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#CRYPTOGRAPHY COURSE ANALYSIS.

## 1. Defining the Question

##a. Specifying the Question. To identify individuals likely to click on the advertisement of cryptography course offered by the Kenyan entrepreneur.

##b. Understanding the Context. Cryptography is the study of secure communications techniques that allow only the sender and intended recipient of a message to view its contents. The term is derived from the Greek word krypton, which means hidden.An example of cryptography is a encrypted message in which letters are replaced with other characters.The different types of cryptography include: *Secret Key Cryptography.* Public Key Cryptography. \*Hash Functions.

##c. Recording Experimental Design \*Checking Data.

\*Data Cleaning.

+check for duplicates and handle duplicates. +check for missing values and handle them. +check for outliers and deal with them.

\*Exploratory Data Analysis.

\*Univariate Analysis.  
  
 +measure of central Tendancy.  
 +measure of dispersion.  
 +visualization.  
   
\*Bivariate Analysis.  
 +Covariance.  
 +Correlation.  
 +Graphical Technique.

##d. Relevance of The Data. The data used for this project is necessary for determine individuals likely to click on the advertisement

[<http://bit.ly/IPAdvertisingData>].

*installing necessary packages*

install.packages(“tidyverse”) library(tidyverse)

library(dplyr)

##Loading dataset loading our advertisement dataset

ad<- read.csv("advertising.csv",TRUE,",")

##Checking the dataset.

**checking head**

head(ad,n=5)

## Daily.Time.Spent.on.Site Age Area.Income Daily.Internet.Usage  
## 1 68.95 35 61833.90 256.09  
## 2 80.23 31 68441.85 193.77  
## 3 69.47 26 59785.94 236.50  
## 4 74.15 29 54806.18 245.89  
## 5 68.37 35 73889.99 225.58  
## Ad.Topic.Line City Male Country  
## 1 Cloned 5thgeneration orchestration Wrightburgh 0 Tunisia  
## 2 Monitored national standardization West Jodi 1 Nauru  
## 3 Organic bottom-line service-desk Davidton 0 San Marino  
## 4 Triple-buffered reciprocal time-frame West Terrifurt 1 Italy  
## 5 Robust logistical utilization South Manuel 0 Iceland  
## Timestamp Clicked.on.Ad  
## 1 2016-03-27 00:53:11 0  
## 2 2016-04-04 01:39:02 0  
## 3 2016-03-13 20:35:42 0  
## 4 2016-01-10 02:31:19 0  
## 5 2016-06-03 03:36:18 0

**checking tail**

tail(ad,n=5)

## Daily.Time.Spent.on.Site Age Area.Income Daily.Internet.Usage  
## 996 72.97 30 71384.57 208.58  
## 997 51.30 45 67782.17 134.42  
## 998 51.63 51 42415.72 120.37  
## 999 55.55 19 41920.79 187.95  
## 1000 45.01 26 29875.80 178.35  
## Ad.Topic.Line City Male  
## 996 Fundamental modular algorithm Duffystad 1  
## 997 Grass-roots cohesive monitoring New Darlene 1  
## 998 Expanded intangible solution South Jessica 1  
## 999 Proactive bandwidth-monitored policy West Steven 0  
## 1000 Virtual 5thgeneration emulation Ronniemouth 0  
## Country Timestamp Clicked.on.Ad  
## 996 Lebanon 2016-02-11 21:49:00 1  
## 997 Bosnia and Herzegovina 2016-04-22 02:07:01 1  
## 998 Mongolia 2016-02-01 17:24:57 1  
## 999 Guatemala 2016-03-24 02:35:54 0  
## 1000 Brazil 2016-06-03 21:43:21 1

**checking dimensions**

dim(ad)

## [1] 1000 10

**check number of rows**

nrow(ad)

## [1] 1000

**checking number of columns**

ncol(ad)

## [1] 10

**check variables and types**

str(ad)

