakhmaty magazine.

He had been a sickly child though he had fairly good health during his youth. He suffered from kidney problems that intensified over time. He underwent several surgeries over the years and even lost a kidney to his illness. An eccentric man with a bohemian lifestyle, he became addicted to smoking and drinking which further affected his health.

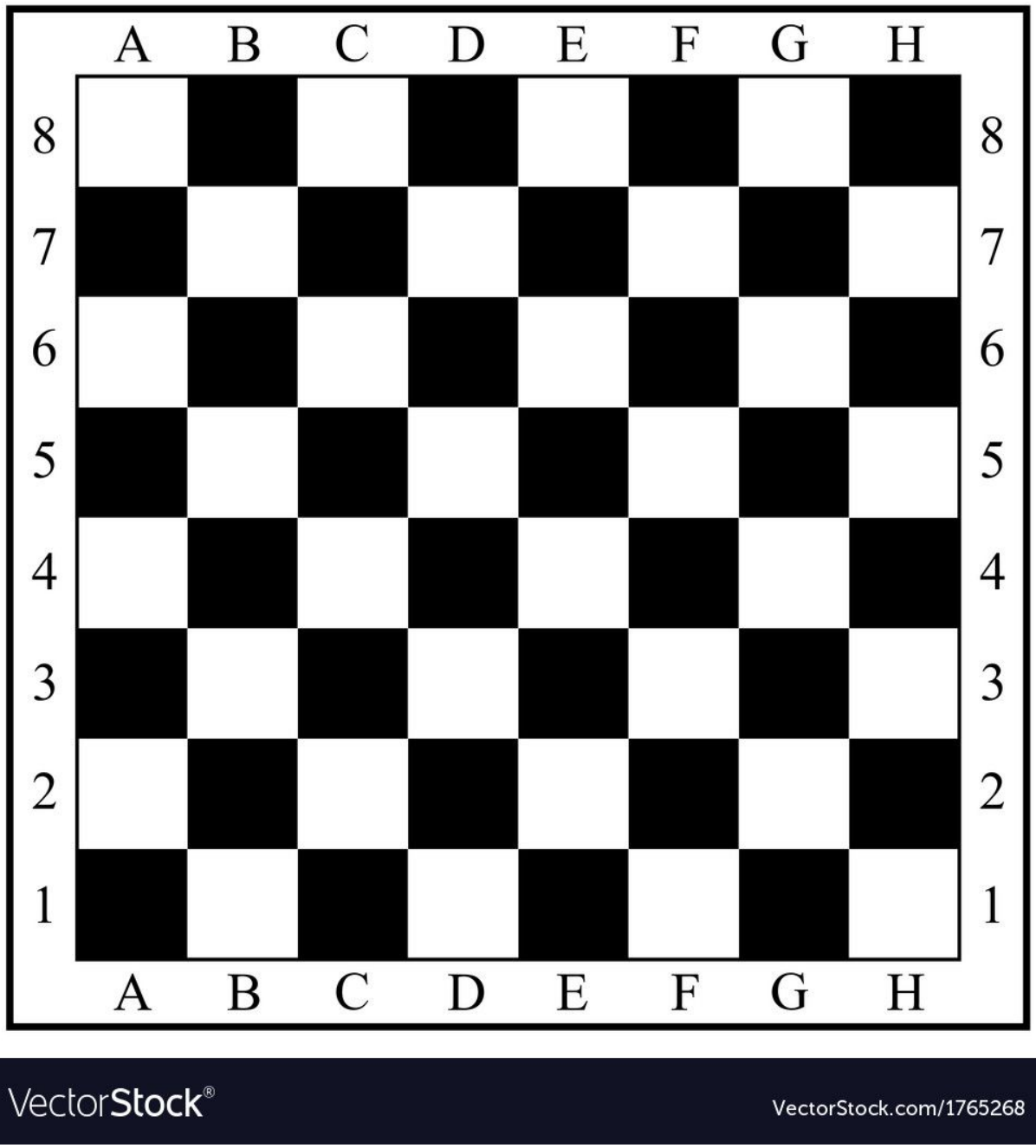
Mikhail Tal died on 28 June 1992 of a haemorrhage in the esophagus. He was just 55.

249.1 About the Author

Mujahid Al-Majali, a 29-year-old former air force soldier and an economic development and business specialist, also does translation and copywriting. Loves long drives, chill music and old school movies. A nicotine addict and a huge fan of Jack Daniel's whiskey. Owned multiple businesses in Amman and southern of Jordan PRE-COVID and now focusing on translation and copywriting part of my experience through Upwork.

NO TWO SITUATIONS OR EVENTS ARE EXACTLY THE SAME IN LIFE AND IN BUSINESS SO IS YOUR 64 BLACK AND WHITE SQUARES ON YOUR CHESS BOARD

Nothing stays the same; everyone and everything changes with time, no wonder “what goes around comes around”, as the book of Proverbs advices. Circumstances, events, and happenings seem to repeat themselves, leaving us with a sense of “de javu” and, in most situations, “a probability.”



Picture1.0: The Chess Board

Probability theory is a branch of mathematics concerned with the study of random events that cannot be anticipated in advance but can have a variety of possible outcomes and are said to be determined by chance.

When a situation repeats itself, we react in the same way we did before, recycling behaviors and patterns. Our default subconscious mind is where this happens.

When confronted with a circumstance, your default mind either recalls similar occurrences from the past or creates new ones by making connections between present and past occurrences. In certain situations, this is a good way to think, but not in all cases. We usually go back into a pattern of conduct and habit most of the time, forgetting that not all conditions, occurrences, phenomena, or events are **exactly** the same.

Many conditions and occurrences may appear to be the same on the surface, but digging deeper reveals a few unexpected twists, turns, and bends that are unfamiliar. How many times have you noticed that something that looked to be the same wasn't exactly what it was? According to Einstein, "the only thing I know is that I know nothing". "Subtle Act of Not Giving a F*ck" author Mark Manson says that you are not fully wrong, but rather more or less wrong, and that the more you know, the less you are wrong.

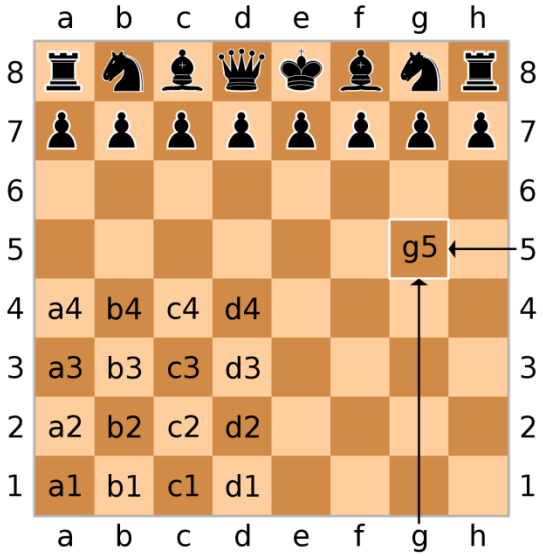
We eventually come to realize that our ideas and customs are not what we thought they were as time passes by. My elder brother and I graduated from the same high school, which is a boarding school, and most of the male students in his graduation set believed at that time, that the more unkempt a male is, the more macho and attractive he is to the opposite sex. Fast forward today, after 17 years, he (my older brother) recognizes that unkemptness has nothing to do with manhood, respect, or machismo. As time passes, he will understand that masculinity is far more than well-kept hair, nails, and polished shoes; now, he is an entrepreneur and a business magnate who has learned to unlearn certain beliefs and perceptions about life, people and business.



Picture 1.1: Strategic Business Planning

Every economy's lifeblood is business right? When two or more individuals zinteract formally or informally, business occurs consciously or subconsciously, which is why business (money) makes the world go round.

Every successful business requires the grouping of two or more people with the goal of achieving a desired result between or among the parties involved. However, no two of these meetings are alike; they may appear similar, they may appear familiar, but they are not 100% identical; why shouldn't you look out for the puzzle?



Picture 1.2: Showing the Fusion of a Rank and a File (g5)

The chess pieces are placed on a 64-square chess board with eight rows and eight columns.

It has a square shape and uses bright and dark square colors in checkered patterns.

Each player's right-hand corner square is brightly lit on the board.

A chessboard's columns are known as file while the rows as rank.

In either algebraic or numeric chess notation, each square on the board is assigned a name.

From left to right, files are marked letter A-H, and ranks are numbered 1 through 8 in from top to bottom.

Despite similarities in appearances, size, color and looks, yet different in computation, structure and formation. Each square is a fusion of a rank and a file, that is, a number and a letter, which differentiates each square from the other.

Like the chessboard with the same size, same color, same appearance yet totally different structure, form and composition, so is your similar phenomenon, events and occurrences yet different underlying capability and capacity , wisdom, and ability in your life and business.

Even if you look, talk, and appear the same as everyone, you will never think, respond, or process life and business in the same manner. At the end of the day, we are not identical. This becomes possible because you now have the capacity to be open minded to unlearn and relearn ideas, beliefs, and perspectives. Realizing that you and the person next to you are not exactly the same helps you to be more tolerant, patient, and loving. This permits you to embrace change, broaden your thought process, and increase your uniqueness. This is what distinguishes you.

Continually use your past experiences only as a guide to treat and react to events, phenomena, and situations as they unfold across time because no two life is Ever exactly the same.

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250.2 About the Author

Samuel Obande is a Linguistics graduate of the University of Jos, Nigeria. During his compulsory one year national service while volunteering as a teacher in his neighborhood where only a few children could read and write English in the city of Gombe 2019, he started a food processing company Kingz Fudz from the leftover space in his one bedroom apartment and sold its first batch of product (White beans) on the streets.

Today, Kingz Fuds (Beans) can be found in over eleven supermarkets and stores within and outside the state, as well as in two varieties: White and Brown Beans (1kg)

Samuel adores children and hopes to have two (2) in the future. He likes to write, cook, and play chess.

CHAPTER

ONE

RICHARD RAPPORT WINS THE SECOND LEG OF GRAND PRIX: ALMOST QUALIFIED FOR CANDIDATES

In the finals of the second leg of the Grand Prix, chess fans witnessed a match between Hungarian GM Richard Rapport and Russian GM Dmitry Andreikin. Andreikin beat Anish Giri in the semi-finals in a very exciting tie- breaks game where Giri was having an overwhelming position but in a very crucial moment Anish blundered and Andreikin did not miss the opportunity and made his way to the finals. While Richard Rapport defeated Maxime-Vachier Lagrave. MVL had some chances but could not channelize his advantage into win. With this loss, the chances of MVL almost came to an end, but with good tiebreak score and win in the last Grand Prix series is only way.



Richard Rapport:credits World Chess

In finals, the two classical games were fighting chess but Rapport showed his creative genius and won the match. This Grand Prix win gave Rapport 13GP points and it is almost certain that Rapport qualifies for Candidates. Rapport can only miss his spot to candidates only if Anish Giri, Leinier Dominguez, or Maxime Vachier-Lagrave win the tournament for Rapport to be disqualified and only if one of these players outscores him on tiebreak criteria.

Richard Rapport did not shy away from showing his usual creative playing style in the first two legs of the Grand Prix,

and has demonstrated thathe is particularly well versed in dealing with imbalanced and sharp positions.

In the second game of the final match in Belgrade, Richard Rapport had the white pieces and managed to get Andreikin spending considerable amounts of time from as early as move 5. A tense and complicated game in the opening and early middlegame gave chances to both players as the time control was approaching. On move 26, the contenders began to repeat moves, signalling an implicit draw offer. After the same position appeared twice on the board, though, Rapport decided to take his chances by deviating into a double-edged struggle — despite only having two minutes on the clock with over 10 moves to go to reach the time control.

The brave decision paid off. Andreikin soon faltered, and Rapport made the most of his chances in an excellent display of calculation and technical abilities to take home tournament victory, €24,000 in prize money and a near-certain qualification to the Candidates.

251.1 About the Author

Jashwaneel Patil is a student pursuing Bachelor of Engineering in Electrical and a young mind who likes to explore and research in different areas. His vision lies in making Earth to make a better place to live with taking small steps towards sustainability and making best use of technology available to make easier life for mankind.

CHAPTER

TWO

SHOULD CHESS BE ADDED IN ACADEMICS?

Chess is a mental sport which is played since ancient times, the Chess we play today is evolved from many different variants of chess but the *'Chaurang'* believed as first of such variants played in India and later travelled across the world in different variants played in different parts of the World. Today, Chess has developed lots of theories, studies, strategies, principles, etc. and have become a very rich and entertaining game to play as well as watch. Even though being a board game Chess is not solved and there are so many permutations, combination, uncountable positions which keep the game evolving and professional explore through it with so much passion. With modern engines and technology like Stockfish, Leela, Alpha-zero, etc., coming in picture human has started to learn different and unexplored factors which ultimately improves quality and excitement in chess game. To watch engines play and the moves which engines play or suggest in particular position of chess game boggles mind of top Grandmasters and persons studying chess.

Chess is a game which requires focus, calculation, mental strength, creativity, strategy, decision making and countless other things which make a person good not only in game but in Life and Academics. It is not only about winning material, protecting king but also about coordinates, finding geometrical patterns, deciding on best possible outcome, consequences of decision, etc. The chess can become an excellent educational tool which will help child to improve and inculcate all this qualities which will be lifelong.



Chess in Education Commission(FIDE)

A study by Smith and Cage (2000) posited that students who received chess instruction scored significantly higher on all measures of academic achievement, including math, spatial analysis, and non-verbal reasoning ability. Other findings in various locations around the United States and Canada indicate that chess results in improved scores on standardized tests in both math and reading.

Playing chess also improves memory which is proved by Robert Ferguson in an experiment conducted where he took fourteen 6th graders to provide them with chess lessons to check their memorizing capabilities. Students played chess daily for a year. In the end, with the help of the "memory subtest from California Achievement Test battery," the results revealed that students who played chess daily had developed their memory power more effectively as compared to the general population. Research indicated that students who play chess instantly understand concepts and better correlate them with cognitive patterns. In short words, it connects the symbolic equations with understandings.

After going all this studies and researches conducted across the world it is certain that chess has only benefitted and by

adding chess in academics and making a standardized syllabus or studying pattern can help children to excel in different fields and as a whole increase productivity and efficiency of whole world. This is truly exceptional by adding particular game in academics can change the future.



CPS Academic Chess Programs

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252.2 About the Author

Jashwaneel Patil is a student pursuing Bachelor of Engineering in Electrical and a young mind who likes to explore and research in different areas. His vision lies in making Earth to make a better place to live with taking small steps towards sustainability and making best use of technology available to make easier life for mankind.

CHAPTER

THREE

TATA STEEL CHESS WIJK AAN ZEE 2022

The Tata Steel Chess Tournament is an annual chess tournament held in January starting the academic calendar of elite chess tournaments. It is held in Wijk Aan zee, the Netherlands and is considered as 'Wimbledon of Chess' in which top Grandmasters from across the world are invited which fight in 13 rounds of single round robin format. There are different events arranged in Wijk Aan zee during first month of the year viz; Tata steel chess festival, Amateur chess tournament, online tournaments, etc.

Recently Tata steel chess hosted its 84th edition of prestigious tournament in 2022 GM Anish Giri as tournament ambassador. World Champion GM Magnus Carlsen emerged as a winner of 84th edition with one round to spare and 1.5 points ahead of the equally strong field with undefeated and 6wins in 13 rounds of which one win was by forfeit against Russian GM Daniil Dubov who was tested covid positive and have to end his tournament with 3 rounds remaining. GM Shakhriyar Mamedyarovand GM Richard Rapport were tied on 2nd spot with 8 points each. The challengers section of this edition was won by 18-year-old Indian sensation GM Arjun Erigaisi whose performance was class apart in challengers' section and booked a spot in next year's Masters section.

GM Magnus Carlsen won his 8th title in Wijk Ann zee in fashion by beating top GM Fabiano Caruana with black pieces in 12th round with right exchange sacrifice and converted endgame in his style. "I think there have been a lot of good moments here in this tournament. I think I have had nine winning positions and I converted five of them which is probably one or two too little, considering what I had. There are a lot of positives, especially compared to the last couple of years where I didn't play well and frankly didn't get many chances. So, the huge amount of chances that I got, it's of course partly due to my opponents playing a bit weaker than usual but l think I also managed to create more of them than normal. Obviously, the total score +5 is great and more than enough for tournament victory but there is always this thought that it could have been even better, that will have to be another time. I am really satisfied in general." - Magnus Carlsen said on his performance at 84th Tata Steel Chess 2022 Masters.

30th, January 2022

CHAPTER

FOUR

THE PAWN



Has someone ever referred to you as a pawn? That's fine since we're all pawns, including the one who labeled you a pawn. This is something you should know right now!

Everyone was once a pawn, including Michelle Obama, Ellen, Oprah, Beyoncé, Joe Biden, Dangote, and you!

A pawn is a chess piece that is unprotected, unnoticed, and extremely vulnerable. Because of its evident restrictions, it is regarded as the board's weakest piece.

On a chess board, pawns make up the majority of the pieces. Take a careful look at yourself; did you just discover you're a member of society's majority? Have you ever become disoriented in a crowd? That's OK.

Every pawn is designed to defend an official, but no official is required to defend the pawn until it chooses to do so. You are built to defend someone or something by default, yet nothing defends you, or does it? Continue to go forward.

The majority of the time, the pawns are utilized as bait. How many times have you been exploited to buy something for someone and not been appreciated for it? You're not on your own.

They (pawns) capture diagonally, which means that in order to survive, you must learn to shift directions and not become obsessed on a single object. Accept and embrace change.

Blocking pawns is simple. To be honest, anyone can stop you from progressing. Anybody. This includes the individual you dismiss, ignore, or dislike. Continue to be humble.

These fascinating chess pieces accomplish a one-of-a-kind capture between them known as “En Passant.” When dealing with others with similar brains, social standing, financial resources, and situations, knowing your boundaries is a good idea. Please do not trespass.

You, like the pawn, are probably moaning and nagging about all the limits that surround you. There is a restriction of one or two movements ahead (only at first movement). Limitation fades away.

Pawns never go backwards in the game. It’s not in your nature to withdraw or submit. You have a lovely, bright, and promising future ahead of you. Never, ever, ever, ever, ever, ever, ever, ever, ever, ever

Once a pawn has successfully reached an opponent’s back rank, they must be promoted to any official of their choice. At the conclusion of the day, you will automatically receive the victory crown. When you successfully complete that race, you must undoubtedly be known, admired, feared, and invincible. Because you can no longer be stomped, fooled, or controlled, this process is unavoidable. You’ve done it!!!

This post is dedicated to the homeless African-American, the single parent, the LGBT boy, the sad mind, the Ukrainian Refugee, and the girl who doesn’t belong. You are the subject of this work.

254.1 About the Author

Samuel Obande

CHAPTER

FIVE

WESLEY SO WINS FINAL LEG OF FIDE GRAND PRIX SERIES, HIKARU AND RICHARD QUALIFY FOR CANDIDATES

The final match of the FIDE Grand Prix 2022 series organised by World Chess was finished on April 4th. In the final match tiebreaker GM Wesley So of USA defeated his countrymen GM Hikaru Nakamura by a score of one and half : half and won the third leg of the Grand Prix in Berlin. The tournament winner and the runner-up looked happy at the closing ceremony as both of them were successful in the major tournament and world championship cycle. Despite the loss in the final match, Hikaru Nakamura qualified for the FIDE Candidates Tournament 2022 and became the overall winner of FIDE Grand Prix Series 2022. Richard Rapport, who is the second in the overall standings and also qualified for the Candidates, while Wesley So was third in overall Series.

After the match ended, Wesley So said: "I am only 28, and I'm hoping that next year or in a couple of years, I will get a chance to play in the Candidates. The last time I played, I was very inexperienced and finished second to last, so I think if you qualify, you have to be ready to fight for first place."

Hikaru Nakamura: "The odds [of winning the whole series] were probably 10-15% before everything began. I was quite fortunate in the first leg as I got players who hadn't played as much; they weren't sharp."