## 'data.frame': 1000 obs. of 10 variables:  
## $ Daily.Time.Spent.on.Site: num 69 80.2 69.5 74.2 68.4 ...  
## $ Age : int 35 31 26 29 35 23 33 48 30 20 ...  
## $ Area.Income : num 61834 68442 59786 54806 73890 ...  
## $ Daily.Internet.Usage : num 256 194 236 246 226 ...  
## $ Ad.Topic.Line : chr "Cloned 5thgeneration orchestration" "Monitored national standardization" "Organic bottom-line service-desk" "Triple-buffered reciprocal time-frame" ...  
## $ City : chr "Wrightburgh" "West Jodi" "Davidton" "West Terrifurt" ...  
## $ Male : int 0 1 0 1 0 1 0 1 1 1 ...  
## $ Country : chr "Tunisia" "Nauru" "San Marino" "Italy" ...  
## $ Timestamp : chr "2016-03-27 00:53:11" "2016-04-04 01:39:02" "2016-03-13 20:35:42" "2016-01-10 02:31:19" ...  
## $ Clicked.on.Ad : int 0 0 0 0 0 0 0 1 0 0 ...

##Data Cleaning **Checking for missing values**

colSums(is.na(ad))

## Daily.Time.Spent.on.Site Age Area.Income   
## 0 0 0   
## Daily.Internet.Usage Ad.Topic.Line City   
## 0 0 0   
## Male Country Timestamp   
## 0 0 0   
## Clicked.on.Ad   
## 0

table(is.na(ad))

##   
## FALSE   
## 10000

*There are no any missing values in our data set*

**checking for duplicates**

dupli<- ad[duplicated(ad),]  
dupli

## [1] Daily.Time.Spent.on.Site Age Area.Income   
## [4] Daily.Internet.Usage Ad.Topic.Line City   
## [7] Male Country Timestamp   
## [10] Clicked.on.Ad   
## <0 rows> (or 0-length row.names)

*There are no duplicates in our data set*

**Checking for outliers and handling them**

*selecting columns with numeric values*

library(dplyr)

library(dplyr)

##   
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':  
##   
## filter, lag

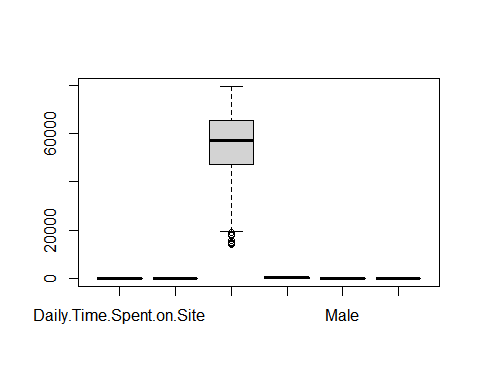
## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