In the first tiebreaker game, Hikaru played the Bishop opening with white, which was a shocker to Wesley So as he didn't expect to see this on the board today. However, Wesley played confidently with Black and got a decisive positional advantage by move 15. Hikaru showed his excellent defensive skills and tenaciousness, and after a couple of mistakes by Wesley, he managed to create a very dangerous attack on the kingside. It was Wesley's turn to find the only moves to defend his position and stay in the game. After several evaluation swings and Evaluation bar dancing in this complicated game, the opponents split a point in a drawish rook ending.

In the second game, the Berlin Defense in Ruy Lopez was played. White managed to get a pleasant edge, but the position seemed quite balanced until a certain point. Wesley exchanged the queens at the cost of doubling his pawns on the d-file but with creative play made some initiative in the center. On the 32nd move, Hikaru made a terrible blunder and after a simple refutation found himself in a hopeless position. Wesley emerged a piece up and then slowly with good technique converted his advantage to win the game and the match.

FIDE Grand Prix Series 2022 final standings:

255.1 About the Author

Jashwaneel Patil is a student pursuing Bachelor of Engineering and a young mind who likes to explore and research in different areas. His vision lies in making Earth to make a better place to live with taking small steps towards sustainability and making best use of technology available to make easier life for mankind.

CHAPTER

SIX

THE AUSTRALIAN OPEN

The Australian Open is the first, referring chronologically, to be held of the four tournaments that make up the Grand Slam. It takes place every January within the sports complex located in Melbourne Park, which is located in the city of Melbourne.



Photo of the Australian Open taken by Vamosrafapuntoes extracted from flickr

The tournament was created on November 17, 1905 and at that time it was called the “Australasian Championship”, but it was renamed the “Australian Championship” in 1927. Later the Open Era was introduced in 1968, where it was allowed participation in the tournament for professional players, so that it changed its name in 1969 to the “Australian Open”.

Its first editions were played on the Kooyong grass courts that were located on the southeast side of the city of Melbourne, however the expected notoriety was not achieved, so it was decided to move the competition to its current location in Melbourne Park, which was then known as Flinders Park. This new complex had concrete tennis courts and

was close to the Melbourne Cricket Ground in the southern part of the financial district. Player Mats Wilander was the only one capable of winning the tournament on both grass and hard courts.

As with the rest of the Grand Slam tournaments, the competition is also divided into categories as we know them, there are individual categories for both men and women, in the same way there is the doubles category for both sexes and the mixed doubles, which are couples made up of a man and a woman, there are also competitions for veteran and junior players, in recent years competitions for players who are in wheelchairs have been included.

The main courts of the complex are two and are named after Rod Laver and John Cain, both courts have retractable roofs, so that in case of rain or extreme heat the game can continue.



Rod Laver Arena

The tournament is held in the middle of the southern summer when the days of extreme heat definitely stand out. That is why on many occasions, the game stops and does not resume until the temperature and humidity values are not adequate.

This tournament has a high rate of attendance among fans, not in vain they have the daily attendance record for a Grand Slam tournament, it was achieved in 2008 with a total of 62,885 attendees.

A new surface was released in 2008 after 20 years using tracks from Rebound Ace. The material that covers the playing court was changed for a new one called Plexicushion, this material absorbs less heat causing less wear on the players and also allows the ball to move at a lower speed. After this change all tournaments in preparation for the Australian Open had to change their court surfaces. The material change generated some controversy in view of the similarity to the surface material used at the US Open. Since 2020 the material used on the slopes of Melbourne Park is Greenset. However, they retained the iconic blue padded acrylic court.

256.1 History of the Australian Open

The Australian Open began in Melbourne in 1905 specifically at the Warehouseman's Cricket Ground, currently known as the Albert Reserve Tennis Center where the court was grass and was administered by the Lawn Tennis Association of Australia (LTAA). Since the tournament was created it has been held in five Australian cities, of course, the city in which it has been held the most times is Melbourne with 54 editions, then Sydney where it was held 17 times, Adelaide (14 times), 7 times in Brisbane and finally 3 times in Perth, but it was also held twice in New Zealand, in Christchurch in 1906 and in Hastings in 1912.

Before 1905, both the Australian states and New Zealand had their own championships, the first being called the Victoria Colony Championship and held in Melbourne in 1880. However, players as important as Norman Brookes and New Zealander Anthony Wilding, participated very little in these tournaments, because although it is true that they existed, the tournaments were divided and unimportant. However, these previous tournaments determined some of the best Australasian players, but for example, when the Australasian Championship was held in Hastings, New Zealand in 1912, Wilding, who had been champion three times at Wimbledon, did not return to play your country of origin. Participation in tournaments was a recurring problem for many players at the time. Norman Brookes only went to Europe three times, reaching the Wimbledon Challenge Round once and then twice winning the Wimbledon Championships.



Anthony Wilding

Many players had never played in the Australian (Asian) Open or Amateur Championships. Among whom we can name the Doherty brothers, Maurice McLoughlin, William Larned, Beals Wright, Bill Tilden, Bill Johnston, Henri Cochet, René Lacoste, Bobby Riggs, Pancho Gonzales, Budge Patty, Ted Schroeder, among others. But in addition Brookes, Jaroslav Drobný or Ellsworth Vines attended only once. Even when traveling was not as difficult as in the 1960s and 1970s, such prominent players as Manuel Orantes, Jan Kodeš, Ilie Năstase or Björn Borg, if they attended at that time it was once or never.

The Lawn Tennis Association of Australia (LTAA), which is the organization in charge of managing the Australian Open, decided in 1972 that the tournament be held in a single city and they chose the city of Melbourne, given that it was the one with a greater influx as far as spectators are concerned. Thanks to the demand generated by the tournament, Melbourne Park was built in 1988 and was a resounding success, as the number of attendees increased from 140,000 to 266,436 in just one year. Although it is true that it was created in 1905, it was not until 1924 that the tournament was designated by the International Tennis Federation as a major championship.

Like the other major tennis tournaments, no tournament was organized in Australia between 1916 and 1918 as a result of the First World War. In the same way, the tournament was not held due to World War II between 1941 and 1945.

Given the geographical location of Australia, many of the foreign players did not participate in the Australian championship in view of its distance, a large part of the players had to travel for 45 days by boat from Europe to Australia, in fact, players who lived in the same Australia could not easily move between cities, since they had to make long trips by train. For example, no one from New South Wales or Victoria traveled the 3,000 km by train to the tournament in Perth, and when the competition was held in Christchurch in 1906, only 10 players participated, of whom two were Australians and it was won by a New Zealander. The first tennis players to visit Australia were Davis Cup players from the United States in November 1946.

The best players at that time were the Australian Norman Brookes who won the 1911 championship and Anthony Wilding (New Zealander) who won the 1906 and 1909 championships. It should be noted that at this time the tournament was not open to all players, since The Open Era had begun. The Australian Open was played at Milton Courts in 1969 and was open to all players, including those professionals who did not belong to any of the traditional circuits.

George MacCall's National Tennis League, which was the one that employed Rod Laver, Andrés Gimeno, Ken Rosewall, Fred Stolle, Roy Emerson and Pancho Gonzales, but prevented its players from entering the tournament in 1970, because it considered that the guarantees they were insufficient. The tournament was won that year by Arthur Ashe.



Arthur Ashe

It was not even until 1982 when the best players began to participate in the tournament, precisely because of its distance, it was also held at Christmas and the monetary gain of the prize was very low.

However, by 1983 players of the stature of John McEnroe, Ivan Lendl and Mats Wilander participated in the big tournament, who was the player who won the singles title. It was after this year's tournament that the International Tennis Federation approached the Lawn Tennis Association of Australia to change the location of the tournament, given that Kooyong Stadium was not capable of hosting a tournament that had grown in importance, it was then when it was moved to Flinders Park (now Melbourne Park), the surface of the pitch being hard and not grass. At that time Mats Wilander not only won the tournament on this surface, but he was the only player who could win on both grass and hard courts.



Mats Wilander

Before the tournament was consolidated in the Melbourne Park stadiums, the dates of the tournaments fluctuated and especially in the first years. For example, the tournament scheduled for 1919 was held in January 1920, while the tournament for the year 1920 was played in March. The tournament in Brisbane in 1923 ended up taking place in August, in order to avoid the inclement weather of that year. Subsequently, the tournament corresponding to 1977 was held in December 1976 and therefore, in December of that same year a second tournament was played, this resulted in the best players not attending.

Foreign authorities and New South Wales proposed to be the new hosts of the tournament in 2008, but this measure never materialized. However, around the time improvements to the facilities for both players and spectators began at Melbourne Park. One of the most important was that a retractable roof was placed over the Margaret Court Arena and this made the Australian Open the first of the Grand Slams to have three courts with retractable roofs. Player facilities and administrative infrastructure were also improved, including access points for the attending public. The complex extended out of Melbourne Park to nearby Birrarung Marr.



Photo of Margaret Court Arena taken by Mark Heath extracted from flickr

Since 2017, the audience can also watch the game on Show Courts 2 and 3 and each field has a capacity for 3,000 fans, while fields 4 to 15, 19 and 20 can hold up to 2,500. people with the help of temporary bleachers.

At the end of 2021, a fourth main show court was completed, with a capacity for 5,000 people and the Centerpiece ballroom was included, along with the rest of the remodeling that took place over a decade, where a building was also built for media, improved facilities for players, the public and administrators in general. In view of the renovations, it was concluded that the tournament would continue to be held inside Melbourne Park, at least until the year 2036.

Tournament organizers announced in December 2008 that the Australian Open would follow certain previous rules established by both Wimbledon and the US Open. So in the final games for the men's and women's singles competitions, tiebreakers would be introduced. However, unlike Wimbledon and the US Open, where conventional tiebreaks start at 12-12 games for Wimbledon and 6-6 games for the US Open, at the Australian Open it was decided to use a first tiebreaker of 10 points in a total of 6 games.

In 2021 the organizers found it necessary to reduce the number of staff due to the COVID-19 pandemic. To do this, they used an electronic evaluation line, which is a system capable of controlling the game with 12 cameras for each of the lanes, which is why many think that this system dehumanizes the game. When a ball goes out of the demarcated area, a robotic voice is heard saying "Out" and if there is skepticism in the decision, seconds later the image can be seen on the giant screen where the error is confirmed. Normally, the "Hawkeye" would have been called just before accepting the linesman's decision, but at the Australian Open this possibility no longer exists.

The electronic arbitration system has completely replaced the line judges, being able to control the matches in an absolute way. The voices over the loudspeakers signaling the error were recorded by eight Melbourne firefighters, police officers, paramedics and volunteers. They lent their voice to this device hosted by Tennis Australia, in order to limit interactions with players during the coronavirus pandemic. This made the Australian Open the first Grand Slam to use electronic line judging exclusively, while the US Open used it for matches taking place outside the stadium's two main courts.

When a player wins the women's singles tournament, her name is written on the trophy to perpetuate her name and the cup is awarded at the Daphne Akhurst Memorial Cup. In the same way the player who wins the men's singles, their name is written on the trophy and it is given in the Norman Brookes Challenge Cup. On the other hand, a certain amount of money is also given as part of the prize for the winner and also for all the participants who compete in the event. For example, in 2011 the prizes were $20,000 for the first round, $32,000 for the second round, $54,500 for the third round, for the fourth round a prize of $93,000 was awarded, in the quarterfinals the Prize money was $210,000, while for the semifinals it was $420,000, for the runner-up $1,100,000 and for the champion $2,200,000.



Photo of trophies taken by AO Tennis Blitz extracted from flickr

During the history of this competition, the tennis players who hold the records for the greatest number of titles are: Roy Emerson, Andre Agassi and Roger Federer in men's singles; Adrian Quist, Bob Bryan and Mike Bryan in men's doubles; Margaret Court and Serena Williams in women's singles, Thelma Cpyne Long and Martina Navrátilová in women's doubles; Harry Hopman, Colin Long, Jim Pugh, Daphne Akhurst Cozen, Nell Hall Hopman, Nancye Wynne Bolton, Thelma Coyne Long, Jana Novotná and Larisa Savchenko Neiland in mixed doubles.

256.2 Below we will show a table with the record of titles won in the men's modality



Current photo of Roy Emerson taken by Tennis Buzz from flickr

256.3 In the female modality, the players who have the records are the following:



Photo Serena Williams taken by AshMarshall extracted from flickr

256.4 Other important records

256.5 The Players who achieved both the junior and senior titles:

Men's Singles: Rod Laver, Vivian McGrath, Jack Crawford, Adrian Quist, Dinny Pails, John Bromwich, Frank Sedgman, Ken Rosewall, Ken McGregor, Lew Hoad, Stefan Edberg, and John Newcombe.

Women's Singles: Joan Hartigan, Thelma Long, Emily Westacott, Beryl Penrose, Kerry Reid, Mary Carter-Reitano, Evonne Cawley, and Chris O'Neil.

256.6 Left-handed players with the most titles:

Men's category: Horace Rice, Norman Brookes, John Hawkes, Mervyn Rose, Rod Laver (1960 - 1962 - 1969), Jimmy Connors, Guillermo Vilas (1978 - 1979), Roscoe Tanner and Petr Korda.

Female category: Monica Seles (1991 - 1992 - 1993 - 1996) and Martina Navratilova (1981 - 1983 - 1985)



Photo Monica Seles taken by John Wisniewski extracted from flickr

256.7 The greatest time distances between the first and the last title won

Men's category: Ken Rosewall won his first title in 1953 and his last in 1972, after 20 years.

Women's category: Nancye Wynne Bolton took her first title in 1937 and then won her last in 1951, after 15 years.

256.8 Players with the results with the greatest difference in the score (6-0, 6-0 and 6-0)

For the men's category: James Anderson for the first round in the year 1925, Fred Perry achieved this difference in the quarterfinals of the year 1935, then in the first round of 1949 it was achieved by John Bromwich, later Neale Fraser in the first round of the year 1953, also in the first round but from 1960 Martin Mulligan and Richard Russell obtained this result, in the first round of 1966.

In the women's category: Margaret Court and Mary Pierce achieved this feat four times, while Wendy Turnbull achieved it three times.

256.9 Highest number of games played in a final:

Men's individual category: In Melbourne 1927 Gerald Patterson defeated John Hawkes by a score of 3-6, 6-4, 3-6, 18-16 and 6-3.

Women's individual category (38 games): In Melbourne 1930 Daphne Akhurst beat Sylvia Harper with a score of 10-8, 2-6 and 7-5.

256.10 Fewest games played in a final:

Men's Singles Category (23 games): Pat O'Hara Wood beat CB St John 6-1 6-1 6-3 at Brisbane 1932; then John Hawkes beat Jim Willard 6-1, 6-3, 6-1 in 1926.

Women's singles category with (14 games): Margaret Smith won the final against Jan Lehane with a score of 6-0 and 6-2 in Sydney 1962; later Steffi Graf won over Arantxa Sanchez Vicario by a score of 6-0 and 6-2 in Melbourne 1994.

256.11 The best matches of the Australian Open

256.12 Rod Laver vs. Tony Roche in the 1969 semi-finals

The Australian Open was played on grass courts until 1987 and at that time the players used wooden rackets, and tiebreakers had not yet been agreed upon. The first set was won by Laver 7-5 and the second set was memorable and endless with a score of 22-20, where Laver managed to break serve in game 41 and won it. For the third set again Laver took a 3-2 lead, but Roche managed to recover by winning the third set by a score of 11-9, to then dominate the fourth set where he won the first 5 games and that's when Laver recovered and passed to be dominated in that fourth set, to win the deciding set 6-3.



Rod Laver

256.13 Chanda Rubín against Arantxa Sánchez in the Quarterfinals of the year 1996

This 1996 final was exciting because it lasted three hours and 33 minutes, making it the longest (women's) match at the Australian Open. Rubín was leading the third set 4-1, but she wasted two chances on Sánchez's serve at 5-4. Later in game 28, Rubín obtained two more match points and Sánchez managed to save those two points, then Rubín let go of a shot by Arantxa Sánchez because she thought the ball was out. At that point Rubín got frustrated but tried to keep his cool and finally prevailed over Sánchez in game 30 of the set.

256.14 Serena Williams versus Kim Clijsters in the 2003 Semifinals

Williams was seeking her fourth consecutive Grand Slam title, however, she did not play her best against Clijsters as she committed 65 errors in that match, while Clijsters committed 33 errors. At that time Williams was treated for blisters on her feet during the third set and perhaps that is why she was on the brink of defeat.

In the deciding set Williams trailing 5-1, she held her serve and managed to take the game to 5-4. Clijsters could still win the match on that score, but on the first two points she double-faulted. Although it is true that she recovered the score 30-30, she could not dominate Serena Williams who managed to conquer the match after winning 6 consecutive games, leaving with a score of 4-6, 6-3, 7-5.

All in all, it was an incredible and unforgettable battle!

256.15 Rafael Nadal vs. Roger Federer in the 2009 final

This was one of the most memorable matches of this tournament as Federer did not hold back and started crying uncontrollably during the trophy presentation.

Both players were considered the top two in the world at the time and an epic duel in the Wimbledon final in the 2008 fifth set set the stage for the highly anticipated match in Australia. While it is true that this game could not match the level of what happened at Wimbledon, it was not so much the game itself as much as the rivalry between the two players. In the match, Nadal won just one point more than Federer leaving the score at 7-5, 3-6, 7-6(3), 3-6, 6-2. But this devastated Federer, who according to the New York Times expressed in his speech "God is killing me" as he shed tears and received the runner-up trophy.



Rafael Nadal

256.16 Jennifer Capriati versus Martina Hingis in the 2002 final

Jennifer Capriati's victory over Martina Hingis in 2002 has been called by many one of the greatest displays of resilience in tennis history. The first half of the match was openly dominated by Hingis with a 6-4, 4-0 lead, to the point that Capriati lost her composure in the second set yelling at the chair umpire and then at the jeering crowd. However, she regained control by winning the second set in a tie-break, while Hingis earned a fourth point in the tie-break at 7-6, but she failed to take advantage of it and Capriati finally won the tie-break with a score of 9- 7. According to the BBC Capriati said "I really don't know how I managed to win today".

256.17 Martina Navratilova vs. Chris Evert in the 1981 final

This was the most exciting of the 80 matches between Martina Navratilova and Chris Evert. When the two players met in 1981 at the Australian Open, the rackets were still made of wood and the game was played on grass.

In an intense first set they were tied 4-4, then Evert managed to win 3 points in a row winning the first set, then she leads 4-3 in the second set until Navratilova changed the momentum winning the next 3 games to conquer the second set and managed to take a 5-1 lead in the third set. At that point Evert tied the match 5-5 and was serving in game

eleven when they were up 30-30 and attempted a rare foray into the net to surprise Navratilova and the point ended with both players at the net where Navratilova spiked for the break, then held serve until completing the victory.



Photo of Martina Navratilova taken by Paolo Rosa taken from flickr

256.18 Pete Sampras vs. Andre Agassi in the 2000 Semifinals

The contrasting styles and rivalry between the two players made any match between them truly intriguing, they met 34 times but only two of those times went to five sets and this match was one of them.

Sampras came out on top with 37 aces and seemed in control later to take the third set tie break. However Agassi recovered and forced the fourth set to a tie break, in which Sampras managed to hit two aces and take a 5-4 tie break lead. Agassi managed to land two great serves and a great forehand with which he won the tie break.

In the fifth set Agassi provided a break of serve that took him to a 2-0 lead and in the last 4 games, Sampras was excessively exhausted compared to Agassi, who took the victory by a score of 6-4, 3-6, 6-7 (0), 7-6 (5), 6-1.

According to the Washington Post, Sampras said: "We have faced each other about 30 times and this was definitely one of the best."

256.19 Boris Becker and Omar Camporese in the 1991 Third Round

Omar Camporese was ranked 45th at the time and in the third round he pulled off one of the most impressive comebacks in tennis history. Camporese recovered from two sets to love and managed to win the third set. In the fourth set Becker seemed to be in control but his opponent always found a way to hold serve, in game 22 Camporese fought against Becker for a triple match point serving 40-0 to prolong the match, this game he lost but managed to win the set with a score of 6-4 and forcing to reach the fifth set.

In this set both held serve for the first 20 games, when Becker broke serve in game 21 and found himself serving 40-0 in game 22 with a chance to win the match, also having one of the most powerful serves in the game tennis. Camporese

saved three match points and then won five straight points, the last of these points with a backhand as he leveled the fifth set at 11-11. Becker broke serve and rallied to 12-11 and again Camporese managed to break, but this time to love. In game 25 Camporese had his serve and a 40-0 sellout, but Becker managed to recover by breaking serve and then hit two aces for the final two points, thus completing the victory that took him more than five hours and with a score of 7-6 (4), 7-6 (5), 0-6, 6-4, 14-12. Camporese lost, but with this game he will go down in history for posterity!



Photo of Boris Becker at the Australian Open (2015) taken by tlaenPix taken from flickr

256.20 Andy Roddick versus Younes El Aynaoui in the 2003 quarterfinals

Both players had faced marathon matches in the fourth round to make it to the quarterfinals. Roddick was 11 years younger than his opponent and the two faced a game that lasted just one minute shy of five hours, with the final set alone lasting two hours and 23 minutes.

In the fifth set Roddick managed to break El Aynaoui's serve in game 21 when the score was 11-10, later El Aynaoui broke his opponent's serve in game 22 and when they reached 19-19 they took a short break.

In the next game Roddick broke serve and placed the score in his favor 20-19, so he did not miss the opportunity, thus certifying the victory that would take him to the semifinal that year.



Photo of Andy Roddick taken by Court Two taken from flickr

256.21 Novak Djokovic vs. Stan Wawrinka in the 2013 Fourth Round

Although Stan Wawrinka lost in the fourth round of the tournament, this match set him on the path to the elite level. Many think that Wawrinka despite losing the match, played the match of his life and to an extremely high standard, even leading the match with a score of 6-1, 5-2 before his opponent came back in a so forceful. Djokovic won both the second and third sets, however Wawrinka bounced back by winning the fourth set in a tie break that led to the marathon final.

This last set both players put on an epic battle, while the crowd exclaimed euphorically during the game. Djokovic capped off the shocking 20-shot rally with a perfect crosscourt backhand, it was all in all a fascinating final point.

256.22 Novak Djokovic vs. Rafael Nadal in the 2012 final

This final was packed with remarkable shots, long rallies, unlikely comebacks, tense moments, entertaining competition and displays of emotion.

This match was definitely one of the best and many insiders rank it in the top 10 of all time, both players showed boundless determination and energy, it lasted 5 hours and 53 minutes of unforgettable moments.

Nadal had lost the last six matches against Djokovic and he knew he had to do his best, he started with a 4-2 lead but Djokovic won the next three games with a 5-4 lead, that's when Nadal jumped in front placing the score at 6-5. Djokovic battled against the two points and took the match to a draw, however Nadal managed to win the first set.

In the second set Djokovic took a 5-3 lead and in the 10th game after a 40-30 deficit to break serve, he finally managed to win the set. For the third set Djokovic led 4-3, but Nadal recovered by holding serve and tied at 5-5, then rain

interrupted the match.

Once they closed the roof Djokovic managed to take a 5-3 lead into the fourth set tie break, when Nadal collected four straight points to win the set. With momentum from his side Rafael Nadal built a 4-2 lead in the final set and was serving in the seventh game when Djokovic broke serve and tied the match at 4-4. At that point Nadal won an extraordinary 32-shot rally opening the ninth game and holding serve until he took a 5-4 lead. Djokovic broke serve and took a 6-5 lead as Nadal won three points in a row, then Djokovic conquered the next three points and when he finished off his first opportunity for the match-winning point, an emotional Djokovic tore off his shirt with a triumph that would mark him forever, being also the longest match in the history of the Australian Open.



Photo from the Meridiano sports newspaper extracted from flickr

256.23 Most recent finals

256.24 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

SEVEN

ROLAND GARROS

The French Open is known as Roland Garros whose name comes from the homonymous French aviator and is one of the tournaments that make up the Grand Slam. It was inaugurated in 1891 under the protection and organization of the French Tennis Federation, also known by its acronym as the FFT. The Roland Garros is the main tennis tournament in the world that is played on red clay and in chronological order, it is the second of the Grand Slam after the Australian Open and the predecessor of the Wimbledon championship, the last tournament being the Open of USA.

The Roland Garros lasts two and a half weeks starting at the end of May in Paris (France), it is competed in the infrastructure of the Stade Roland Garros complex and the final of the tournament is played on the Philippe-Chatrier center court, which has a capacity of up to 15,059 spectators, being of course the one with the largest capacity among all the 19 courts that the venue has. This construction was achieved thanks to the feat of four French tennis players who won the Davis Cup in the 1927 edition, also called "The Four Musketeers", their commemorative statues that recall the event can be seen inside the complex.



Without a doubt, it is one of the oldest and most important tennis tournaments in the world, one of its main characteristics being that the competition is held on clay, generating a slow game on this type of surface. In the men's category, in the case of reaching the five sets tied, a tiebreaker is not played but you have to win by a difference of two games. Due to this and other characteristics, many consider it to be the toughest and most demanding tournament, which is why it demands greater physical and mental effort from the player, along with Wimbledon.

The Spanish Rafael Nadal is the tennis player who has won this tournament the most times in the men's singles category, specifically with 13 victories; followed in the previous period called the French Championship by Max Décugis (French) with 8 wins. In the women's singles category, the American Chris Evert was the one who was proclaimed champion 7 times.



Photo of Rafael Nadal taken by Laurent and extracted from flickr

The complex was remodeled in 2020 where the facilities were improved at a general level and the capacity of the central court was increased, in addition a retractable roof was placed to avoid the inclement weather that has been common in recent years.

257.1 Historical background

Most historians say that tennis began in France in the 12th century, when the French hit a ball with their hands, in a very similar way to the popular Basque ball at the time. However, something similar to a racket did not begin to be used until the 16th century, although it is true that it was more similar to a shovel, the game began to be called tennis. Although this sport was played in closed areas where the ball was capable of hitting the wall and therefore, it was still similar to Basque sport. It was widely practiced among people of high rank and among royalty, with the monarch Henry VIII of England standing out in this sport, which is why historians cataloged those first practices as royal tennis.

Subsequently, several evolutions were added where a racket was finally included as it is known today, and the game was moved abroad. The first tennis club was founded in 1872 at the Leamington Spa and five years later it was when the Wimbledon Championship began in London, being the oldest of the current and current tournaments, where it was possible to standardize the rules of tennis.

This sport was very popular in France where a competition called the French Championship (French Open) was inaugurated in 1891. This open joined those already existing at that time such as the Wimbledon Championship and the Open of USA. Later in 1905 they were joined by the Australian Open, these four tournaments became the most prestigious meetings in this sport and currently maintain that same status and are known as the Grand Slams or "The Big Four".

257.2 French Championship

As we have mentioned, the precedents of this prestigious tournament date back to the year 1891 when a national tennis tournament began in France, specifically in Paris and governed by the Union des sociétés françaises de sports athlétiques (USFSA), an organization in charge at that time of sporting events in the country. At first, the tournament could only be played by tennis players who belonged to the French sports club called the Racing Club de France and the venue for the tournament was the club's own facilities.

The first champion of the French Championship and to everyone's surprise, given that it was a French domestic tournament, was the British H. Briggs in the individual modality, who was able to participate thanks to his status as a member of the club and defeated the French P. Baigneres also won the locals T. Legrand and B. Desjoyau in the doubles category. Only five players participated in that edition and under an amateur character, although it is true that it had little impact, as we already know it has been increasing over time.

In order to gain greater importance and projection, women were allowed to participate in the 1897 edition, where Françoise "Adine" Masson, who was the daughter of the founder of the Paris Tennis Club, became the first woman winner of the French Championship, by beating her compatriot Suzanne Girod in two sets with a score of 5-3 and 6-1. While the mixed doubles modality was introduced from the 1902 edition and the women's doubles, it was included as a modality for the first time in 1907.

In the first edition of the women's modality, only three players participated and at the time they had to meet certain requirements regarding clothing, requirements that were highly regulated. "Adine" Masson managed to win the tournament five times and was the most successful player in this tournament, until in 1926 she was surpassed by her compatriot Suzanne Lenglen. It should be noted that Lenglen's record was somehow considered more relevant, since he had to conquer it in each of the editions, unlike Masson, who in some of the editions did not have any rival, since it was the the only one that had registered in the championship.



The championship continued exclusively for club members and it was not until 1925 that the rules of participation were regulated and opened to any foreign player. That is why the championship changed its name and still exists today as the

International Tournament of France Roland Garros, also known as the French Open and popularly known as Roland Garros.

In the first editions of the championship and in parallel, the World Hard Court Championships were held using the sports facilities of the Parisian Stade Français club, which also alternated on occasions as the venue for the French Championship together with the Racing Club facilities. From 1912 to 1923, its clay courts uninterruptedly hosted a tournament considered by some fans and critics as the forerunner of the famous French international tournament. Among the winners of this tournament, the New Zealander Tony Wilding and the American Bill Tilden stand out as the number 1 in the world at that time. However, thanks to the Olympic Games held in the French capital in 1924, it was seen how the tournament reached its culmination. It was then that the former French Championship increased its category designated by the International Lawn Tennis Federation (ILTF), currently known by all as the International Tennis Federation (ITF) and of course, the aforementioned participation of amateur foreigners was allowed, being In addition, the land located in Saint-Cloud where the Stade Français facilities were located, the new headquarters of the 1925 edition, so that both venues alternated until the aforementioned year of 1928.

257.3 The Four Musketeers

The achievement obtained by Lacoste, Cochet, Borotra and Brugnon by winning the Davis Cup in 1927 against the powerful United States team, generated the construction of a venue to host the tennis matches of the Parisian tournament. Under the name of Stade Roland Garros it was opened in 1928 to honor the legendary aviator Roland Garros, who was so fond of this sport. The aforementioned tennis players managed to successfully defend the title won the previous year in Philadelphia for a period of five consecutive years, but this time in the new venue located in Porte d'Auteuil which is in the Arrondissement district of Passy. It is important to emphasize that the four musketeers not only won the tournament in the individual modality, but also in the doubles tournament.

257.4 Professionalism and the "Open Era"

In subsequent years, professionalism was gaining strength among the great players, however many of them tried to hide it to continue attending the famous French tournament, while others simply had to give up their participation. That was the case of the aforementioned Suzanne Lenglen who could not participate after her last title in 1926, which led to her withdrawal a little later. It was then that the tournament had to face its worst years, in view of the problems caused by World War II and, of course, it was interrupted in the same way that it happened in the previous war.



Suzanne Lenglen

After the war the tournament was resumed in 1946 after the Wimbledon Championship had been held, becoming the third Grand Slam tournament for this year, at that time a player was not seen who would dominate the tournament until the Frenchman Max Décugis managed win eight championships.



Golding, Laurentz, Beamish, Decugis

During the decade of the 60s, two important moments stood out, the first was in the 1962 edition when Rod Laver from Australia not only won the record, but the same year he managed to win the Grand Slam of trophies, this was repeated 7 years later and is the only tennis player to achieve this feat twice. In 1968, the pressure of the promoters and the sporting and economic differences between professional players and amateurs were felt at the inauguration of the Open Era. The main idea was that all players could compete (without exception) in any tournament, this definitely led to greater equality, where great players were able to enter the competition and under that premise, the French championship was the first Grand Slam in accept the new regulations.

At that time, a total of 10 tennis players of different nationalities won the men's singles category. The Spanish Manolo Santana won his first title after beating Nicky Pietrangeli (Italian) in the final in the 1961 edition. Santana won the first of the 16 titles of the championship, which a player of Spanish nationality would achieve until today. . It is no secret to anyone that the Spanish have been historical leaders in this competition, in fact, they are five times ahead of the Australian and American players, surpassing the Swedes and the French hosts by six.



Photo of Manolo Santana taken by Banco Sabadell extracted from fickr

The members of the World Championship Tennis (WCT) and the National Tennis League (NTL) (predecessors of the Association of Professional Tennis Players in force today) were dealing with the troubled panorama, where there were vetoes in the participations and some initial problems of the Open Era, to such an extent that the French tournament bore the consequences, which is why no independent tennis player appeared in the 1970 edition. To avoid the threat and control of many promoting organizations, the ILTF decided to intervene a couple years later to normalize the situation, he then decided to stop a circuit capable of regularizing the participation "El Grand Prix" and thus Roland Garros was included within the new circuit.

A short time later, the most competitive period of professional tennis would arrive, where new players would go down in tennis history both worldwide and in the particular tournament won at that time.

257.5 The ATP protects new talents

There were still some conflicts that raged for a few more years, between the WTC (which had absorbed the NTC) and the ILTF, thus depriving the French tournament of some of the best tennis players of the time. However, other talents emerged for the enjoyment of the ever-increasing number of fans. Although it is true that both organizations had disagreements and many disputes to maintain control over the famous sport. In the same way, there was a boom and expansion stage, so given the delicate situation, the tennis players themselves decided to form a union among the players, in order to protect their own interests against associations and promoters, thus it was born in September 1972 the Association of Professional Tennis Players (ATP).

For the year of 1981, new prizes were presented in the tournament such as the Orange Prize, which was awarded to the player capable of demonstrating the best sportsmanship and the most cooperative attitude with the press. For the player with the strongest character and personality, the Citron Award was created, in addition to the Burgeon Price, which was awarded to the revelation player of the year.

To honor the organizer of the Davis Cup, the main field of the venue was named Philippe-Chatrier Stadium in 1988.



Court Philippe Chatrier photo taken by Mathieu Marquer from fickr

Another novelty was that as of 2006 the tournament begins with a schedule of 12 games starting on Sunday and they are played on three main courts. Additionally, on the eve of the opening of the tournament, the traditional Benny Berthet fair is held, in order to obtain profits and allocate them to different charitable associations.

As of March 2007, an equal amount is delivered for the first time in history, both for male players and for female players.

257.6 Old venues

Since the French international tournament was created in 1891, it moved through four different venues until it reached the Stade Roland Garros, where it finally settled.

In the year 1909, the tournament was played at the Société Athlétique de la Villa Primrose, which was in Bordeaux, although it is true that it was only played there during that year, the championship was held on the characteristic clay soil and that the tournament would never abandon in hereafter

The Paris Tennis Club was the oldest of the venues in Auteuil, until it was moved in 1928 to the premises inaugurated in commemoration of the four French tennis players who won the Davis Cup the previous year.

The Suzanne Lenglen stadium or track was named in this way, in honor of the emblematic player capable of winning the tournament six times. This court is the second in importance and in terms of the capacity of the venue, this tennis player obtained the absolute record of titles when adding all the categories, for a total of 15 conquests between the years 1919 and 1926.

257.7 Track 1

This track, also called Court 1, is the third stage of the venue when it comes to capacity and importance. In the annexes of this track is the famous Plaza de los Mosqueteros since 1989, in honor of the four famous tennis players. In the center of the square there are four bronze statues, to honor each of the musketeers who won the Davis Cup in 1927 and knew how to defend it during the following five editions.

257.8 Attached tracks

The rest of the sports complex has a total of 16 tracks called annexes, which of course have less capacity than those previously named. In the first days of the tournament the number of matches is very high, so that all the adjoining courts are used, thus allowing a quick and comfortable course of the tournament.

Once the players are organized according to their number in the tournament's seeding, the competitors play on the successive courts until the end of the championship, which takes place on the center court of the venue.

The tracks are numbered from 2 to 12 and then from 14 to 18, to complete 19 tracks in total, to which 3 more tracks should be added that are intended for other practices. A curious fact is that there is no track number 13, for a simply superstitious reason.

257.9 Modernization project

The French Tennis Federation (FFT) stated in 2009 the poor state of the French Open venue when compared to the rest of the Grand Slam tournament venues. For this reason, the French organization hired the architect who designed the Deux Rives Footbridge (a pedestrian bridge in Strasbourg), named Marc Mimram, who was in charge of designing a significant expansion of the Roland Garros complex. This remodeling also involved a complete new lighting system, a retractable roof was added to the Philippe-Chatrier main court, among other improvements.

However, there were differences between the Council of the Municipality of Paris and those involved, this caused the FFT to announce the possibility of an alternative plan to move the tournament to a new location. In view of this consideration, a total of 55 new proposals for venues to host the tournament on the outskirts of the city were put forward.

It was finally agreed in February 2011 to keep the French Open in its current location, but the capacity had to be increased by 60% and a series of improvements were scheduled for subsequent years.

257.10 Surface characteristics

The clay courts or courts produce a slowdown of the ball compared to the courts of other surfaces such as grass, cement, synthetic floors, the latter being classified as hard and fast surfaces. That is why the red clay courts reduce the advantage of those players whose style is based on the well-known serve-volley tactic, thus allowing baseline players to dominate on this type of surface.



A great example of the aforementioned considerations is the great former American tennis player Pete Sampras who was able to win 14 Grand Slam tournaments, being number 1 in the world for 218 weeks in total. He is a highly admired tennis player for his powerful serve, however, he could never win the French Open and in fact, it was the only Grand Slam tournament that resisted him. Along with Sampras, another large number of famous players and tournament winners among the big four stand out and who ultimately could never obtain the French tournament cup, among them we can name Boris Becker, Jimmy Connors, Martina Hingis, Lindsay Davenport and Stefan Edberg. This shows that for many this prestigious tournament has a greater difficulty. But there are also other players whose styles are more suitable for this surface, such as Chris Evert and Rafael Nadal, where both players had great success in this tournament.

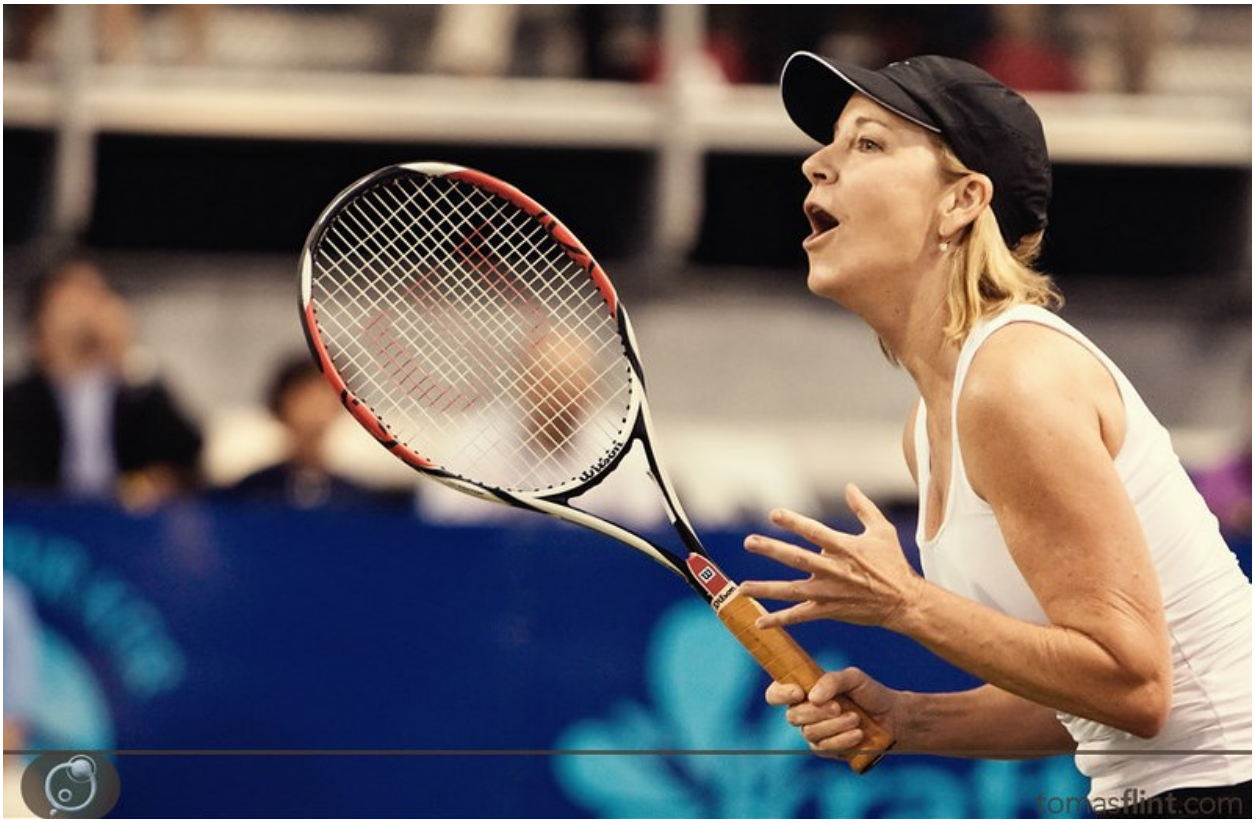


Photo of Chris Evert taken by Tomas Flint taken from fickr

The Wimbledon championship has significantly different characteristics to its predecessor of the Grand Slam, since on a grass surface the conditions for the player are very different. That is why these differences mean that winning both tournaments and also consecutively, is definitely one of the greatest challenges that a player can have in the world of tennis. In the open era, only five players were able to win both the French Open and the Wimbledon championship in the same year. These players were Rod Laver from Australia, Björn Borg from Switzerland, Rafael Nadal from Spain, Rogers Federer also Swiss and the Serbian Novak Djokovic, it should be noted that all these players were at the time number 1 in the world.