adver=ad%>% select\_if(is.numeric)  
adver

## Daily.Time.Spent.on.Site Age Area.Income Daily.Internet.Usage Male  
## 1 68.95 35 61833.90 256.09 0  
## 2 80.23 31 68441.85 193.77 1  
## 3 69.47 26 59785.94 236.50 0  
## 4 74.15 29 54806.18 245.89 1  
## 5 68.37 35 73889.99 225.58 0  
## 6 59.99 23 59761.56 226.74 1  
## 7 88.91 33 53852.85 208.36 0  
## 8 66.00 48 24593.33 131.76 1  
## 9 74.53 30 68862.00 221.51 1  
## 10 69.88 20 55642.32 183.82 1  
## 11 47.64 49 45632.51 122.02 0  
## 12 83.07 37 62491.01 230.87 1  
## 13 69.57 48 51636.92 113.12 1  
## 14 79.52 24 51739.63 214.23 0  
## 15 42.95 33 30976.00 143.56 0  
## 16 63.45 23 52182.23 140.64 1  
## 17 55.39 37 23936.86 129.41 0  
## 18 82.03 41 71511.08 187.53 0  
## 19 54.70 36 31087.54 118.39 1  
## 20 74.58 40 23821.72 135.51 1  
## 21 77.22 30 64802.33 224.44 1  
## 22 84.59 35 60015.57 226.54 1  
## 23 41.49 52 32635.70 164.83 0  
## 24 87.29 36 61628.72 209.93 1  
## 25 41.39 41 68962.32 167.22 0  
## 26 78.74 28 64828.00 204.79 1  
## 27 48.53 28 38067.08 134.14 1  
## 28 51.95 52 58295.82 129.23 0  
## 29 70.20 34 32708.94 119.20 0  
## 30 76.02 22 46179.97 209.82 0  
## 31 67.64 35 51473.28 267.01 1  
## 32 86.41 28 45593.93 207.48 1  
## 33 59.05 57 25583.29 169.23 1  
## 34 55.60 23 30227.98 212.58 0  
## 35 57.64 57 45580.92 133.81 1  
## 36 84.37 30 61389.50 201.58 0  
## 37 62.26 53 56770.79 125.45 1  
## 38 65.82 39 76435.30 221.94 0  
## 39 50.43 46 57425.87 119.32 1  
## 40 38.93 39 27508.41 162.08 0  
## 41 84.98 29 57691.95 202.61 0  
## 42 64.24 30 59784.18 252.36 0  
## 43 82.52 32 66572.39 198.11 1  
## 44 81.38 31 64929.61 212.30 0  
## 45 80.47 25 57519.64 204.86 0  
## 46 37.68 52 53575.48 172.83 1  
## 47 69.62 20 50983.75 202.25 1  
## 48 85.40 43 67058.72 198.72 0  
## 49 44.33 37 52723.34 123.72 1  
## 50 48.01 46 54286.10 119.93 0  
## 51 73.18 23 61526.25 196.71 1  
## 52 79.94 28 58526.04 225.29 0  
## 53 33.33 45 53350.11 193.58 1  
## 54 50.33 50 62657.53 133.20 1  
## 55 62.31 47 62722.57 119.30 0  
## 56 80.60 31 67479.62 177.55 0  
## 57 65.19 36 75254.88 150.61 0  
## 58 44.98 49 52336.64 129.31 0  
## 59 77.63 29 56113.37 239.22 0  
## 60 41.82 41 24852.90 156.36 0  
## 61 85.61 27 47708.42 183.43 0  
## 62 85.84 34 64654.66 192.93 1  
## 63 72.08 29 71228.44 169.50 0  
## 64 86.06 32 61601.05 178.92 1  
## 65 45.96 45 66281.46 141.22 0  
## 66 62.42 29 73910.90 198.50 1  
## 67 63.89 40 51317.33 105.22 0  
## 68 35.33 32 51510.18 200.22 0  
## 69 75.74 25 61005.87 215.25 1  
## 70 78.53 34 32536.98 131.72 0  
## 71 46.13 31 60248.97 139.01 0  
## 72 69.01 46 74543.81 222.63 0  
## 73 55.35 39 75509.61 153.17 1  
## 74 33.21 43 42650.32 167.07 1  
## 75 38.46 42 58183.04 145.98 1  
## 76 64.10 22 60465.72 215.93 0  
## 77 49.81 35 57009.76 120.06 1  
## 78 82.73 33 54541.56 238.99 1  
## 79 56.14 38 32689.04 113.53 1  
## 80 55.13 45 55605.92 111.71 0  
## 81 78.11 27 63296.87 209.25 1  
## 82 73.46 28 65653.47 222.75 1  
## 83 56.64 38 61652.53 115.91 0  
## 84 68.94 54 30726.26 138.71 0  
## 85 70.79 31 74535.94 184.10 0  
## 86 57.76 41 47861.93 105.15 0  
## 87 77.51 36 73600.28 200.55 0  
## 88 52.70 34 58543.94 118.60 1  
## 89 57.70 34 42696.67 109.07 0  
## 90 56.89 37 37334.78 109.29 1  
## 91 69.90 43 71392.53 138.35 0  
## 92 55.79 24 59550.05 149.67 0  
## 93 70.03 26 64264.25 227.72 1  
## 94 50.08 40 64147.86 125.85 1  
## 95 43.67 31 25686.34 166.29 1  
## 96 72.84 26 52968.22 238.63 0  
## 97 45.72 36 22473.08 154.02 1  
## 98 39.94 41 64927.19 156.30 0  
## 99 35.61 46 51868.85 158.22 0  
## 100 79.71 34 69456.83 211.65 1  
## 101 41.49 53 31947.65 169.18 0  
## 102 63.60 23 51864.77 235.28 1  
## 103 89.91 40 59593.56 194.23 0  
## 104 68.18 21 48376.14 218.17 1  
## 105 66.49 20 56884.74 202.16 0  
## 106 80.49 40 67186.54 229.12 1  
## 107 72.23 25 46557.92 241.03 1  
## 108 42.39 42 66541.05 150.99 0  
## 109 47.53 30 33258.09 135.18 0  
## 110 74.02 32 72272.90 210.54 0  
## 111 66.63 60 60333.38 176.98 0  
## 112 63.24 53 65229.13 235.78 1  
## 113 71.00 22 56067.38 211.87 0  
## 114 46.13 46 37838.72 123.64 1  
## 115 69.00 32 72683.35 221.21 1  
## 116 76.99 31 56729.78 244.34 1  
## 117 72.60 55 66815.54 162.95 0  
## 118 61.88 42 60223.52 112.19 1  
## 119 84.45 50 29727.79 207.18 0  
## 120 88.97 45 49269.98 152.49 0  
## 121 86.19 31 57669.41 210.26 1  
## 122 49.58 26 56791.75 231.94 0  
## 123 77.65 27 63274.88 212.79 0  
## 124 37.75 36 35466.80 225.24 0  
## 125 62.33 43 68787.09 127.11 0  
## 126 79.57 31 61227.59 230.93 0  
## 127 80.31 44 56366.88 127.07 0  
## 128 89.05 45 57868.44 206.98 0  
## 129 70.41 27 66618.21 223.03 0  
## 130 67.36 37 73104.47 233.56 0  
## 131 46.98 50 21644.91 175.37 0  
## 132 41.67 36 53817.02 132.55 0  
## 133 51.24 36 76368.31 176.73 0  
## 134 75.70 29 67633.44 215.44 0  
## 135 43.49 47 50335.46 127.83 0  
## 136 49.89 39 17709.98 160.03 1  
## 137 38.37 36 41229.16 140.46 0  
## 138 38.52 38 42581.23 137.28 1  
## 139 71.89 23 61617.98 172.81 1  
## 140 75.80 38 70575.60 146.19 1  
## 141 83.86 31 64122.36 190.25 0  
## 142 37.51 30 52097.32 163.00 1  
## 143 55.60 44 65953.76 124.38 1  
## 144 83.67 44 60192.72 234.26 1  
## 145 69.08 41 77460.07 210.60 0  
## 146 37.47 44 45716.48 141.89 1  
## 147 56.04 49 65120.86 128.95 1  
## 148 70.92 41 49995.63 108.16 1  
## 149 49.78 46 71718.51 152.24 0  
## 150 68.61 57 61770.34 150.29 0  
## 151 58.18 25 69112.84 176.28 1  
## 152 78.54 35 72524.86 172.10 0  
## 153 37.00 48 36782.38 158.22 1  
## 154 65.40 33 66699.12 247.31 0  
## 155 79.52 27 64287.78 183.48 1  
## 156 87.98 38 56637.59 222.11 1  
## 157 44.64 36 55787.58 127.01 0  
## 158 41.73 28 61142.33 202.18 1  
## 159 80.46 27 61625.87 207.96 1  
## 160 75.55 36 73234.87 159.24 0  
## 161 76.32 35 74166.24 195.31 1  
## 162 82.68 33 62669.59 222.77 1  
## 163 72.01 31 57756.89 251.00 0  
## 164 75.83 24 58019.64 162.44 0  
## 165 41.28 50 50960.08 140.39 0  
## 166 34.66 32 48246.60 194.83 0  
## 167 66.18 55 28271.84 143.42 0  
## 168 86.06 31 53767.12 219.72 1  
## 169 59.59 42 43662.10 104.78 1  
## 170 86.69 34 62238.58 198.56 0  
## 171 43.77 52 49030.03 138.55 1  
## 172 71.84 47 76003.47 199.79 1  
## 173 80.23 31 68094.85 196.23 0  
## 174 74.41 26 64395.85 163.05 0  
## 175 63.36 48 70053.27 137.43 0  
## 176 71.74 35 72423.97 227.56 0  
## 177 60.72 44 42995.80 105.69 0  
## 178 72.04 22 60309.58 199.43 0  
## 179 44.57 31 38349.78 133.17 1  
## 180 85.86 34 63115.34 208.23 0  
## 181 39.85 38 31343.39 145.96 0  
## 182 84.53 27 40763.13 168.34 0  
## 183 62.95 60 36752.24 157.04 0  
## 184 67.58 41 65044.59 255.61 1  
## 185 85.56 29 53673.08 210.46 0  
## 186 46.88 54 43444.86 136.64 0  
## 187 46.31 57 44248.52 153.98 1  
## 188 77.95 31 62572.88 233.65 1  
## 189 84.73 30 39840.55 153.76 0  
## 190 39.86 36 32593.59 145.85 0  
## 191 50.08 30 41629.86 123.91 0  
## 192 60.23 35 43313.73 106.86 0  
## 193 60.70 49 42993.48 110.57 1  
## 194 43.67 53 46004.31 143.79 1  
## 195 77.20 33 49325.48 254.05 1  
## 196 71.86 32 51633.34 116.53 0  
## 197 44.78 45 63363.04 137.24 1  
## 198 78.57 36 64045.93 239.32 1  
## 199 73.41 31 73049.30 201.26 1  
## 200 77.05 27 66624.60 191.14 0  
## 201 66.40 40 77567.85 214.42 0  
## 202 69.35 29 53431.35 252.77 1  
## 203 35.65 40 31265.75 