257.11 Awards

The Roland Garros tournament establishes a prize for the winners of individual tournaments in the amount of €2,200,000, being the same amount of money for both men and women since the 2007 edition.

The total amount of the prizes for the year 2012 was €18,718,000, while for the year 2018 the budgeted amount exceeded 39 million euros.

257.12 Trophies

All the trophies that the organization gives to the winners are made of silver and their decorations on the sides are also silver. It should be noted that the names of the winners are inscribed on the trophies, as well as the year of the conquest, so that they last for posterity. Each winner is also awarded a smaller replica of the trophy won, made from the same material as the original trophies.

Rafael Nadal received an exact replica of the original size of the "Musketeers Cup" trophy in 2017, for having won the tournament 10 times. It is important to emphasize that no tennis player had performed this feat in any other tournament in the world so the organization wanted to award him as the best clay court player in the entire history of tennis.



Photo of Rafael Nadal taken by mariampais extracted from flickr

257.13 Historical background of titles

Since the tournament was created in 1891, there have been a total of 60 different players in the men's singles category, for a total of 112 editions.

In the period between 1891 and 1968, Frenchman Max Decugis stood out in the Pre-Open era by winning eight titles when it was still called the French Championship. But not only that, the French were the most successful at that time with a total of 37 titles. Later in the Open Era, that is, from 1968 to the present day, the Spanish Rafael Nadal continues to be the most successful, who was able to contribute 13 titles to the Spanish nationality. On the other hand, the Spanish were the most awarded, winning a total of 19 Roland Garros championships, including the winners Costa, Gimeno, Ferrero, Moyá and the two from Bruguera. In the same way, the French Suzanne Lenglen stood out in the women's category with 6 titles and contributed significantly to her country being also the most successful with 29 titles in the Pre-Open era and in this modality. On the other hand, the American Chris Evert won 7 titles in the Open Era and the United States is the most successful country in this Open Era with 14 titles.

Although it is extremely difficult to repeat as individual champion in this tournament, we can mention four tennis players who have managed to conquer the Roland Garros tournament consecutively and for four years. In the female category we can mention the French Suzanne Lenglen and Jeanne Matthey, while in the male category the Swedish Björn Borg and the French Paul Aymé achieved it. However, the Spanish Rafael Nadal broke the record with 5 consecutive titles in this championship and likewise holds the record for total titles in the men's category, where he was proclaimed champion 13 times in the French capital.

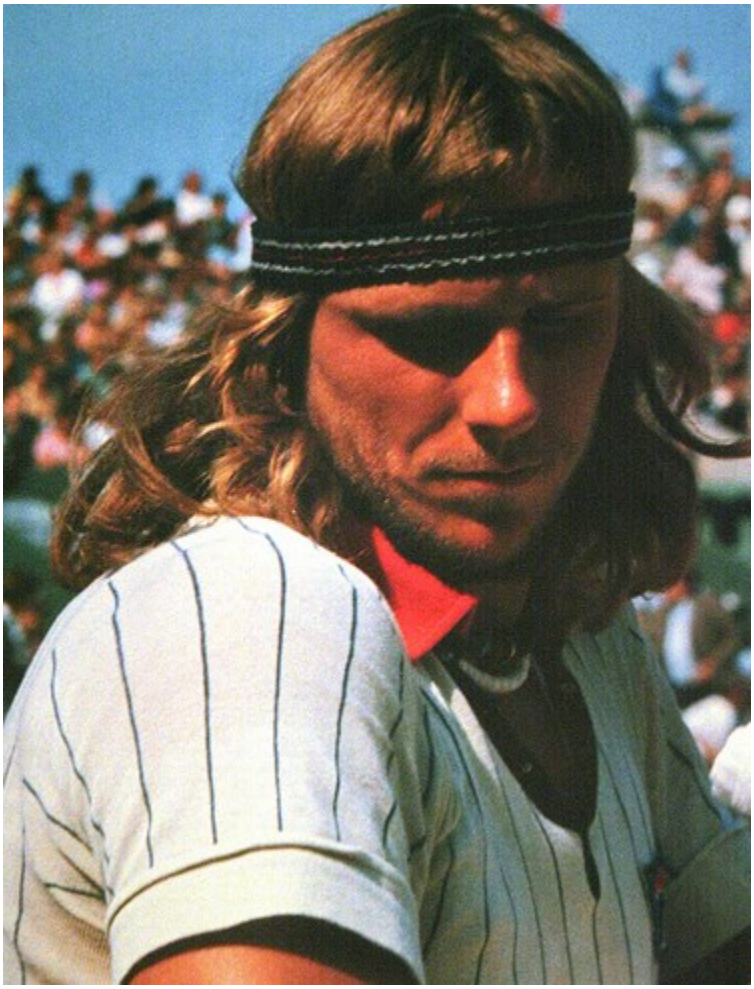


Photo of Björn Borg taken by Anna @ D16 taken from flickr

In the Open Era the youngest winner of this tournament was Michael Chang, this North American of Indochinese descent conquered his only Roland Garros when he was 17 years and three months old. Michael defeated Stefan Edberg himself in that 1989 final in a wonderful five-set match. While the youngest winner in the female category was Mónica Seles, who managed to win the championship at just 16 years and six months old. This Yugoslav teenager battled former Roland Garros champion Steffi Graf in 1990 and became the youngest athlete (male or female) to win the tournament in France.



Photo of Steffi Graf taken by Tennis Buzz from fickr

As for the oldest winner on the list of records, it was the Spaniard Andrés Gimeno, when he conquered Roland Garros and his only Grand Slam in 1972 at the age of 34 years and 10 months, he later died in 2019. Although it is true that he does not seem that being 34 years old is such an advanced age, but winning Roland Garros after 30 is really very difficult and at almost 35 years old, even more so.

In the women's category, the oldest woman to win this tournament was the American Serena Williams, being somewhat younger than Gimeno at 33 years and 9 months when she won the title in Paris in 2015.

257.14 Unseeded winners

In the Open Era, three tennis players have managed to win the Musketeers Cup without being part of the seeded teams. Among them is Gustavo Kuerten "Guga" who was able to achieve this feat with the lowest ranking. This Brazilian-born player was number 66 in the world when he defeated Bruguera in 1997 to win the final for the first time in Paris. The second with the lowest ranking was the Argentine Gastón Gaudio, who turned around that great game he played against Coria in 2004, winning the Roland Garros and being number 44 in the world at that time. The last in the ranking was Mats Wilander, who won as number 18 in the world in the 1982 tournament, it should be noted that at that time there were no 32 seeds.



Gustavo Kuerten photo taken by FreeCS taken from flickr

The only player who was able to win the Roland Garros without being a seed was the Latvian Jelena Ostapenko, although it is true that she was close to losing when playing against Simona Halep, she ended up winning in that grand final of 2017, being number 47 in the WTA ranking.

Others who won without being seeded were the French Marcel Bernard in 1946 and in the women's category the British Margaret Scriven in 1933, of course, it is not comparable with those mentioned above, since they won before the Open Era .

257.15 The longest game

In recent years at Roland Garros, three memorable matches have stood out in this regard. The first was the one that Fabrice Santoro won when he played against Arnaud Clement in 2004, it was the only match that exceeded six hours, the score was 6-4, 6-3, 6-7, 3-6 and 16-14 , the specific time was 6 hours and 33 minutes. Second place in this respect belongs to Paul-Henri Mathieu, when he defeated John Isner in 1912 with a score of 6-7, 6-4, 6-4, 3-6 and 18-16, the match lasted 5 hours and 41 minutes. Lastly, the Spaniard Alex Corretja stood out when he defeated, after a long duel, the Argentine Hernán Gumy at Roland Garros in 1998 by 6-1, 5-7, 6-7, 7-5 and 9-7, the dispute it lasted 5 hours and 31 minutes.

257.16 The game with the biggest difference in the score

The year in which Rafael Nadal won the 10th Roland Garros title he played against Nikoloz Basilashvili and will go down in history as the biggest beating in history with a score of 6-0, 6-1 and 6-0, in addition to achieving it in as only one 1 and 34 minutes. While in the women's category, it was Steffi Graf who defeated the Russian Natalia Zvereva with a score of 6-0 and 6-0.

257.17 The best matches in history

[Novak Djokovic versus Roger Federer in the 2011 semi-final]{.underline}: This was a pitched battle between two players with an amazing first set. It was one of the most intense duels with impossible backhands, spectacular volleys and winning forehands. The game was won in four sets by Roger Federer, after 3 hours and 39 minutes of play. It was almost called off due to lack of light and it was Novak Djokovic's first loss after 43 matches. Although it is true that the final was conquered by Rafael Nadal, Federer showed his total skill in this great match.

[Michael Chang vs Ivan Lendl in the 1989 round of 16]{.underline}: As we know, this 17-year-old won the final that year in a big match. However, this competition was no less glorious than the final. Ivan Lendl already had 8 Grand Slams in his showcase by that time and was able to easily win the first two sets, many thought that Lendl would obtain a sure victory. But Chang changed the strategy and began to play high balls to drive the Czech tennis player crazy and apparently he succeeded, since he was able to take the next two sets from him and in an epic fifth set, the American used the "spoon serve" thus winning the match, It was definitely a movie game.



Photo of Michael Chang taken in 2014 by Tennis Buzz from fickr

[Gaston Gaudio vs. Guillermo Coria in the final of the year 2004]{.underline}: Coria "El Mago" was the favorite to win the tournament, since he had the skills to succeed on clay courts, in addition to being fast, with consistency from the baseline and a good forehand . However, after winning the first two sets he began to cramp, so he lost the next two sets. The fifth was a challenge for the two players where up to nine service breaks occurred. Finally, and after a great game, he managed to beat Gastón Gaudio, who was emerging as the favorite.

[John McEnroe vs. Ivan Lendl in the 1984 final]{.underline}: While it's true that McEnroe could never win Roland Garros, he came very close in a beautiful final with Ivan Lendl. It was a match where everyone brought out all their weapons, McEnroe displayed his characteristic left wrist and remarkable ability at the net, while Lendl had enviable physical strength that led him to overcome two sets in which he was at a disadvantage and finished winning in a fifth

set, not suitable for the faint of heart.



Photo of Ivan Lendl taken by Tennis Buzz from fickr

[Jim Courier versus Andre Agassi in the 1991 final]{.underline}: This final brought together all the incentives that can be asked of a tennis match. There was talent in both players, a lot of rivalry and emotion poured out. Jim Courier won after 5 sets and proved his supremacy in this excellent match.

[Carlos Moya faced Marcelo Ríos in the quarterfinals of 1998]{.underline}: The Chinese Ríos seemed to have the dispute assured, that year he was a finalist in Australia, as well as champion in Indian Wells and Miami. Everything indicated that he was going to win the first Grand Slam of his career. But in the quarterfinals he faced Carlos Moya and this match seemed like an early final. Ríos, with his plethoric serve and his excellent forehand, took the match in one of the best matches in his career and finally won the tournament. This is one of those times where tournaments are not won in the finals, but in the previous matches.

[Rod Laver vs. Roy Emerson in the 1962 final]{.underline}: At that time, tennis was played differently, but both Australians battled it out in a great match in this 1962 final. Both battled a duel where Laver after coming back from two sets and a 0-3 in the fourth set, he ended up winning this Grand Slam.



Photo of Rod Laver taken by Brisbane City Council from fickr

[Björn Borg versus Ivan Lendl in the 1981 final]{.underline}: It was Iván Lendel's first final in the French city and it was Borg's last title in Paris. It was a tremendous cross between the perfection that the Swede had and the powerful machine that was Lendl. Each had won a set until the fifth came, where Borg demonstrated his superiority on this clay court and won the match.

[Pete Sampras and Jim Courier in the 1996 quarterfinals]{.underline}: As we know Sampras had never been to the final of Roland Garros, this tournament was very adverse for him. However, he managed to beat Sergi Bruguera in the previous rounds and that's when it was his turn to meet Jim Courier in the quarterfinals. After losing the first two sets he lifted the match from the bottom with pride and excellent serves, he hit 28 aces and in this way ended up breaking Courier's resistance, finally winning the match.

257.18 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

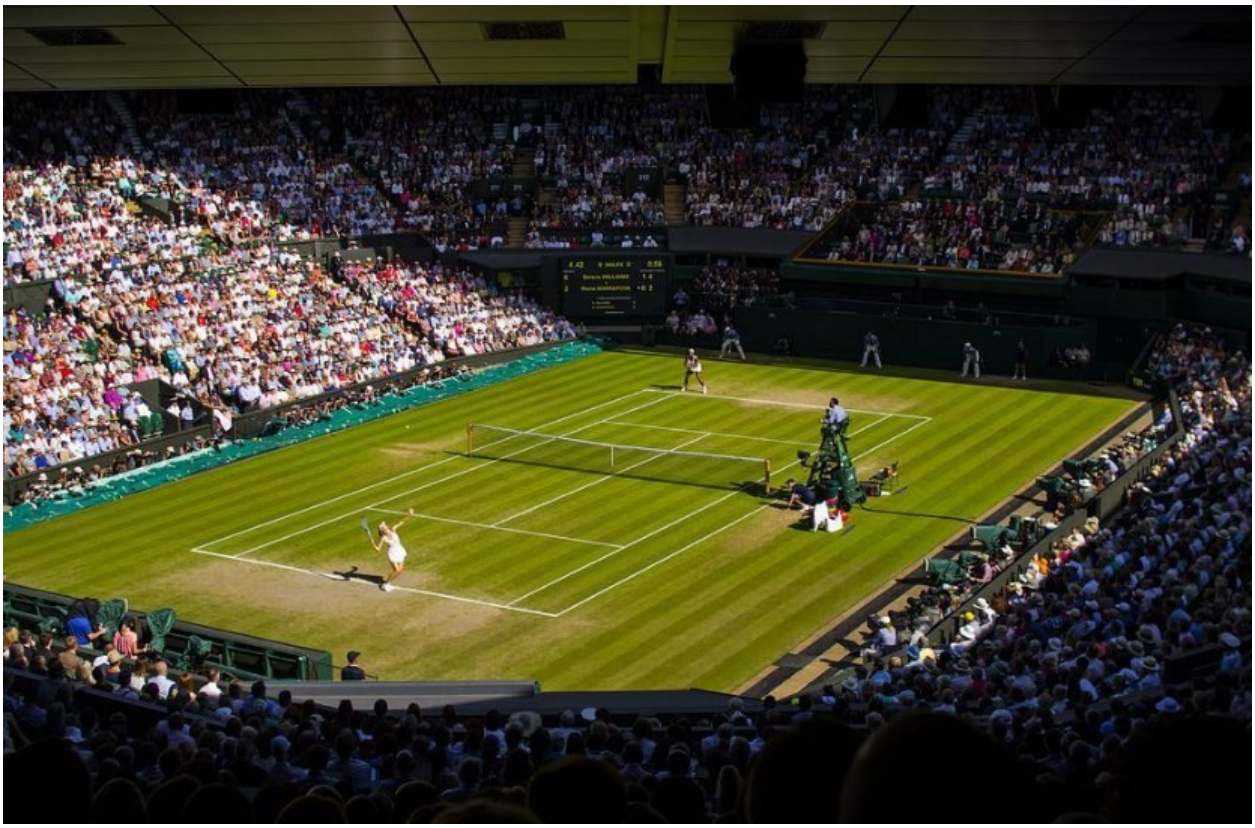
CHAPTER

EIGHT

THE WIMBLEDON CHAMPIONSHIPS

The Wimbledon Championship is the oldest and most prestigious tennis event in the world, it takes place between the months of June and July, being the third tournament of the four Grand Slam tournaments. The first is the Australian Open which is played on a cement court, the second is the Roland Garros whose court is clay or brick dust, while the Wimbledon is on grass or grass and the last of these is the Open of United States where the players once again compete on the cement court.

At Wimbledon all the players wear white going back to their roots and it is the only one of the Grand Slam tournaments that is played on grass. Wimbledon was traditionally held in late June and early July for two weeks, beginning on the last Monday in June and ending with the men's and women's singles finals, which were scheduled for Saturday and Sunday of the second week. But in the year 2015 there were changes in the tennis calendar and the event was moved by a week, starting in early July. Although it is true that the tournament lasts two weeks, it can be extended in case of rain. Both men's and women's singles tournaments, men's and women's doubles tournaments, as well as doubles are played simultaneously. But the individual and double youth tournaments are also played, for women and men. There are even special invitational tournaments for retired players, which are men's doubles for players over 35 and 45 and women's doubles for players over 35. In 2021 the champions in the individual category were Ashleigh Barty and Novak Djokovic.



The first Wimbledon tournament was organized by the "All England Lawn Tennis and Croquet Club" and was held in 1877 where only the men's singles category was played, the women's singles entered in 1884 and it was not until 1913 that it was implemented the doubles category.

The tournament rapidly gained international relevance, especially when the American May Sutton won the singles championship in 1905 and was the first foreign woman to do so, while the first foreign victory for the men's singles was won by the Australian Norman Brookes in 1907.

In 1922 the championship venue was moved to a track near Church Road and remains Wimbledon today. German forces bombarded the complex with five bombs during World War II in October 1940, one of the bombs destroying the equipment room, while another fell on the roof of the Central Court.

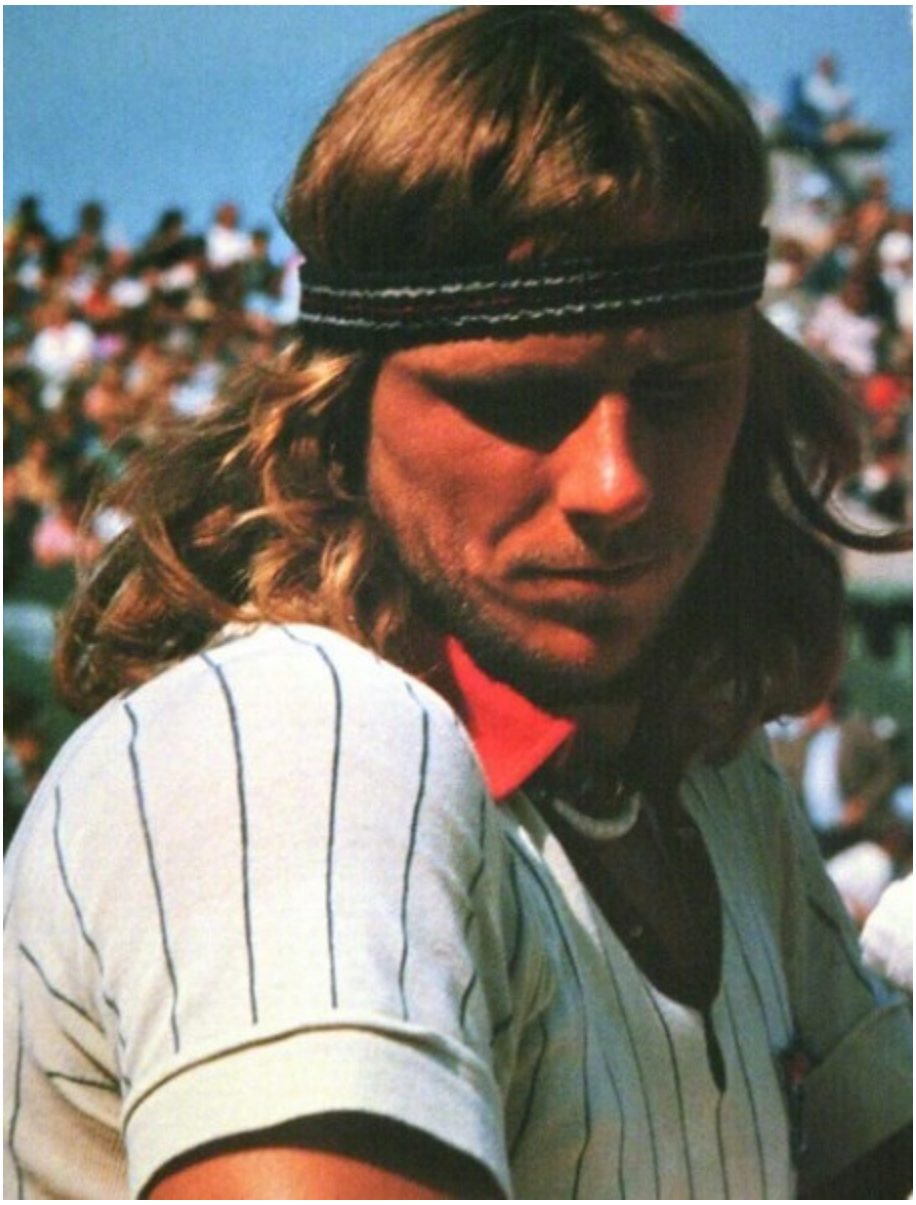
While it is true that the British take great pride in the tournament, for a long time it was part of the national mourning and humor, since 1936 when Fred Perry won the men's singles championship, no Briton won it again until Andy Murray She achieved this feat again in 2013. It should be noted that since 1977 when Virginia Wade won this award, no other British woman has managed to win this championship again.

258.1 The biggest finals in Wimbledon history

The greatest tennis matches have been held on this stage, among which the match between Björn Borg and John McEnroe on July 6, 1980 stands out. All the spectators thought that the match was a masterpiece, John McEnroe He came out with great force from the first moment passing over the Swede winning the first set with a 6-1 advantage, but from one moment to another Borg began to come back and cut the way on the scoreboard, winning the next two sets. Many thought that everything was already decided, without knowing what would happen in the fourth set, today what happened is still remembered as one of the best games ever seen on a tennis court. Both players reached the tiebreak and in that tiebreaker the spectators were delighted with the following 34 points, 22 minutes of history of the most exciting for this sport.

McEnroe saved five match points and managed to take the match to the fifth set while the fans vibrated at each point

and despite the missed opportunity Borg was not intimidated and continued to control the North American's thrusts, his concentration reached such a point that he only lost three points with his serve for this set. Both defending their games until reaching 7-6 and it was then that Borg managed to break McEnroe's serve by means of a crossover passing, which was recorded for history. Borg dropped to his knees on the grass, clenched his fists and raised them in victory.



Borg photo taken by Stylecouncil1 taken from flickr

258.2 Wimbledom final in 2001

Another match to be remembered was the 2001 final between Goran Ivanisevic and Patrick Rafter. Croatian Ivanisevic was recorded in the record books as the only player who, being a special guest of the organization, won the Wimbledon championship.

Ivanisevic was ranked No. 125 in the FedEx ATP Rankings and due to rain, the final with Rafter was postponed until Monday. It was when 10,000 fans crowded for tickets the night before that the day began to be called "the Monday of the people".

The Croatian had been in virtual darkness for a year and a half, going 10-11 on the year due to a shoulder injury, so expectations weren't good and he was expected to advance just in case, a couple of rounds. However, from the start he dispatched five rivals to reach the final, three of them (Roddick, Rusedski and Henman) being grass specialists. Ivanisevic faced Patrick Rafter, double champion of the United States Open and finalist of the previous year.

That Monday the Croatian won 2 sets to one, but had to receive medical attention for his left shoulder injury. In the fourth set it was thought that his temperament was going to play against him when they were 4-4, at the break point against the Croatian he hit an ace, but at that moment he was called a foot fault, in the second serve the ball was called bad and then the Croatian kicked the net, threw the racket and had an off-key argument with the chair umpire, later Rafter secured the fourth set. However, Ivanisevic was able to keep his cool and in the fifth set, the Croatian broke Rafter's resistance in the fifteenth game and that's when he got the chance of a lifetime from him, making the most of it.

In an emotional three-hour final, the Croatian won the match with the following score 6-3, 3-6, 6-3, 2-6, 9-7, Ivanisevic's feat remains as one of the best in all the story, to the point that it inspired the making of a movie.

Rarely in life has a game been seen with so much nerve and so much emotion. Ivanisevic is the lowest-ranked tennis player in history to win Wimbledon and the only one to arrive as a special guest, as if that were not enough, the feat was performed in his 48th Grand Slam appearance and he is still the tennis player who it has taken longer to win his first "major" trophy.

The most moving moments were when the Croatian sat on the court with his eyes to the sky, screaming and shedding a few tears before winning the match. On his fourth championship ball, Ivanisevic fell to the grass and cried after winning his first Grand Slam title.



Photo of Ivanisevic taken by Carine 06 taken from flickr

258.3 Federer and Nadal in the 2008 final

Continuing with the best matches we cannot forget the 2008 Wimbledon Championship. The men's singles final was played between Roger Federer and Rafael Nadal, who at that time were the number 1 and 2 players in the world respectively. After a heated confrontation of 4 hours and 48 minutes, Rafael Nadal defeated Federer with the score 6–4, 6–4, 6–7, 6–7, 9-7.

The two players had a rivalry that many believed was the greatest in tennis history. By the time they reached the championship in 2008, both players had managed to win 14 of the last 16 Grand Slam titles. At that time it was the third year in a row where Federer and Nadal met in the Wimbledon final, and Federer had also been the Wimbledon champion for the fifth time in a row and therefore had beaten Nadal in the previous two matches, this time trying to become the tournament champion for the sixth consecutive year.

For his part, Nadal had just been the Roland Garros champion for the fourth time in a row and was trying to achieve the Roland Garros-Wimbledon double, for connoisseurs of the sport, it is known that this feat is extremely difficult, because it requires that the player went from winning on a clay surface to a grass one, in just the span of a month.

Although it is true that the players had to be on the field at two in the afternoon, the game was delayed 35 minutes due to rain. Once the match started Rafael Nadal won the first two sets with a score of 6–4, 6–4, it was when the rain again stopped the game while Federer was winning the third set 5-4. After an 80-minute break as the weather settled, Federer managed to win the next two sets, both by scores of 7-6, thus saving 2 championship points for the fourth set of the tiebreak. It should be noted that this tiebreaker is considered by many to be one of the greatest in tennis history.

Federer later put the score in his favor at 5-2 and Nadal was able to win the title on his next two serves, but he committed two faults, as well as a backhand miss at the net, thus giving Federer the game back with the score. 4-5 against, but with his service. The score was positioned 7-7 when Nadal managed a passing shot and stayed in the match, Federer for his part responded with another passing shot to stay in the match. Federer subsequently won the tiebreak 10-8 sparking off a fifth set and then at 19:53, play was again rained out for another 30 minutes.

When they returned to the field it was already getting dark and they discussed delaying the match for the following day, but it did not happen. During the deciding set Federer was up 7-6, however Nadal held his serve and at some point he broke Federer's serve and in the next game, he had the serve in his hands winning the fifth set 9-7 and of course, the match. John McEnroe expressed on July 5, 2008 "It's the best game in history."

The match ended at 9:15 p.m. and it was the last Wimbledon final to be affected by rain, since the 2009 Wimbledon championships, the Central Court already had a retractable roof.



Photo of Rafael Nadal taken by Massura taken from flickr

258.4 2009 Championship Final

The 2009 Wimbledon final was an event that everyone wanted to witness. Roger Federer and Pete Sampras were tied at 14 for the number of Grand Slams won in the Open Era, so much so that Pete Sampras flew all the way to London to watch the tournament.

The final was between Roger Federer and Andy Roddick, the first duel between the two occurred at Wimbledon 2004 and in this final, Roddick was chasing his first Wimbledon trophy.

The match was not what everyone expected with a devastating Federer, Roddick won the first set and the Swiss the next two in the tiebreak. The fourth set was won again by Roddick. The game lasted four hours and 16 minutes in which the American played the best tennis of his career, which was what allowed him to reach an epic fifth set, in which Federer required nothing less than 30 games to win the tournament. Federer had to suffer through these five sets against a punishing Roddick in an exciting match to proclaim himself Wimbledon champion for the sixth time. The Swiss managed to make history to become the first player capable of winning 15 Grand Slam titles, surpassing the mark that he had shared with Pete Sampras until then. The result was 5-7, 7-6 (6), 7-6 (5), 3-6 and 16-14, adding his 20th final of a "big" and beating the American Iván Lendl to beat another mark and snatching Rafael Nadal the number 1 in the world.



Photo of Roger Federer taken by Yaseen Khawar taken from flickr

258.5 Djokovic vs Federer in the 2019 final

In the first set, Djokovic's colossal defenses, heroic points and Federer's entire repertoire were already present, which led to a well-deserved tiebreak. While it is true that the Swiss began this tiebreak with greater strength, then he had a small downturn and ended up delivering the first set. Then Federer in the second set got two breaks out and leveled the competition with a resounding 6-1.

Djokovic returned renewed in the third game and had to give the best of his service to save a ball when the score was 5-4 against. Once they got to another tiebreak there wasn't much difference between the level of one player and another. Djokovic, however, took the lead again by winning the third set. The Swiss reacted and scored two consecutive breaks which led to the fifth and final set, at that time the final was an ode to tennis.

In the fourth game of the fifth set Djokovic managed to have three breaks, the first two being with Federer's second serve and in the Swiss's next service it was when the Serb would give a blow to get the score in his favor 4- two. However, Federer's response was not long in coming, placing the score 6-6, at that time they had already passed the four hours of battle and Federer broke the Serb's serve, but inexplicably wasted two balls with his serve and the match was revived contest. The unexpected 12-12 came and the final went down in history for becoming the first Wimbledon match to feature this tiebreaker. It was then that Novak Djokovic once again crowned Wimbledon in one of the finals that has been considered one of the most legendary in tennis history, where both players displayed all their magic.



Novak Djokovic photo taken by Carine 06 taken from flickr

258.6 Wimbledon's longest match

The longest match in history was played in 2010 between the American John Isner and the Frenchman Nicolas Mahut in the first round of the championship, it was played on June 22, 23 and 24 for a total of 11 hours and five minutes, the scoreboard was in favor of the winner Isner by 6-4, 3-6, 6-7(7), 7-6(3) and 70-68, with 183 games played. The match took place on court 18 starting on June 22, 2010, but due to lack of light it had to be suspended until the following day. Once resumed on the 23rd it would become the longest match in tennis history where four groups of 28 ball boys and two groups of 14 line judges were moved to help the match. But due to bad weather, the game was postponed again at 9:13 p.m., resuming the next day and leaving the score at 70-68.



Photo of John Isner taken by Christofer Levy taken from flickr

Numerous records in tennis history were broken in this match:

• The longest game with 11 hours and 5 minutes

• The longest set, the fifth set lasted 8 hours and 11 minutes

• The most games in a set, with a total of 138 in the fifth set.

• Highest number of aces made by a single player in a match, Isner hit 113 aces and Mahut had the second most aces hit by a player in a single match.

• Most aces made in a single match (216)

• Number of consecutive serves held in a match for a total of 168, Isner held 84 serves and likewise, Mahut also held 84 serves.

• Greater number of games won by a player in the same match, which was Isner with 92 and Mahut second with 91 games won.

• Highest number of points won in a single match, this record was held by Mahut with 502 points.

• Greater number of points (980) obtained in a single game.

As we stated before, the time played was 11 hours and five minutes, breaking the record, but what we want to highlight is the abysmal difference that exists with respect to the previous record, which was in the match between Fabrice Santoro and Arnaud Clément at Roland Garros of the year 2004, where they played for 6 hours and 33 minutes.

Regarding the games played in a match, they broke the record with 183, the previous records were established by Andy Roddinck who required 83 games to beat Younes El Aynaoui at the 2003 Australian Open and Pancho Gonzales who

needed 112 games to defeat Charlie Pasarell in 1969, but this was all before the tiebreak was introduced in 1969.

The 8 hours and 11 minutes that the fifth set lasted is longer than the previous record for the longest complete tennis match in history.

The record for the number of aces was set by Isner with 113, but the previous record was held by Croatian Ivo Karlovic with 78 aces in the 2009 Davis Cup. Even the number of total aces (216) far exceeded the previous record Karlovic and Štěpánek had it with 96 aces in total, in the 2009 Davis Cup.

Even Queen Elizabeth II was present at the final points of the match, in fact, it was the first time in more than three decades that she had attended a Wimbledon match.

258.7 Wimbledon traditions

The traditional colors of the turner are dark green and purple. On the other hand, it is the only tournament where the clothing for both sexes is required to be 100% white.

The tennis players are named as "Miss" or "Mrs" when the referee professes the scores during the game, while the men are called by their last name.

Each year the tournament begins six weeks before the first Monday of August arrives and ends 15 days later. It is not usually played on Middle Sunday, only four times in Wimbledon history has rain caused it to be played on "Middle Sunday".

The first week is when the preliminary rounds are played, while the second week is where the Round of 16, Quarterfinals, Semifinals, and Final take place.

In the individual games the men's champions receive a silver trophy, while the women's champion receives a silver platter called the "Rosewater Dish" or "Venus Rosewater Dish". In addition, the trophies are awarded in separate events.

258.8 Historical facts

• In 1877, the first Wimbledon championship was played, where 200 spectators attended the entire tournament, the ticket cost one shilling per person, only 22 people attended the final and the winner was Spencer Gore.

• The official ball of the tournament has been Slazenger since 1902.

• Wimbledon is held at "The All England Lawn Tennis & Croquet Club" and prior to its relocation to Church Road in 1922, the championships were located at Worple Road. Including the honorary members, who are those champions in Singles in the past, it has only 375 active members. But John McEnroe was the exception, as after winning the tournament in 1981 he was not given access to such an honor in view of his misconduct, however, after two years he was accepted.

• Sweden's Borg was Wimbledon champion for five consecutive years between 1976 and 1980, while Britain's Renshaw won the championship for six successive years from 1881 to 1886, a feat of consecutive championships equaled by Martina Navratilova between 1982 and 1987 .

• Princess Stephanie of Austria was the first royal to attend Wimbledon on Sunday, July 15, 1895.

• In the year 1987 the German Steffi Graf was the first woman who came from the open era and reached the final, in addition she had not lost a single match throughout the year, she had seven titles and 45 wins, however, lost against Martina Navratilova.

• Martina Navratilova not only managed to win the championship for six consecutive years, but she also took the title 9 times.



Photo of Martina Navratilova taken by Richard Thorpe taken from flickr

• Pete Sampras also won Wimbledon 7 times, but not consecutively, from 1993 to 1995 and then from 1997 to 2000.



Photo of Pete Sampras taken by Popeyee taken from flickr

• William Renshaw had also performed the same feat as Sampras but between 1881 and 1886 and then won again in 1889.

• The chair umpires who participate in the tournament usually officiate 2 matches a day, although not necessarily on the same court.

• Steffi Graf managed to win the competition in 1988 and what was interesting was that she won the Grand Slam (Australian Open, Roland Garros, Wimbledon and US Open) all in the same year.

• The first singles champion to publicly present the trophy on court was American Ted Schroeder in 1946.

• The 100th Anniversary was celebrated in 1977, although it is true that the 100 championships played were actually completed in 1986 (in view of the two world wars), the Dukes of Kent awarded medals to a large number of the former champions, In addition, the public was able to enjoy a local victory, since the British Virginia Wade won.

• In 1974 Jimmy Connors won the male single title and Chris Evert won the female single for that same year, the funny thing is that both were dating at the time.

• The only married couple who both held the title were Leslie Godfree and Kitty McKane Godfree from Great Britain in 1926.

• In 1884 it was the first time that the women's tournament was held, where 13 players participated and Maud Watson was the winner.

• The first black man to win the men's singles championship was Arthur Ashe in 1975.

• The first Wimbledon prize money was awarded in 1968 in the amount of 25,150 pounds sterling ($ 158,106), while for the year 2021 the prize between all prizes was 35 million pounds sterling ($ 49.4 millions of dollars).

• Maggie, Manuela and Katerina Maleeva were sisters and ranked 10th, 11th and 12th in the main draw at the 1993 singles competition.

• Jimmy Connors held the record for most appearances in the singles chart ranking, he appeared 17 times between 1973 and 1989.

• England's Virginia Wade holds the record for having competed in 26 consecutive editions of Wimbledon.



Photo of Virginia Wade taken by John Scott taken from flickr

• The youngest champions of the tournament have been Martina Hingis who won the in 1996 at just 15 years and 282 days old and Germany's Boris Becker who won the singles championship at 17 years and 227 days in 1985, while the North American Ralston won in the year 1932 with 17 years and 341 days. Britain's Dod won the ladies' singles in 1887 at the age of 15 years and 285 days and Australia's Rob Laver won the mixed championship in 1959 at the age of 20 years and 328 days, while the American Serena Williams won this category in 1998 at the age of 16 and 282 days.

• The Yugoslav Tennis Federation suspended the player Nikki Pilic for a year in 1973, since he refused to play in the Davis Cup, reasons why 80 ATP professionals began to boycott the tournament where the Czechoslovakian Jan Kodes won and in the women's category, it was won by the North American Billie Jean King.

• The oldest champions to win the tournament were the American Dupont at 44 years and 125 days old in 1962 who won the Doubles title. The British Gore won the men's singles championship at 41 years and 182 days in 1909. While the American Mulloy won the title in 1957 at 43 years and 226 days. Britain's Sterry won the ladies' singles title in 1908 at 37 years and 282 days, while American Ryan won the title in 1934 at 42 years and 152 days. Lastly, the oldest gentleman to win the doubles title was the North American Stewart at 42 years and 28 days old in 1988.

• The oldest competitor in the entire history of the tournament was Frenchman Jean Borotra, who was able to participate in the men's doubles event at the age of 65 years and 317 days in 1964. It should be noted that this same player participated in 223 matches between singles and doubles between the years 1922 and 1964.

• Wimbledon took 28 years to become an international tournament capable of opening up to players from all over the world. The victory in ladies was in 1905 for the American May Sutton, while the first "non-English" victory for the gentlemen was obtained by the Australian Norman Brooks in the year 1907.

• Jennifer Capriati was the youngest player to qualify in the ladies' singles draw at 14 years and 89 days in 1990. Sweden's Bjorn Borg set the same record for men in 1973 at 17 years and 19 days of age .

• In case of rain, which as we know is very frequent during Wimbledon, the 18 courts can be covered in 5 minutes, since the organization has 120 people designated for this purpose.

• The first time the tournament was televised was in 1937.

• The last time a competitor won all three titles in the same year was the player Billie Jean King who was able to win the ladies' single, together with Casals she won the and together with Davidson she won the mixed double in 1973.

• The record of 41 consecutive tournament wins was held by Bjorn Borg between 1975 and 1981.

• Three brothers like David, John and Tony Lloyd competed in the year 1977 in the same box singles.

• Some curious statistical data is that more than 650 matches are played refereed by 330 umpires, there are 132 ball boys and ball girls; the courtesy cars are driven by 150 people, there are 220 security employees, 10 psychotherapists work, 16 people in the press and balls are changed for the first time in each game after 7 games and subsequently every 9 games, so they are used throughout the tournament some 31,200 balls, to then sell them to clubs affiliated with the Lawn Tennis Association.

• Since 1922 when the club moved to Church Road, the Gentlemen's Singles Final has been played on Central Court.

• The first official website of the tournament (www.wimbledon.org) was uploaded to the network in 1995, however, the traffic record was recorded in 2001 during the 15 days that the event lasted. The company that designed the web was IBM and provided the metrics for that time, where 3.2 million people visited the website at least once. On the other hand, that Monday Goran Ivanisevic and Patrick Rafter played the men's singles final and 230,457 people followed the instances of the match through the "instant scores" section.

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Photo of Billie Jean King taken by Lucas Balduino (CBT) taken from flickr

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258.9 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

NINE

THE US OPEN

The US Open Tennis Championships since 1987 is chronologically the last and fourth Grand Slam tournament. The year starts with the Australian Open, then comes the French Open, then Wimbledon and this would be the last of the big four.



The US Open begins on the last Monday of August and lasts for two weeks, with the middle weekend coinciding with Labor Day, which is a public holiday in the United States. This tournament is one of the oldest in the world and was originally known as the US National Championship, where the men's singles and men's doubles categories were initially played for the first time in August 1881.