172.58 1  
## 204 70.04 31 74780.74 183.85 1  
## 205 69.78 29 70410.11 218.79 0  
## 206 58.22 29 37345.24 120.90 0  
## 207 76.90 28 66107.84 212.67 0  
## 208 84.08 30 62336.39 187.36 1  
## 209 59.51 58 39132.64 140.83 0  
## 210 40.15 38 38745.29 134.88 1  
## 211 76.81 28 65172.22 217.85 1  
## 212 41.89 38 68519.96 163.38 0  
## 213 76.87 27 54774.77 235.35 1  
## 214 67.28 43 76246.96 155.80 1  
## 215 81.98 40 65461.92 229.22 0  
## 216 66.01 23 34127.21 151.95 0  
## 217 61.57 53 35253.98 125.94 1  
## 218 53.30 34 44893.71 111.94 0  
## 219 34.87 40 59621.02 200.23 0  
## 220 43.60 38 20856.54 170.49 0  
## 221 77.88 37 55353.41 254.57 0  
## 222 75.83 27 67516.07 200.59 0  
## 223 49.95 39 68737.75 136.59 0  
## 224 60.94 41 76893.84 154.97 0  
## 225 89.15 42 59886.58 171.07 0  
## 226 78.70 30 53441.69 133.99 0  
## 227 57.35 29 41356.31 119.84 0  
## 228 34.86 38 49942.66 154.75 0  
## 229 70.68 31 74430.08 199.08 0  
## 230 76.06 23 58633.63 201.04 0  
## 231 66.67 33 72707.87 228.03 1  
## 232 46.77 32 31092.93 136.40 1  
## 233 62.42 38 74445.18 143.94 0  
## 234 78.32 28 49309.14 239.52 0  
## 235 37.32 50 56735.14 199.25 1  
## 236 40.42 45 40183.75 133.90 1  
## 237 76.77 36 58348.41 123.51 0  
## 238 65.65 30 72209.99 158.05 0  
## 239 74.32 33 62060.11 128.17 0  
## 240 73.27 32 67113.46 234.75 1  
## 241 80.03 44 24030.06 150.84 0  
## 242 53.68 47 56180.93 115.26 1  
## 243 85.84 32 62204.93 192.85 1  
## 244 85.03 30 60372.64 204.52 0  
## 245 70.44 24 65280.16 178.75 1  
## 246 81.22 53 34309.24 223.09 1  
## 247 39.96 45 59610.81 146.13 1  
## 248 57.05 41 50278.89 269.96 1  
## 249 42.44 56 43450.11 168.27 0  
## 250 62.20 25 25408.21 161.16 0  
## 251 76.70 36 71136.49 222.25 0  
## 252 61.22 45 63883.81 119.03 1  
## 253 84.54 33 64902.47 204.02 1  
## 254 46.08 30 66784.81 164.63 1  
## 255 56.70 48 62784.85 123.13 0  
## 256 81.03 28 63727.50 201.15 0  
## 257 80.91 32 61608.23 231.42 0  
## 258 40.06 38 56782.18 138.68 1  
## 259 83.47 39 64447.77 226.11 0  
## 260 73.84 31 42042.95 121.05 0  
## 261 74.65 28 67669.06 212.56 0  
## 262 60.25 35 54875.95 109.77 0  
## 263 59.21 35 73347.67 144.62 1  
## 264 43.02 44 50199.77 125.22 0  
## 265 84.04 38 50723.67 244.55 0  
## 266 70.66 43 63450.96 120.95 1  
## 267 70.58 26 56694.12 136.94 0  
## 268 72.44 34 70547.16 230.14 0  
## 269 40.17 26 47391.95 171.31 1  
## 270 79.15 26 62312.23 203.23 0  
## 271 44.49 53 63100.13 168.00 1  
## 272 73.04 37 73687.50 221.79 1  
## 273 76.28 33 52686.47 254.34 0  
## 274 68.88 37 78119.50 179.58 0  
## 275 73.10 28 57014.84 242.37 0  
## 276 47.66 29 27086.40 156.54 0  
## 277 87.30 35 58337.18 216.87 0  
## 278 89.34 32 50216.01 177.78 1  
## 279 81.37 26 53049.44 156.48 1  
## 280 81.67 28 62927.96 196.76 1  
## 281 46.37 52 32847.53 144.27 0  
## 282 54.88 24 32006.82 148.61 0  
## 283 40.67 35 48913.07 133.18 0  
## 284 71.76 35 69285.69 237.39 0  
## 285 47.51 51 53700.57 130.41 1  
## 286 75.15 22 52011.00 212.87 1  
## 287 56.01 26 46339.25 127.26 0  
## 288 82.87 37 67938.77 213.36 0  
## 289 45.05 42 66348.95 141.36 0  
## 290 60.53 24 66873.90 167.22 0  
## 291 50.52 31 72270.88 171.62 0  
## 292 84.71 32 61610.05 210.23 0  
## 293 55.20 39 76560.59 159.46 1  
## 294 81.61 33 62667.51 228.76 0  
## 295 71.55 36 75687.46 163.99 1  
## 296 82.40 36 66744.65 218.97 1  
## 297 73.95 35 67714.82 238.58 0  
## 298 72.07 31 69710.51 226.45 0  
## 299 80.39 31 66269.49 214.74 0  
## 300 65.80 25 60843.32 231.49 1  
## 301 69.97 28 55041.60 250.00 0  
## 302 52.62 50 73863.25 176.52 0  
## 303 39.25 39 62378.05 152.36 0  
## 304 77.56 38 63336.85 130.83 1  
## 