Currently the tournament comprises 5 main championships which are the men's and women's singles tournaments, the men's and women's doubles modality, the mixed doubles category, but it also includes events for junior and senior players, in addition to the wheelchair players category. . Since 1978, the tournament has been played at Flushing Meadows–Corona Park, located in Queens, New York City, specifically at the USTA Billie Jean King National Tennis Center, and the courts are hard acrylic.

The United States Open is organized and owned by the United States Tennis Association (USTA), being its president Patrick Galbraith and it should be noted that it is a non-profit organization where the income received from the sale of tickets, television contracts and sponsorships, are used for the purpose of developing tennis in the United States.



Photo of Patrick Galbraith taken by chezsmith taken from flickr

The US Open counts within its rules with standard tiebreaks, being the first to 7 and won by 2 in the sets of each singles match, while for the rest of the Grand Slam events, there are other methods of scoring for the matches that arrive tied at 6-6 in the possible last set, being the third for the women's category and the fifth set for the men's category. In the French Open when the deciding set is presented, it continues until either player manages to take a two-game lead, but in the Australian Open the tie-break is played extended to 10 points, while in Wimbledon it is used the standard tiebreaker only when the game score reaches 12-12. In the same way as the US Open, all Grand Slam events use standard tiebreaks when deciding the other sets.

259.1 History

In August 1881 this tournament was held for the first time at the Newport Casino in Newport located in Rhode Island. In this first edition, only those members who belonged to the United States National Lawn Tennis Association (USNLTA) will be allowed to enter, with the first male singles winner being the player Richard Sears, obtaining the first of his

seven consecutive individual titles.



Newport Casino

Between 1884 and 1911, the tournament used a system whereby the defending champion automatically qualified for the following year's final, where he would play against the winner of that next year's tournament.

For the first few years of the championship only men competed and was called the United States Men's National Singles Championship. However, six years after the first men's national elections were held, in September 1887 the first United States Women's National Singles Championship was held at the Philadelphia Cricket Club. The player who won the title was Ellen Hansell from Philadelphia, who was only 17 years old at the time and that same year, the men's doubles event was held at the Orange Lawn Tennis Club located in South Orange, New Jersey. The semifinal of the United States Tennis Championship was held in Newport in the year 1890 and the match was between Oliver Campbell and Bob Huntington.



Philadelphia Cricket Club

Between the years 1888 and 1918 a challenge system was used in the women's tournament with the exception of the year 1917 and between the years 1890 and 1906 sectional tournaments were held both in the east and in the west of the country, to establish the best doubles teams. at which point, they competed in a playoff for the right to compete against the defending champions who were determined in the challenge round.

Between the years 1888 and 1989 the men's doubles events were played at the Staten Island Cricket Club located in Livingston, Staten Island, New York. While the 1893 championship was played at the Chicago-based St. George Cricket Club, the men's doubles event. For the year of 1892 the US Mixed Doubles Championship was included, while the National Women's Doubles Championship was introduced in 1899.

The national championship was moved in 1915 to the West Side Tennis Club in Forest Hills located in Queens New York. To move the championship to New York City, a group of tennis players led by New Yorker Karl Behr were the ones who dedicated themselves to this mission.

259.2 West side tennis club

A group of approximately 100 tennis players signed a petition to move the tournament in early 1915, arguing that most of the players, fans and tennis clubs were located within the vicinity of New York City and therefore, this move to New York would be of great benefit to the development of the sport. However, another group of players, including eight former individual national champions, opposed this decision. So it had to be put to a vote on February 5, 1915 at the USNLTA's annual meeting, with 128 votes in favor compared to 119 votes against relocation. The men's singles tournament held in August 1915, took place at the West Side Tennis Club for the first time located in Forest Hills in New York, while the women's tournament took place at the Philadelphia Cricket Club in Chestnut Hill in Philadelphia, it should be noted that the women's tournament was not moved until 1921. Between 1917 and 1933 the men's doubles event took place at the Longwood Cricket Club in Chestnut Hill in Massachusetts and in 1934 both men's and women's doubles events were held at the Longwood Cricket Club.


Pancho Gonzales playing in the Longwood Cricket Club

Between 1921 and 1923 the men's singles tournament was held at the Germantown Cricket Club located in Philadelphia, however in 1924 it returned to the West Side Tennis Club after the completion of the Forest Hills Stadium with a capacity of 14,000 seats. Although it is true that many considered it a great championship, it was not until 1924 that the International Lawn Tennis Federation officially designated it as one of the main tournaments in the world. The 1922 United States National Championship was when the draw seeded players for the first time, thus preventing the leading players from playing each other for the first few rounds. From 1935 to 1941 and from 1946 to 1967, both the men's and women's doubles took place at the Longwood Cricket Club.

259.3 Open Era

The open era was when professional tennis players were first allowed to compete in a Grand Slam tournament held at the West Side Tennis Club in 1968, in previous years the tournament was limited to amateur players. With the exception of mixed doubles, the tournament events were open to professionals and that year a total of 96 men and 63 women participated, in addition to a prize pool of $100,000.

The US Open became the first Grand Slam tournament in 1970 to use a tie break, to decide those sets that reached a score of 6-6. Between the years 1970 and 1974 the US Open used a best of 9 sudden death tiebreaker, this was before starting with the points system where the best of 12 points wins, proposed by the International Tennis Federation (ITF) .

The US Open in 1973 was the first Grand Slam tournament to award the same prize money for both men and women. For example, that year's individual champions Margaret Court and John Newcombe each received $25,000. After 1975, after several complaints regarding the surface and the impact on the ball's bounce, the tournament began to be played on clay surfaces instead of on grass courts. That same year, in order to make the tournament a little more friendly with television, it was decided to experiment with adding spotlights and this allowed the matches to be played at night.



Margaret Court

The tournament moved from the West Side Tennis Club to the USTA National Tennis Center in 1978, as it was newly built at Flushing Meadows three miles north in Queens, as well as being larger. The court surface was also changed to hard clay, with Jimmy Connors being the only person to have managed to win US Open singles titles on three different surfaces (grass, clay and hard clay), while the only woman capable of winning US Open singles titles on two surfaces (hard clay and clay) was Chris Evert.

The only Grand Slam tournament that has been played every year since its inception is the US Open. In the 2006 edition, the complex began to be called the USTA Billie Jean King National Tennis Center, to honor Billie Jean King, who was a four-time champion in the women's singles category of the United States Open, in addition to being a pioneer of women's tennis.



Billie Jean King

The US Open changed the traditional practices regarding the programming of tennis tournaments between the years 1984 and 2015 with the concept of "Super Saturday". This meant that the women's finals were played on the last Saturday of the tournament, while the men's finals were played on the last Sunday, with the respective semifinals being held a day earlier. Originally the women's final was held between the two matches of the men's semifinals, but in 2001 the women's final was moved to the night to be able to present it on prime time television, in this way a great growth was achieved between viewers of the popularity of women's tennis. This scheduling pattern was very helpful in building TV viewership, but it somehow caused divisions among players as they were given less than a day.

Between 2008 and 2012 the men's final was postponed for five consecutive tournaments due to weather, while for 2013 and 2014 the USTA intentionally scheduled the men's final for Monday, this move was praised for allowing players to an extra day to rest after the semi-finals, but this caused some anger from the ATP for deviating from the structure of

the other Grand Slams. The concept of Super Saturday was eliminated in 2015 and the US Open returned to a format similar to that of the other Grand Slams, with the women's finals on Saturday and the men's on Sunday. However, both sets of semi-finals due to weather delays were forced to be held on Friday of that year.

The US Open was the first Grand Slam tournament that in 2018 began to control the time of the players between points, since it introduced the shot clock and in this way the rhythm of the game is increased, the clock is placed in a place Visible to both the players, the chair umpire and the fans, now in all Grand Slams, WTA and ATP tournaments they apply this technology since 2020.

In view of the COVID-19 pandemic, the 2020 event was held without spectators and it was announced that the wheelchair tennis competition would not take place, this caused excessive controversy as the USTA took the measure without consulting the disabled athletes, as it had done with non-disabled competition organizations. She was later accused of discrimination and the USTA had to reverse this measure, in addition to admitting that it should have discussed this decision with the disabled competitors and offered them $150,000 to divide among themselves, as opposed to the $3.3 million they were given. Affected players were offered to split among themselves for the cancellation of the women's qualifying competition, men's qualifying competition and reductions in mixed doubles pools, as part of the Open a competition with 95% of the 2019 prize funds or a competition that would take place at the USTA in Florida.

259.4 Arthur Ashe Stadium in 2010

The field of play of the US Open is developed with 22 outdoor courts and outside the East Gate there are 12 more practice courts, they consist of four exhibition courts that are the Arthur Ashe Stadium, the Grandstand, the Louis Armstrong Stadium and Court 17, 13 are field courts and five of them are practice courts.

The Arthur Ashe Stadium on the main court opened in 1997 and has a capacity of 23,771 seats, in addition to a retractable roof that cost 180 million dollars and where its construction was completed in 2016. The stadium is called Arthur Ashe in honor the tennis player who won the men's singles at the inaugural US Open in 1968, but also won the Australian Open in 1970, the Wimbledon championship in 1975 and is a character who was inducted into the Tennis Hall of Fame in 1985 International.



Arthur Ashe Stadium photo taken by slgckgc taken from flickr

The Louis Armstrong Stadium is the next largest field in the complex and has a capacity to hold 14,061 people, it was inaugurated in 2008 and its construction cost 200 million dollars; this court is divided into a lower level consisting of 6,400 seats and its tickets are sold separately as they are reserved seats, while admission seats for the general public is located on the upper level and has 7,661 seats. On the other hand, in the southwest corner of the complex, the third largest court was inaugurated in 2016, it is a grandstand with a capacity of 8,125 seats. Also in the southeast corner of the complex is court 17, which is the fourth largest stadium, it was inaugurated in 2011 with temporary seats, however, the following year it received its permanent seats and has a capacity of 2,800 seats where all they are of general admission and it is called by all as "The Pit", since the playing surface is sunk eight feet into the ground. For

the practice courts that go from P1 to P5 they have a total capacity of 672 seats, while the competition fields that go from 4 to 16 have 12,656 seats, broken down as follows:

- Courts 11 and 12 have a capacity of 1,704 seats each.

- Court 5 with 1148 seats

- Court 7 has 1494 seats

- Courts 10 and 13 have 1,104 seats each

- Court 4 with 1,066 seats

- Court 6 has 1,032

- Court 9 has 624

- Courts 14 and 15 have 502 seats each

- Courts 8 and 16 have 336 seats each

What allows television coverage and matches to extend into prime time is that all the courts used by the US Open are fully lit. The women's singles final was intentionally scheduled in prime time for the first time in 2001. This happened because Sean McManus, the president of CBS Sports, was interested in the great interest of the viewers in the players Serena Williams and Venus Williams, in addition to of the increased ratings performance seen in the 1999 women's singles finals, which due to rain delays had to be held in prime time.

259.5 Area

The US Open was played between 1978 and 2019 on a surface called Pro DecoTurf hard court, being a multi-layer padded surface that was classified as medium fast by the International Tennis Federation. It is important to note that the courts are resurfaced every August just before the start of the tournament. However, the USTA decided that Laykold would be the new supplier of court surfaces, beginning in March 2020. Every single US Open tennis court since 2005 is painted blue within the lines, so that it is easier for players, spectators and viewers to see the ball, to the point that it is already a registered trademark as "US Open Blue", while the area outside the lines It is still green, to increase visibility due to the difference in colors.



259.6 Challenges in the player line

Instant replay checks made on the so-called line were introduced by the US Open in 2006 using a computer system called Hawk-Eye, the first Grand Slam tournament to use this system. The organization felt the need to use the system due to the controversy that arose between Serena Williams and Jennifer Capriati in the quarterfinals of the 2004 edition, given that important line calls against Serena Williams occurred in that game and instant replay were only available on the Arthur Ashe and Louis Armstrong stadium courts until the 2008 tournament. However, on the Grandstand court the system was installed for 2009. It should be noted that all competition courts are already equipped with the Hawk-Eye

as of 2018 and in all matches of the main draws, both singles, men's doubles and women's, the same procedure is followed: each player is allowed three incorrect challenges per set and one more in a tiebreaker.

In the year 2021 the player challenges were removed and it was then the second Grand Slam to use the Hawk-Eye Live in an absolute way, that is, from then on all line calls are executed electronically. In the previous year's edition, Hawk-Eye Live had already been incorporated for all fields, except in the main Arthur Ashe and Louis Armstrong stadiums, in order to reduce personnel during the pandemic.

JP Morgan Chase renewed its sponsorship of the US Open in 2007 and part of the deal was that the replay system should be called "Chase Review" on both video and television in the stadium.

259.7 The best games of the US Open

259.8 Manuel Orantes vs. Guillermo Vilas in the 1975 Semifinals

Manuel Orantes had an amazing comeback in his win over Guillermo Vilas, when he won the 1975 semi-finals with a score of 4-6, 1-6, 6-2, 7-5, 6-4. Very few people watched the match because it took place without television coverage and late at night, in fact it is extremely difficult to find a video of this match online. Both players were the best on clay in the world at the time, and yet it was a match that didn't get the attention it needed. It was even the first time that a Grand Slam tournament had night sessions, Vilas was the number 2 seed, while Orantes was the number 3 seed. While it is true that the match featured long exchanges between both players, everything indicated that the match would end at a reasonable time since Vilas won the first two sets, later maintaining a 5-0 lead in the fourth, however Orantes impacted the Argentine when playing that point with a serve and volley , thus achieving his first volley in order to stay alive. Then Vilas with his serve had two more match points reaching 5-1, but again Orantes not only saved both points but also in the fourth set he managed to save five match points and then won seven straight games to win the set with a score of 7-5.

By the time the Spaniard managed to finish the fifth set which was when he was able to get to his room, it was already two in the morning and after his grueling semi-final match, Manuel Orantes returned to the court approximately 18 hours later to play Jimmy Connors. However, Orantes showed no signs of emotional or physical fatigue, to the point that he outscored Connors 6-4, 6-3, 6-4 to claim his first and only Grand Slam title.



Photo of Manuel Orantes taken by Tennis Buzz and extracted from flickr

259.9 Novak Djokovic beat Roger Federer in the 2011 Semifinals**

Novak Djokovic in beating Roger Federer 6-7, 4-6, 6-3, 6-2, 7-5, produced one of the greatest shots in history in the 2011 US Open semifinals.

Djokovic saved two match points in the US Open semifinals by beating Federer for two years in a row. In the 2010 fifth set he had battled back two match points while trailing 5-4, but the 2011 effort was much more dramatic.

After losing the first two sets Djokovic recovered to force a fifth set. However Federer managed to break Djokovic in the 8th game, the score was 5-3 and Federer was serving having a double match point at 40-15. At that point, Djokovic hit a forehand crosscourt return, saving the first match point, to such an extent that John McEnroe said, according to The Guardian, that it was "one of the greatest shots of all time." Later he managed to save the second match point and also managed to win four consecutive games, thus being able to win the match with a flourish.

259.10 Martina Navratilova vs. Steffi Graf in the 1991 Semifinals

When Martina Navratilova faced Steffi Graf in the semifinals of the 1991 US Open, she had lost four straight matches against her opponent and was 34 years old at the time, while Steffi Graf was only 22 years old and had she had beaten Navratilova in the 1988 and 1989 Wimbledon finals, but also in the 1989 US Open final, she had also been the number 1 seed that year 1991, when Martina Navratilova was the number 6 seed.

In this match Navratilova scored important points and was in the lead with a score of 7-6 (7-2), 6-7 (6-8), 6-4. In the

second set she battled back four points, before Steffi Graf managed to win the tie break on the fifth point of the set and level the match.

Martina Navratilova managed to rally in the third set and took a 4-1 lead, but in the sixth game she double-faulted and lost serve, bringing Graf to within 4-3 and subsequently earning two break points while With Navratilova serving for the match at 5-4, Navratilova outlasted Graf by saving the first break point to then respond to the second point with 3 excellent big serves, with which she ultimately managed to win the match.



Photo of Stefanie Graf and Martina Navratilova taken by Elton John AIDS Foundy from flickr

259.11 Bjorn Borg vs. Jimmy Connors in the 1976 Final

Although Jimmy Connors was ranked No. 1, he hadn't won a single Grand Slam event since his triumph in the 1974 US Open final, when he beat Ken Rosewall. The 1976 US Open was played on a gray-green clay court (Har-Tru) and Borg had already won the French Open in 1974 and 1975 on clay, and had also won the first of five consecutive titles two months earlier. would get at Wimbledon. But Connors before the 1976 final had managed to beat Borg five times in a row. Connors' aggressive drives towards the net, flat and hard groundstrokes seemed to wear the Swede down.

The turning point turned out to be the third set that made the match really special, this happened after each player managed to win one of the first two sets. Connors began leading the third set 4-2 and found himself serving at 40-0, just one point away from a commanding 5-2 lead. However, Borg managed to win five straight points to win the game and subsequently earned a double set point in the tie break. Connors then hit two game winners to equalize the tie break but let a set point slip away at 7-6, subsequently saving two points when the score was against him at 8-7 and 9-8. The game was too exciting when the last point managed to tie the tiebreaker at 9-9. At that moment Borg was ready to serve when a ball boy informed the referee that the players had to change sides again, since in the midst of the intensity of the match both the referee and the players had forgotten that they had to change sides. .

The next two points were won by Connors after he battled through four set points to put the score in his favor at 11-9 and win the set. In the fourth set while serving at 5-4 he had his first match point, when Borg managed to save the situation with a difficult forehand and subsequently saved another point, before Connors ended up winning the title with a score of 6-4. , 3-6, 7-6 (11-9), 6-4.

Connors expressed in his book The Outsider that some of the shots they both played that day, Borg with his little wooden racket and him with his Wilson T-2000, were just plain crazy.

259.12 Jimmy Connors vs. John McEnroe in the 1980 Semifinals

Both players were American stars with a lot of attitude and they didn't like each other. The day of the match saw several tirades between McEnroe and the chair umpire, which somewhat added flavor to that 1980 semi-final. McEnroe won the match 6-4, 5-7, 0-6, 6. -3, 7-6 (7-3), but not before putting on a very entertaining show.

McEnroe took the lead 6-4, 5-4 and it was when Connors took control winning 11 consecutive games, to lead 2 sets to 1 winning the third set to love, it was precisely in that set that McEnroe argued with the judge of chair calling him among other things "Mr. Incompetent". Connors for his part, placed himself on the wall during the outburst to avoid the argument.

In the fourth set McEnroe recovered and led 5-4 in the fifth set, however Connors hit two great winners breaking his opponent's serve and managing to tie the match. At that point McEnroe lost control of his racket which traveled the length of the court where he just barely missed Connors, which cost McEnroe a $250 fine.

They eventually reached a tie break in the fifth set and Connors committed two serious fouls giving McEnroe an insurmountable 4-1 lead and winning the match.



Photo of John McEnroe taken by Rob Rudloff Foundy from flickr

259.13 Venus Williams vs. Serena Williams, 2008 quarterfinals

Sisters Venus and Serena Williams had had 16 meetings, each winning eight of them before meeting in the 2008 US Open quarterfinals, this match being the most compelling of all their 24 meetings.

Serena reached the semifinals with a 7-6 (8-6), 7-6 (9-7) victory and according to the Associated Press it was very hard to imagine that any of those encounters could be even close to the quality of the competition run in 2008 by sisters who grew up together perfecting their shots on the same court in Compton, California. Venus hit serves up to 125 miles per hour, while Serena hit up to 115 miles per hour, landing groundstrokes and volleys that were ultimately the envy of all the women on tour.

Venus led the first set 5-3, but Serena forced the tie break and then earned a double set point while trailing 6-4 and won the first set. In the second set Venus had the advantage at 5-3, but saved three points and another one at 6-5. Venus

with another triple set point led the tiebreaker 6-3, however, Serena not only saved all three set points but she won the tiebreaker 9-7, winning the match.



Photo of Serena and Venus Williams taken by Universal Tennis taken from flickr

259.14 Steffi Graf vs. Monica Seles in the 1995 Finals

Both players had major mishaps while preparing for the 1995 US Open final. After an absence of two years and several months, as Monica Seles, who had been out of the game since April 1993, was stabbed by a Steffi Graf fan in Hamburg, by a German who wanted Graf to regain supremacy over Seles.

Steffi Graf, for her part, spent much of the competition dodging the German press, since her father Peter was in jail in Germany at the time, for failing to pay income tax on his daughter's earnings for more than of 1.5 million dollars. The night before the final, Graf even had an MRI for a sore foot.

In the first set Monica Seles thought she had won it with an ace at 6-5, however the ball was disallowed and Graf managed to save set point, later winning the tiebreak. The second set was completely dominated by Seles, winning it to love and in just 27 minutes.

Steffi Graf was serving up a 5-3 lead at 40-15 in the third set, when Seles landed a smashing forehand to stay alive, however, she erred on the second match point and Steffi Graf achieved victory.

259.15 Andre Agassi vs. Pete Sampras in the 2001 quarterfinals

Although it is true that this match between Andre Agassi and Pete Sampras was not exactly a final, in these quarterfinals of the US Open in 2001 it was a sample of what any tennis fan could wish for.

These two American stars, who already owned 21 Grand Slam singles titles between them, met for the 32nd time in their careers having developed a great rivalry between them, each with their contrasting styles and personalities.

Sampras held a slim 17-14 advantage in match wins, including wins in the 1990 and 1995 US Open finals. The excessive crowd that attended the night session of the US Open, in addition the audience was openly known for its raucous participation in the matches. The crowd in New York had their sentimental favorites and every one of them, both 30-year-old Sampras and 31-year-old Agassi, had his fan base.

The match was characterized by being a close contest at all times, to the point that there was not even a single break of service during the entire match. The atmosphere created by the crowd of fans was simply phenomenal.

Sampras conquered the victory with a score of 6-7 (7-9), 7-6 (7-2), 7-6 (7-2), 7-6 (7-5), but the curious thing was that they were 12:14 a.m. and almost all of the 23,033 spectators who attended Arthur Ashe Stadium that night were still present.

Agassi had to fight off a triple match point when they were in the first set tie-break and came back from a score down 6-3 to reach a score of 9-7. In the second set, Sampras volleyed skillfully to win the tiebreak, before finishing off with back-to-back aces in the third set tiebreak.

In the fourth set Sampras hit two more aces and had a triple match point to leave the score at 6-3. But the suspense increased when Sampras double faulted, missing a volley to make the score 6-5, however Agassi on the third match point missed a forehand, which Sampras knew how to take advantage of very well to take the victory match victory.



Photo of Pete Sampras and Andre Agassi taken by Tennis Buzz from flickr

259.16 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

HARRIET, THE MOVIE

The movie titled "Harriet" premiered at The Toronto Film Festival on Sept. 10, 2019. It was a terrific and eye opening expansion of everything I thought I knew about the Civil War era Underground Railroad Conductor Harriet Tubman. The film exposed much information about Harriet that the general public in the U.S. was unaware of and in the process made a few mistakes as well. It received great acclaim and also some criticism for being "formulaic". The acclaim was primarily for the lead actor, oddly enough a British citizen, named Cynthia Erivo. I found her to be a completely believable character, yet the woman she portrayed was almost super-human in her real life existence.

At the end of this article I will include seven links to articles explaining in detail the relatively minor criticisms and historical inconsistencies of the movie. The articles also provide detailed praise and a story-line of the movie. You can follow links in the articles for even more in-depth analysis of the movie and historical context of Harriet's life.

The movie opens, showing Harriet having a "spell" that has caused her to lose consciousness, explaining that she often had visions that she believed were God speaking to her. These visions were the result of brain injury resulting from having a two pound weight strike her in the head when a white overseer threw it at her.

Harriet Tubman was born on a farm in Maryland in about 1822 (according to two articles) as Araminta "Minty" Ross and later changed her name, in the movie, to Harriet Tubman after meeting an abolitionist named William Still in Philadelphia after her 100 mile trek from the farm where her owners, the Brodess family, resided. However, one article suggests that she took the name when she married a free black man named John Tubman while still residing on that farm.

Harriet and her father meet with Mr. Brodess and show him a document based on a will that Brodess's father left, promising that when Harriet's mother turned 45 (12 years earlier) she and her children would be freed. Mr. Brodess says they will always be slaves and tears up the letter from the lawyer who analyzed the will, stating that "Minty", her mother and siblings should be freed. Afterward, Minty prays for Mr. Brodess to die and when he does, not long after, his son, Gideon decides it's time to sell Minty. She decides to escape to freedom after having a "vision" of herself as a free woman.

Harriet does not take her husband John with her because she believes if caught, he would no longer be a free man but would revert to being a slave. She escapes to Philadelphia with the help of a black preacher, Reverend Samuel Green, who is a freed slave, and her two brothers who leave with her, end up returning to the Brodess farm out of fear.

The story of her 100 mile journey to Philadelphia in 1849 is a harrowing one because she is closely pursued for part of the way by Gideon. Gideon and his family need to recover Harriet because they are in dire financial straights. They NEED all the slaves they can sell, to pay their debts. Gideon loses track of Harriet when she jumps off a bridge into a river. Gideon later hires a black slave catcher, Bigger Long, to help track Harriet down and the movie shows some detail about their last encounters. By that time Harriet has learned to use a gun very effectively.

Upon arriving in Philadelphia, Harriet finds her way to the abolitionist William Still using information provided by the Reverend Green. Still meticulously documents much of the action from that point on. He was a true historical figure and he inducted Harriet as a fellow Underground Railroad Conductor. They both helped to free many slaves and move them to freedom in the north.

In the movie Harriet is introduced to Marie Buchanon, a free black woman who provides lodging and advice to Harriet. She teaches Harriet how to act like a FREE black woman. There is no evidence that such a relationship existed. It was made up for the movie but it certainly could have happened that way. There is one scene where a man in the south is checking Harriet's "papers" and they say that she is 5'3" tall (if I remember correctly). The man says "You don't look

that tall" and Harriet says "I must have been wearing my tall boots that day". She is portrayed as a very intelligent woman and she must have been to have rescued so many slaves before and during the Civil War.

Harriet made many trips back south to rescue relatives and other slaves. She eventually had a direct hand in the rescue of about 70 slaves and near the end of the movie she gives a speech to a troop of about 150 black soldiers who, with her leadership, rescued about 750 fugitive slaves. Her reputation grew to the point where she was referred to as ""Moses" by the abolitionists and other conductors in the Underground Railroad.

Although it is not mentioned in any of the articles I read, the movie tells us that she was given a home on the estate of a member of congress who she made friends with. I found no corroboration of this. She lived to be about 91 years old. Harriet was a HIT MOVIE!

https://en.wikipedia.org/wiki/Harriet_(film)

https://www.imdb.com/title/tt4648786/

https://www.imdb.com/title/tt4648786/plotsummary?ref_=tt_stry_pl

https://www.rottentomatoes.com/m/harriet

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https://blogs.loc.gov/headlinesandheroes/2020/06/harriet-tubman-conductor-on-the-underground-railroad/

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260.1 About the Author

Harley Armentrout is a happy husband and father, former silversmith, aerospace electronics prototype assembler, test, calibration & repair technician, also writing test procedures at BallAerospace. Then 21 years in the gaming industry, in a range of positions, culminated as a Gaming Inspector, observing and reporting on rules violations, safety issues and criminal activities for the Yavapai Prescott Indian Tribe. After "retiring" Harley taught himself a few graphic design skills and he works as a freelance designer.

CHAPTER

ONE

LIFE IS BEAUTIFUL

This is a 1997 Italian film that was starred, written and directed by the filmmaker Roberto Benigni. The story of this film is drawn from real life about the experience of Rubino Romero salmoni, who was one of the Jews who was able to survive the holocaust and left the testimony of his experience through a book called “In the end I defeated Hitler” .

Roberto Benigni is also inspired to make this film by the experience of his own father, since during World War II he spent two years in a prison camp during Nazi Germany.

The film also stars Nicoletta Braschi who is the wife of the director in real life and Giorgio Cantarini. Life is beautiful is a film that is presented to us from the perspective of both the protagonist and his family, the horrible experience and everything they have to go through in order to survive, it also teaches us how love can be above hate and terror.

The story is about a young Italian but of Jewish origin who meets Dora at her work and falls madly in love with her. However, this young woman is the fiancée of a local fascist bureaucrat whose name is Rodolfo.

Guido (Roberto Benigni) manages to snatch his fiancée from the Nazi leader as a romantic process begins with the girl of his dreams, all this occurs while the change of environment propitiated by the Nazi ideology that is becoming violent becomes more and more evident. and dangerous.

Six years later Guido and Dora are married and have a son named Giosué while World War II is taking place. But despite the Nazi invasion and the outbreak of war, they lead quite a satisfying life where they are truly happy.

The family is a victim of irrational hatred and war that are present on Guido’s son’s birthday, when both are arrested for the criminal act of their Jewish origin and are soon put on a train that goes directly to a field. of concentration. Although it is true that Dora is not Jewish, she also demands to get on the train to be able to stay next to her loved ones, but when they arrive at the concentration camp, both men and women are separated into different rooms.

From the beginning, the family must get used to the horror, since some of their acquaintances and friends are sent to the gas chambers, since they are not considered by the terror regime as useful labor.

Throughout the film Guido manages to hide from his son the terrible circumstance in which he finds himself and makes him believe that it is a hyper-realistic contest in which it is a matter of winning as many points as possible, since the first to achieve 1000 points wins. you will be able to take home a real armored tank. He even explains to Giosué that he should remain calm, without demanding to see his mother, asking for food or appealing to tears, since that way he will lose points without having a chance to win the game. Keeping a low profile and avoiding the gaze of the Nazis at all costs, hiding from the danger that threatens them is an important part that will help them earn extra points for their team and in this way Guido convinces his son to behave up to the task of events.

This is how Guido justifies with all this fantasy, the reality of the moment and explains to Giosué that the guards mistreat them because in reality what they want is to win the tank for themselves. On the other hand, due to the ever decreasing number of children (since they have been murdered in gas chambers) it is because they are hidden in order to gain points.

Guido manages to convince his son in this way so that he does not want to go home, telling him that they are up in the score with respect to the rest and that they only need a little more time to be able to return home, but with the tank as a prize. .

The days go by with all the horrors that the holocaust generated, until one fine day the Germans begin to withdraw before the allied troops arrive, who already have enough counterweight in the war. However, the Nazi soldiers do not want to leave without doing as much damage as possible and intend to kill every Jew found in the concentration camp.

Guido instructs his son to hide and not come out until everything calms down, since they are very close to winning the prize. Meanwhile, the protagonist goes in search of Dora so that they can all go together, but at that moment he is surprised and one of the guards shoots him. As soon as dawn breaks, Giosué comes out of his hiding place and realizes that the Germans have fled. It is when suddenly a tank appears and the boy believes that it is the prize that will take him home, but it is the Americans who are liberating the field. They pick up the boy along the way and Giosué manages to find his mother among the released prisoners, excitedly informing him that they have won.

Guido's love managed to triumph in the face of horror, but not before offering everything he had in his power to keep the love of his life safe and sound, as well as free from trauma and horror.

Life is Beautiful was a commercial success with excellent reviews internationally. The film was awarded countless prizes from all over the world, including the "Grand Jury Prize" awarded by the Cannes Festival. He also won nine "Davis di Donatello" awards in Italy, as well as 50 international awards. The film obtained 7 Oscar nominations including Best Picture and this makes it the 6th film to receive this nomination, being non-English speaking and the 2nd Italian film competing for this award (the first was Il Postino in 1995), but finally he would only get three statuettes for Best Actor, Best Soundtrack and Best Foreign Film of the year 1998.

261.1 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

TWO

THE FIGHT CLUB

This film is narrated by its protagonist who is a man who works as an expert for a certain automobile company, he is from the upper middle class and his real name is never known. He is a lonely being who tries to fill his existential emptiness by decorating his expensive house and buying designer clothes. He has suffered from terrible insomnia for six months and as a result his mental health is weakened, so he decides to consult his doctor in order to prescribe some sleeping pills, but the specialist refuses and invites him to attend meetings of support for cancer victims and thus become aware of true human suffering.

The already desperate protagonist attends the meeting posing as a sick person, but seeing the pain of those people he vents and cries in such a way that he finally manages to sleep that night. It is at that moment that he becomes addicted to whatever support group there is for different illnesses.

The protagonist meets Marla Singer who is a mysterious woman who usually smokes in all the meetings at the back of the room. He realizes that it is the presence of another impostor that begins to disturb him within the support groups, so he confronts her and they both admit her charade, so they decide to exchange phone numbers and share the support groups.

While returning from a business trip he casually meets Tyler Durden on the plane, who is a soap maker whose life philosophy is quite unique, to the point that it intrigues and impresses him. After this scene, the main narrator arrives at his house to find out that he lost all his belongings, as there was an explosion inside his apartment and he ends up calling Tyler.

When the two meet, they start a conversation about the current lifestyle, consumerism and capitalism. It is when Tyler challenges the protagonist to hit him with his maximum force and the somewhat confused narrator accepts the challenge. After the fight, both characters feel euphoric and that is when Tyler invites the protagonist to live in his house. This fact becomes more and more frequent and more men begin to arrive who are included in the fight and that is how the fight club is born.



Marla calls the narrator on the phone appearing again on the scene and this occurs after she has consumed an overdose of pills and in her suicide attempt, she cries out for her help. The narrator ignores the matter and leaves the phone off the hook, but the next morning and to his surprise, he finds that the girl spent the night at his house. How could this be possible? To later discover that Tyler took the phone, he talked to Marla and not only brought her to her house but also had sex with her.

As the film progresses, the fight club gains more and more participants, to the point that it spreads over several cities

and Tyler is the one who leads it. Over time, men willing to fanatically and blindly follow the leader's orders begin to appear, and that is when Project Chaos arises, where an anarchist group provokes acts of violence and vandalism throughout the city.

Then Tyler disappears and the narrator chases him across the country in order to stop the cycle of destruction carried out by his soldiers and he has a strange feeling of having known all the places he goes and that is when one of the members of the fight club, reveals that Tyler Durder is really the narrator and protagonist of this film, that is, he confirms in a hotel room that they are both the same person. With this personality dissociation while the protagonist sleeps, Tyler takes possession of his body to set his plan of action in motion.

Realizing this, the narrator reveals his objectives to the police, but his other personality has accomplices everywhere, so he causes the explosion of several credit companies where all the bank records are found and thus be able to free the population of all their debts. The two personalities fight for control and finally Tyler is shot by the narrator, who suddenly disappears. At the beginning of the film, the narrator can be seen as a man without a purpose in life, defeated, somewhat robotic and who fulfills all his obligations to society. He has a stable job and a house of his own filled with all the luxuries that anyone wants to have, however, he is completely unhappy and his condition causes him insomnia for so long.

Before meeting Tyler Durder during the flight, a monologue is heard in which the narrator deeply wants the plane to crash, he is someone desperate for the routine that consumes him and it is precisely his encounter with Tyler that changes his life and encourages him. to live an experience that leaves behind everything that makes you feel cornered.

This shocking film also has renowned actors, the narrator is played by Edward Norton, while his other personality is played by Brad Pitt and Marla is played by actress Helena Bonham. Fight Club is based on a novel written by Chuck Palahniuk and 20th Century Fox producer Laura Ziskin has hired Jim Uhls to write the script and adapt it for film production. Four directors were considered for the making of the film and David Fincher was hired after multiple debates, thanks to his high enthusiasm for the project.

Fight Club received mixed reactions from critics and became one of the most controversial films of that year. Critics praised the direction, acting, messages and theme, however the explicit violence was highly debated as was the moral ambiguity. But without a doubt, it is one of the films that you have to see!

262.1 About the Author

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CHAPTER

THREE

THE SEVENTH SEAL

This film is director Ingmar Bergman's masterpiece, with a highly significant philosophical value since it portrays human dilemmas regarding the meaning of life. One of the dilemmas to which the Swedish director dedicated himself was "The Silence of God" since he seems to observe the world without intervening and as a spectator.



The film is about a boy accompanied by his father after contemplating the pictorial works that he observed in the churches near Stockholm. Gothic images such as the work of Albertus Pictor where death appears playing chess, but it also recalls paintings on the dance of death.

The Black Death is present in a decadent Europe and the film takes place in Sweden in the fourteenth century, with the voice of a narrator pronouncing verses from the Apocalypse.

Antonius Block is masterfully played by Max Von Sydow and represents a knight who has just returned from the Crusades and finds himself confused by so much misery. The protagonist speaks with death and asks for a little more life, because he wants to clear up some doubts that have assailed him for many years. Death, who is played by Bengkt Ekerot, is playing chess with Antonius and grants him an extension to continue on his path of doubts. Antonius is always accompanied by a squire named Jons who is played by Gunnar Bjornstrand who is a very practical man and far from metaphysical quest.

Antonius and Jons meet different characters that imprint a notorious force on the plot. A girl convicted of witchcraft, a thief of goods taken from the dead, a professor of theology, a family of puppeteers minstrels, a woman saved by Jons from being raped, a group of flagellants and a blacksmith with his unfaithful wife. Almost everyone the protagonists meet is in one way or another shaken by the Black Death. Only the group of comedians breaks this rule, they are minstrels who guide their lives in a simple way and Antonius wants to save them from death, although he knows that he himself cannot escape his fate.

The encounter of the protagonists with the flagellants who whip themselves, are accompanied by monks who carry a crucifix and sing, where people pay them a ceremonial tribute to appease the wrath of God. However, Antonius, his squire and the minstrels do not kneel and resist against a blind faith that is trapped in superstition, while one of the monks refers to death in apocalyptic terms and the procession continues on its way until disappears.

On the other hand, the scenes of the girl accused of witchcraft and her execution are shocking. Antonius is interested in the woman accused of having relations with the devil and sentenced to the stake, he talks to the young woman to tell him about her experience with the devil and thinks that he can convince her to dissipate her anguish thanks to his

skills with other dimensions. He also said that he could give her an answer about God, in this way the young woman could clear up questions about life after death. However, the girl finds no answers and the knight can only glimpse a deep emptiness that terrifies him.

The journey of the knights and their companions ends when, almost at the end of the film, they arrive at Antonius's castle, where they are received by his wife and begin to read the Apocalypse. At that moment, the knight who had lost the chess game feels deeply intimidated by the requirements of his squire, who rebukes him for the way he feels trapped by destiny. It is then that death takes the lives of Antonius and some of his companions, dancing with them and making its way in a macabre way. However, the family of minstrels made up of Mia, Joy and her son are saved from death, thus ending the film.

Bergman shows us in the middle of the medieval era a legitimate resource to think about issues concerning contemporary man. The agnostic void and doubt are important issues even for those people who have fled the reference to God for other beliefs.

The seventh seal is of the fantastic dramatic genre and this Swedish film was shown to the public in 1957. It is considered one of the great classics of universal cinema and helped Ingmar Bergman establish himself as a renowned director. This classic contains iconic scenes that have been honored through time. America magazine credits this film with starting a series of films capable of exploring faith in a post-Holocaust era. It has been awarded multiple prizes such as:

1- The special prize of the Cannes film festival of the year 1957

2- The Golden Labrum of 1960 in the fifth week of Religious Cinema in Valladolid

3- The prize for the best foreign film director awarded by SNGCI in 1961

4- The Fotogramas de plata award, to the best foreign film performer awarded to Max Von Sydow in 1962.

5- Prize for the best film of the year awarded by Sant Jordi de cine and also for the best foreign director, both in 1962.

6- Prize for the best foreign film awarded by Medals of the Circle of Cinematographic Writers and also to the best foreign director in 1961.

The seventh seal is characterized by not being governed historically, since the problems it raises are mainly current. This film has the dichotomy of belonging to an atomic age literature, but it also has a lot to do with judgment day. Being its central characters, both the knight and his squire figures that are clearly contemporary. This film shows the fears in which man is submerged, but not only in medieval times, but also belong to his fears today.

It is a film that forces us to reflect and therefore should be included in the list of films to see.

263.1 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

FOUR

DOWNTON ABBEY

Created and co-written by Julian Fellowes

Downton Abbey is a British television series that aired on ITV in the U.K. and on PBS in the U.S.A. for six years beginning in 2010 on ITV and 2011 on PBS. It features the fictional, aristocratic, Crawley family and their servants, as well as many other characters who interact with them over a period from 1912 to 1926. It is set primarily at Downton Abbey, a fictional Yorkshire country estate. There was also a film released in 2019 which covered a visit from the English Royals, King George V and Queen Mary, who were on their way to their Scottish estate of Balmoral. They would often visit different estates during their yearly trips.