305 33.52 43 42191.61 165.56 0  
## 306 79.81 24 56194.56 178.85 1  
## 307 84.79 33 61771.90 214.53 0  
## 308 82.70 35 61383.79 231.07 0  
## 309 84.88 32 63924.82 186.48 0  
## 310 54.92 54 23975.35 161.16 0  
## 311 76.56 34 70179.11 221.53 1  
## 312 69.74 49 66524.80 243.37 0  
## 313 75.55 22 41851.38 169.40 0  
## 314 72.19 33 61275.18 250.35 1  
## 315 84.29 41 60638.38 232.54 0  
## 316 73.89 39 47160.53 110.68 0  
## 317 75.84 21 48537.18 186.98 0  
## 318 73.38 25 53058.91 236.19 1  
## 319 80.72 31 68614.98 186.37 0  
## 320 62.06 44 44174.25 105.00 0  
## 321 51.50 34 67050.16 135.31 0  
## 322 90.97 37 54520.14 180.77 0  
## 323 86.78 30 54952.42 170.13 1  
## 324 66.18 35 69476.42 243.61 0  
## 325 84.33 41 54989.93 240.95 0  
## 326 36.87 36 29398.61 195.91 0  
## 327 34.78 48 42861.42 208.21 1  
## 328 76.84 32 65883.39 231.59 0  
## 329 67.05 25 65421.39 220.92 0  
## 330 41.47 31 60953.93 219.79 0  
## 331 80.71 26 58476.57 200.58 0  
## 332 80.09 31 66636.84 214.08 0  
## 333 56.30 49 67430.96 135.24 1  
## 334 79.36 34 57260.41 245.78 1  
## 335 86.38 40 66359.32 188.27 1  
## 336 38.94 41 57587.00 142.67 1  
## 337 87.26 35 63060.55 184.03 0  
## 338 75.32 28 59998.50 233.60 1  
## 339 74.38 40 74024.61 220.05 1  
## 340 65.90 22 60550.66 211.39 0  
## 341 36.31 47 57983.30 168.92 0  
## 342 72.23 48 52736.33 115.35 0  
## 343 88.12 38 46653.75 230.91 0  
## 344 83.97 28 56986.73 205.50 1  
## 345 61.09 26 55336.18 131.68 1  
## 346 65.77 21 42162.90 218.61 1  
## 347 81.58 25 39699.13 199.39 0  
## 348 37.87 52 56394.82 188.56 1  
## 349 76.20 37 75044.35 178.51 0  
## 350 60.91 19 53309.61 184.94 0  
## 351 74.49 28 58996.12 237.34 0  
## 352 73.71 23 56605.12 211.38 1  
## 353 78.19 30 62475.99 228.81 0  
## 354 79.54 44 70492.60 217.68 1  
## 355 74.87 52 43698.53 126.97 0  
## 356 87.09 36 57737.51 221.98 1  
## 357 37.45 47 31281.01 167.86 0  
## 358 49.84 39 45800.48 111.59 0  
## 359 51.38 59 42362.49 158.56 0  
## 360 83.40 34 66691.23 207.87 0  
## 361 38.91 33 56369.74 150.80 1  
## 362 62.14 41 59397.89 110.93 1  
## 363 79.72 28 66025.11 193.80 1  
## 364 73.30 36 68211.35 135.72 1  
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## 808 1  
## 809 1  
## 810 1  
## 811 1  
## 812 0  
## 813 0  
## 814 0  
## 815 0  
## 816 0  
## 817 1  
## 818 1  
## 819 0  
## 820 0  
## 821 1  
## 822 0  
## 823 1  
## 824 0  
## 825 0  
## 826 0  
## 827 0  
## 828 1  
## 829 1  
## 830 1  
## 831 1  
## 832 1  
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## 843 0  
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## 847 1  
## 848 0  
## 849 0  
## 850 1  
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## 858 0  
## 859 1  
## 860 0  
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## 862 0  
## 863 0  
## 864 0  
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## 888 1  
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## 899 1  
## 900 1  
## 901 1  
## 902 1  
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## 906 0  
## 907 1  
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## 909 1  
## 910 0  
## 911 1  
## 912 1  
## 913 1  
## 914 0  
## 915 1  
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## 917 1  
## 918 0  
## 919 0  
## 920 0  
## 921 0  
## 922 1  
## 923 1  
## 924 1  
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## 976 1  
## 977 1  
## 978 1  
## 979 0  
## 980 0  
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## 986 1  
## 987 0  
## 988 1  
## 989 0  
## 990 0  
## 991 1  
## 992 1  
## 993 1  
## 994 0  
## 995 1  
## 996 1  
## 997 1  
## 998 1  
## 999 0  
## 1000 1