The series is incredibly convoluted and detailed when relating many, many story lines and I will leave out the details to avoid confusing readers and boring you with endless descriptions. The series portrays the effects of many significant historic events on the Crawley family and on British social hierarchy in general. Such events include the sinking of the Titanic, the outbreak of the First World War, the Spanish Flu Pandemic, the Marconi Scandal (not unlike modern day government "pay for play" scandals), the Irish War of Independence, the Teapot Dome Scandal, the British general election of 1923, Adolph Hitler's Beer Hall Putsch in the same year, and in Series Six, the rise of the British working class and the decline of the aristocracy.

Downton Abbey has received many awards and great acclaim, such as a Golden Globe award, several Primetime Emmy Awards (and the most nominations of any series), and recognition by Guinness World Records as the "the most critically acclaimed English-language television series of 2011". It was the most watched television series on both ITV and PBS.

My wife and I found the detailed story lines to be so engrossing that we have watched the entire series twice. It is easy to become involved in the daily lives of the many interesting characters to the extent that we would eagerly anticipate watching the next episode time after time. The main characters are Robert Crawley, the Earl of Grantham, his wife Cora, the Countess of Grantham, their three daughters, Mary, Edith and Sybil, Robert's mother, his sister, and a total of 11 other characters who are all listed on imdb.com as part of the Main Cast. The servants lives are at least as interesting as the Crawley family, just as if they are part of the family. There are literally hundreds of other interesting characters to keep one captivated. We found the acting and directing to be superb, as if we KNEW the characters. Sometimes we could predict their behavior, and then sometimes not. What fun!

The film locations are fascinating as well. There are at least ten notable locations shown on a Wikipedia map ranging from Scotland in the north to the very south of England. The exterior shots of Downton Abbey and most of the interior shots were filmed at Highclere Castle in north Hampshire. Notably, for the sponsor of this article, there are at least three locations and many, many scenes set in Bampton, Oxfordshire. Inside and outside, I found the locations to be absolutely beautiful and captivating. After watching the series, I feel like I know much more about a land that I have never seen in person, and it is almost as though I HAVE been there.

There is some controversy regarding the authenticity or realism of some of the aspects of the series. The positive, sympathetic portrayal of the aristocracy has been criticized. The accents of some of the actors have been questioned. Some of the expressions used and specific behavior have been questioned in a historical accuracy context. Others have argued that Downton Abbey was never intended to be a perfectly, historically accurate portrayal of the times, but rather a generally representative portrayal and yes, entertainment. There are always those who will pick apart any subject because that is their nature.

It is interesting to me that many of the scenarios in this wonderful series are something that we can relate to in our present day. There are issues that resemble our lives today and that is part of the charm of Downton Abbey. If you would like a more detailed description of the series, just visit the references shown below - and then rent or stream Downton Abbey, but be careful. It IS addicting….. Enjoy!

- https://en.wikipedia.org/wiki/Downton_Abbey
- https://www.imdb.com/title/tt1606375/

264.1 About the Author

Harley Armentrout is a happy husband and father, former silversmith, aerospace electronics prototype assembler, test, calibration & repair technician, also writing test procedures at BallAerospace. Then 21 years in the gaming industry, in a range of positions, culminated as a Gaming Inspector, observing and reporting on rules violations, safety issues and criminal activities for the Yavapai Prescott Indian Tribe. After "retiring" Harley taught himself a few graphic design skills, and he works as a freelance designer.

CHAPTER

FIVE

LAW & ORDER

From 1990 to 2010, Law & Order was a powerful example of police/courtroom drama exemplified by other series listed at the end of this article, such as CSI (Crime Scene Investigation) and NYPD Blue. The series' idea, conceived by Dick Wolf, was originally considered by Fox and then CBS, but after they decided to pass on the opportunity, NBC made the decision to order one season of the series. 19 more seasons followed.

The basic format, followed for the most part of its 20 year span, was the discovery of a crime, usually, but not always, murder, followed by the normal sequence of investigation and subsequent prosecution of a suspect in court. Crimes depicted on TV were very often based on actual current events, or as the series said "ripped from the headlines". The plots highlighted "legal, ethical or personal dilemmas to which people can relate". The location was New York City and often depicted intimate details of big city life.

Investigations could be very detailed, including wide ranging and in depth scientific analysis of evidence, psychoanalytical/psychiatric analysis of motives and methods, and in the later years, digital evidence was included, such as video surveillance, cell phone and GPS tracking. A senior and a junior detective would interview suspects, witnesses, scientific investigators, medical examiners and forensic technicians. Victim's family members and friends were often consulted, as well as friends and family members of the suspect(s). The suspect would then be interrogated and the Defense Attorney would have his or her input. Detectives would then normally consult with their commanding officer and devise a plan of action to apprehend (if not already in custody) and charge the suspect. Sometimes an Assistant District Attorney would be part of the procedure in order to ensure that the prosecution would be successful.

The second part of each episode would move on to the prosecutors' jobs. A pair of prosecutors, the Executive Assistant District Attorney and the Assistant District Attorney, would outline their plan for prosecution and at times, the District Attorney, being an elected official, would introduce political considerations into the equation (aaarrrggghhh!). The prosecutors and the Defense Attorney would all have their input and often jockey for position using admissibility of evidence, jury selection, plea bargaining and other legal maneuvers. This is the approximate time when action would move into the courtroom. Scenes would show a judge ruling on the various legal maneuvers in preparation for the trial.

During the trial, we see professional testimony from the medical examiners, crime lab technicians (including fingerprint analysts, DNA profilers and ballistics analysts), and psychologists or psychiatrists and many of the characters already introduced: witnesses, family members, and of course suspects. Occasionally, the action would move into the judge's chambers for rulings outside of the public trial procedure. Many moral, ethical and just plain crazy defense arguments are made at this point. Back in the courtroom, both sides present their arguments and then the action breaks while the jury deliberates.

Once the jury has reached a verdict, the scene often depicts the reactions of the concerned parties, the families of the victim and the suspect (whether found guilty or not), the detectives and the prosecutors. If found guilty, the suspect is led away and then after some observations from police and prosecutors, sentencing follows.

The final scenes will usually be the prosecutorial team's further observations and sometimes the detectives will discuss the case and outcome. The moral and ethical issues are often discussed.

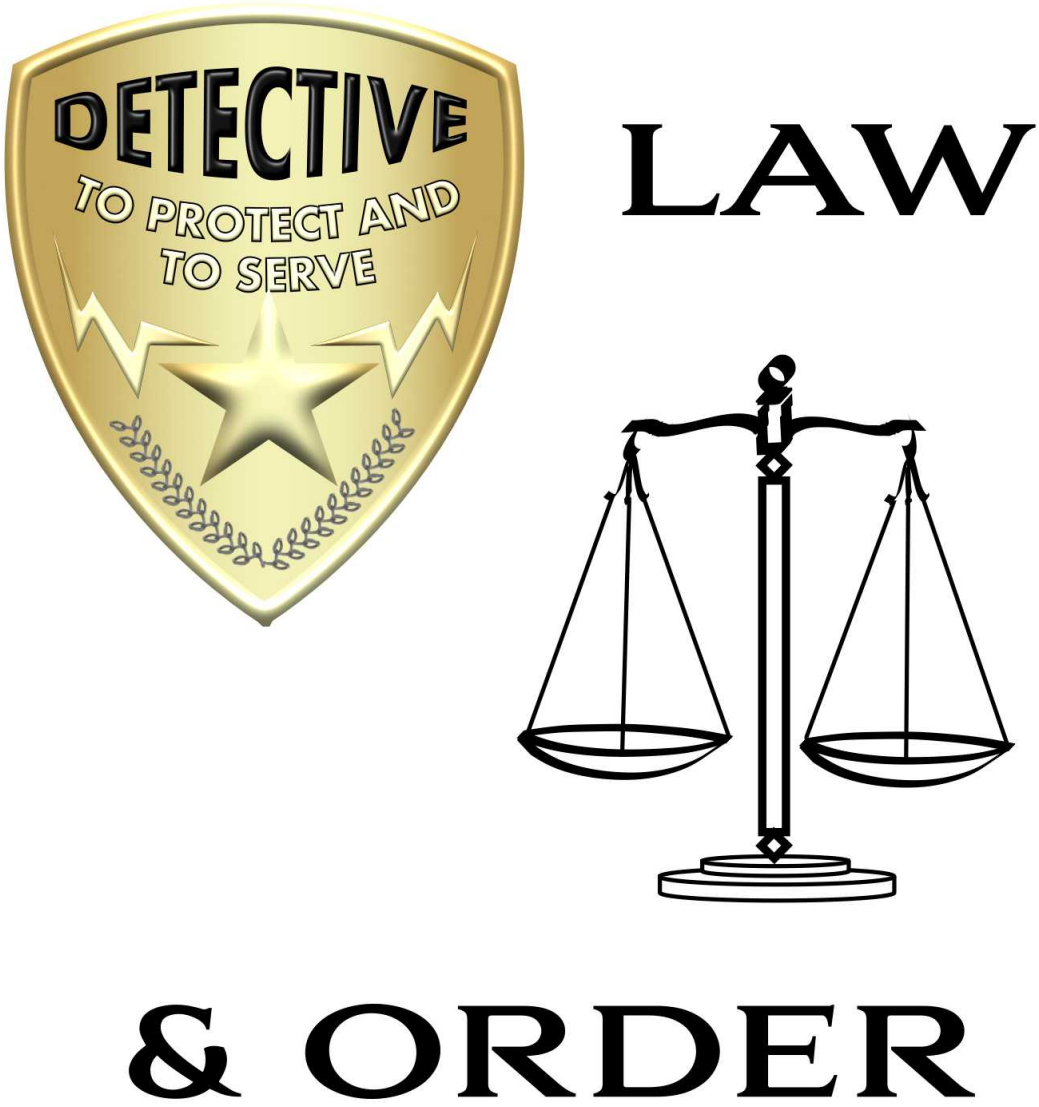
Law & Order received many awards over the years and the list of noteworthy actors involved, both as regular cast members and as guests is huge. The cast maintained continuity, with characters coming and going from time to time,

but always following a story line that explained every change. A huge part of the charm of the series was that the story of the cast, the characters, captivated the audience. I was happy to be part of that audience.

- https://en.wikipedia.org/wiki/Law_%26_Order
- https://www.imdb.com/title/tt0098844/
- https://lawandorder.fandom.com/wiki/Law_%26_Order
- https://www.nbc.com/law-order

265.1 Related TV series and shows

Hill St. Blues, NCIS, CSI, NYPD Blue, Law & Order Special Victims Unit, Law & Order Criminal Intent, Law & Order Trial by Jury and Law & Order LA, "Exiled: A Law & Order Movie", "Law & Order: UK" Mayors Rudy Giuliani and Michael Bloomberg and many other real personalities appeared.



265.2 About the Author

Harley Armentrout is a happy husband and father, former silversmith, aerospace electronics prototype assembler, test, calibration & repair technician, also writing test procedures at BallAerospace. Then 21 years in the gaming industry, in a range of positions, culminated as a Gaming Inspector, observing and reporting on rules violations, safety issues and criminal activities for the Yavapai Prescott Indian Tribe. After "retiring" Harley taught himself a few graphic design skills and he works as a freelance designer.

CHAPTER

SIX

LAW & ORDER: SPECIAL VICTIMS UNIT

Law & Order was a series created in the 1980s by Dick Wolf and co-produced with Machael Mann. It was so successful, that they never imagined that the series would continue to this day, the series begins when the rookie Olivia Benson begins to work in a police force called the "Special Victims Unit" that is dedicated to investigating sexual crimes in the city of New York.



Since its inception, the series has dealt with complex cases that were rarely seen on television, such as: domestic violence, rape, serial murder, abuse, hate crimes, among others. Of course, in most cases, the victims of this type of abuse are usually women and in the background also homosexuals, lesbians and children.

The investigations are based on real news that have managed to impact society and it is possible that the great success of the series comes from there. The universality and topicality of its themes immediately catch everyone's attention, since physical or psychological aggression never ceases to move the television audience. Actress Mariska Hargitay has earned the respect of viewers over the years, although it is true that her character began as secondary and supporting detectives Elliot Stabler starring Chistopher Meloni and detective John Munch (Richard Belzer) . Olivia Benson was violent and impulsive, but gradually changed as the series progressed and became the most intelligent and mature person in the cast, probably because of the closeness with which the actress treated the cases and in some way, this interpreter It was becoming a symbol of the fight for equality, to the point that he received letters from people in gratitude for making them aware of their reality and that in many cases they did not want to acknowledge. Thanks to the messages received from her fans, the concern of helping in a real way was generated in the actress and that is why she created an association to support victims of sexual crimes in her country.

This American television series premiered on September 20, 1999, is produced and set in New York City where a whole range of police, procedural, legal and criminal drama is reflected. The media have contributed their headlines to the script of the series, since the most notorious sexual crimes have been taken into account for the realization of the scripts of Law & Order.

To shoot the interiors of Law & Order, the producers realized that there were no suitable locations available in New York. During the incessant search, they found an NBC building where it centralized its archives that was located in

North Bergen in New Jersey, which had recently become empty, measured 4900 m^2, but also had air conditioning and sufficient parking to the required one. This building was used for the realization of the scenery of the police station and the courtroom.

On the other hand, this series has garnered countless accolades, including Mariska Hargitay's Emmy for Outstanding Lead Actress in a Drama Series, but she received not only the first but the only Emmy to date that has been received regularly for any other TV franchise. the Law & Order series. It is broadcast during prime time in the United States and is considered the oldest non-animated series on American television.

Originally the series focused almost exclusively on the actions of the detectives who made up the special victims unit of the 16th district of New York City, but as the series progressed, additional secondary characters were added, who helped the detectives. Detectives in the Manhattan District Attorney's Office, such as Sex Crimes Bureau Assessors, and medical examiners were also included.



The personal life of the detectives comes to light in several episodes and their dissociation or not with certain crimes that are dealt with during the program. There are episodes where the detectives develop their own personal dramas and follow them for several chapters as they investigate and prosecute sexual crimes, child abuse, crimes against the elderly, etc. Detective Elliot Stabler accompanies Olivia Benson in her first 12 seasons, but Christopher Meloni decides to leave the series and an agreement could not be reached regarding his contract.

Law & Order has had very famous actors who appear in some of its chapters such as: Bradley Cooper, Robin Williams, Amanda Seyfried, Lea Thompson, Sharon Stone and Jeremy Irons, among others. Emblematic moments such as the Manson family murders, the confrontation between Woody Allen and Mía Farrow, the student massacres, etc. have been portrayed in the series.

The idea of creating the series originated in 1986, due to the shocking case of Robert Chambers who strangled a woman with whom he was dating Jennifer Levin, after murdering her he alleged "hard and consensual sex", this terrible crime inspired Dick Wolf to create the episode "Kiss Them and Kill Them" which was the story told in the first season episode. However, after writing this episode, Dick Wolf was still tormented by the harsh reality of cases taken from real life and decided to delve into psychology where sexuality plays an important role in the crimes committed.

From that moment to the present day, this series has made us reflect on the large number of injustices, murders, rapes and other aberrations that may exist in the minds of certain individuals psychologically marked by the social and family environment, for which they are capable of commit such atrocities.

266.1 About the Author

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CHAPTER

SEVEN

THE SQUID GAME

This is a television series made in South Korea of drama and thriller, it premiered on Netflix in 2021 on September 17. Starring Lee Jung-jae, Wi Ha-joon, Park Haesoo, Jung Ho-yeon, Heo Sung.tae, Kim Jooryoung, and Anupam Tripathi.

The story is about a man who has accumulated large debts to loan sharks named Seong Gi-hun who finds himself estranged from his ex-wife and daughter. He meets a well-dressed man at a train station who asks him to play ddakji for money and ends up giving him a card to invite him to play some very high-stakes games. Due to his current condition Gi-hun ends up accepting and they take him to a mysterious place along with 455 other players, each one is identified with a number on his clothes.

The venue is managed by a fully masked staff and each player was anesthetized so that the site's whereabouts are unknown. All the contestants are in dire financial straits and it is proposed that the winner will receive billions of won, but must win six games over six days.



Gi-hun befriends an old man with a brain tumor and is player 001, but he also recognizes Cho Sang-woo who is an investment broker and former classmate from his school, he also manages to recognize a girl who is the player 067 and that he had previously stolen the money he won in a horse race.

The first game that the 456 players face is red light, green light and those who lose, are killed during the game. It is there when a Pakistani saves Gi-hun's life and that is why he can complete the game. It should be noted that at the end of this first game, more than half of the participants have already been eliminated.



To the surprise of the players who may die, they appeal to the third clause of the contract, where it is specified that everyone will be sent home if the majority of the participants vote in favor of ending the games, but yes, they will not receive money any. All the participants vote and it is the player 001 with the decisive vote of him, the one who places the balance in favor of everyone returning home safe and sound.

Gi-hun goes to the police to report the macabre games, but no one believes him for lack of evidence. However, a detective named Hwang Jun-ho whose brother has disappeared realizes that they both received the same card.

Subsequently, each of the players is invited again and due to the precarious economic position they accept 187 of the 201 who remained alive, including Gi-hun.

Detective Jun-ho closely follows Gi-hun and hides in the van that takes them back to the games, successfully infiltrating himself by disguising himself as one of the masked workers and realizing the location is on an island. remote. The participants upon arrival, begin to form alliances where Gi-hun, his childhood companion Sang-woo, the old player 001 and the Pakistani who saved the protagonist's life meet.

Neither game is revealed in advance and the second game is about taking off figures from a platform made of sugar, but without breaking them and in a set time. Not knowing what it is about, Gi-hun chooses the most complicated figure (an umbrella) but manages to complete the game, after discovering that it is easier to detach the figure if he licks it to melt it.

Deok-su is a strong and ruthless player who kills another participant to take away his food and this what it does is increase the prize money, so a revolt led by Deok-su rises to eliminate the rest of the competition and It is when the player 067 joins the team made up of Gi-hun, to protect herself from the alliance formed by Deok-su and his cruel team.

The third game is made up of groups of 10 players for each team that are on two elevated platforms and it is about pulling a rope to make the opposing team fall into a deadly abyss. Gi-hun's team wins the match with an idea from Sang-woo and a strategy from player number 001.

In the fourth game the players are instructed to pair up and they choose their best ally. To their surprise, the participants are horrified to learn that they will actually play against their chosen partner, the game is with marbles and whoever gets their partner's marbles in half an hour wins and survives. Gi-hun chooses the old man with memory loss who is player 001 and when he is about to lose, he takes advantage of his opponent's memory loss thinking that he would not notice, but at the last moment the old man reproaches him but he leaves all his marbles anyway and Gi-hun goes on to the next round.

In the fifth game, the participants have 16 minutes to cross a bridge made up of normal or tempered glass panels. The tempered ones can support the weight of two people, but the normal ones break when standing on them. Afraid to step on the normal glass panes, many delay or refuse to move forward, but because they have a set time, the last few players are at a disadvantage as they can't make it to the other side just in time.

Sang-Woo pushes Player 017 to the next panel for taking too long and the glass shatters, revealing the safe panel. Only the last three players who are Sang-Woo, Player 067 and Gi-hun manage to cross the bridge.

Sang-woo kills the player 067 so that only he and the protagonist remain for the last game, which is called the "Squid Game". After a fierce fight in the rain Gi-hun defeats Sang-woo but refuses to kill him, he also tries to invoke the third clause so that they can both get out alive, but at that moment Sang-woo stabs himself in the neck taking off life, but as he dies he asks Gi-hun to help his mother with the prize money.

267.1 About the Author

Idais, Graduated in Mechanical Engineering, and a master's degree in teaching component, she gave classes in several institutes of mathematics and physics, but she also dedicated several years of my life as a television producer, she did the scripts for mikes, the camera direction, editing of video and even the location. Later she was dedicated to SEO writing for a couple of years. She likes poetry, chess and dominoes.

CHAPTER

EIGHT

INDICES AND TABLES

- genindex
- modindex
- search