*checking for outliers*

boxplot(adver)



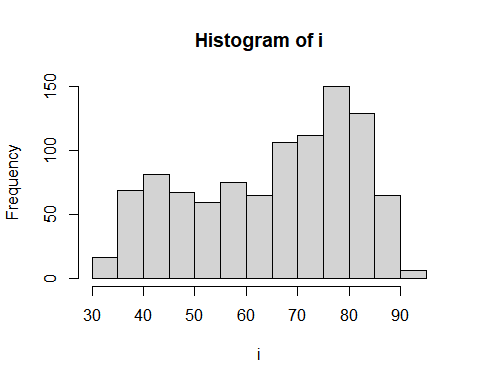
*we will not drop outliers i =n our data set since dropping them will affect the accuracy of our analysis*

##Exploratory Data Analysis

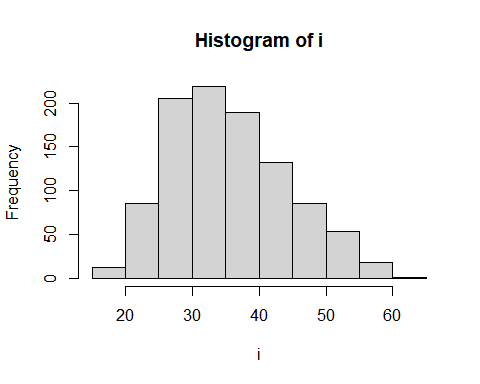
### Univariate Data Analysis.

**histogram of variables**

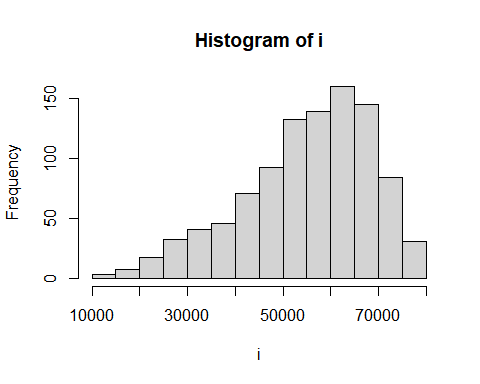
#Histogram showing Daily.Time.Spent.on.Site,Age,Area.Income,Daily.Internet.Usage,Male,Clicked.on.Ad respectively.  
for(i in adver)  
 {print(hist(i))}



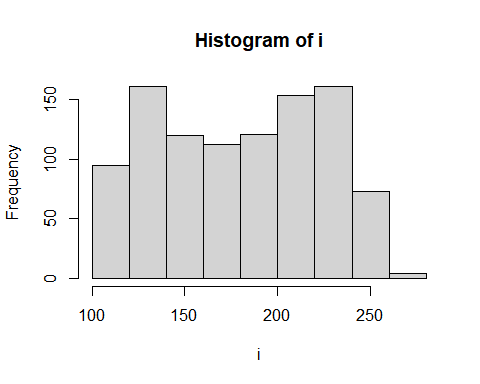
## $breaks  
## [1] 30 35 40 45 50 55 60 65 70 75 80 85 90 95  
##   
## $counts  
## [1] 16 69 81 67 59 75 65 106 112 150 129 65 6  
##   
## $density  
## [1] 0.0032 0.0138 0.0162 0.0134 0.0118 0.0150 0.0130 0.0212 0.0224 0.0300  
## [11] 0.0258 0.0130 0.0012  
##   
## $mids  
## [1] 32.5 37.5 42.5 47.5 52.5 57.5 62.5 67.5 72.5 77.5 82.5 87.5 92.5  
##   
## $xname  
## [1] "i"  
##   
## $equidist  
## [1] TRUE  
##   
## attr(,"class")  
## [1] "histogram"



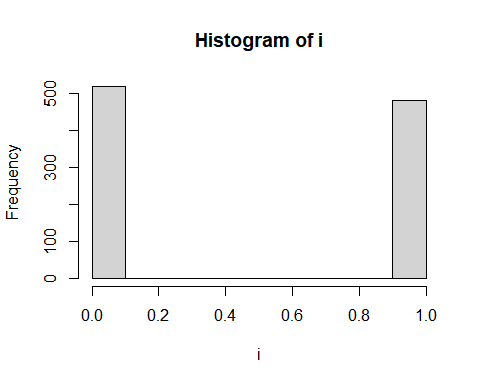
## $breaks  
## [1] 15 20 25 30 35 40 45 50 55 60 65  
##   
## $counts  
## [1] 12 86 205 219 189 132 85 53 18 1  
##   
## $density  
## [1] 0.0024 0.0172 0.0410 0.0438 0.0378 0.0264 0.0170 0.0106 0.0036 0.0002  
##   
## $mids  
## [1] 17.5 22.5 27.5 32.5 37.5 42.5 47.5 52.5 57.5 62.5  
##   
## $xname  
## [1] "i"  
##   
## $equidist  
## [1] TRUE  
##   
## attr(,"class")  
## [1] "histogram"



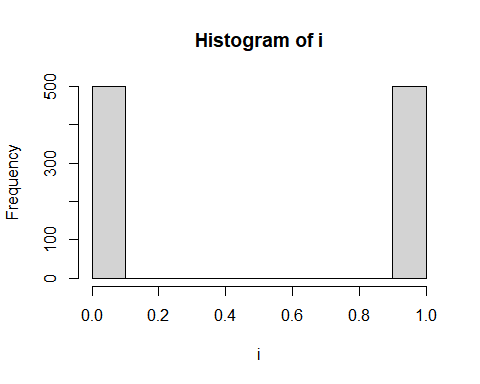
## $breaks  
## [1] 10000 15000 20000 25000 30000 35000 40000 45000 50000 55000 60000 65000  
## [13] 70000 75000 80000  
##   
## $counts  
## [1] 3 7 17 32 41 46 71 92 132 139 160 145 84 31  
##   
## $density  
## [1] 6.00e-07 1.40e-06 3.40e-06 6.40e-06 8.20e-06 9.20e-06 1.42e-05 1.84e-05  
## [9] 2.64e-05 2.78e-05 3.20e-05 2.90e-05 1.68e-05 6.20e-06  
##   
## $mids  
## [1] 12500 17500 22500 27500 32500 37500 42500 47500 52500 57500 62500 67500  
## [13] 72500 77500  
##   
## $xname  
## [1] "i"  
##   
## $equidist  
## [1] TRUE  
##   
## attr(,"class")  
## [1] "histogram"



## $breaks  
## [1] 100 120 140 160 180 200 220 240 260 280  
##   
## $counts  
## [1] 95 161 120 112 121 153 161 73 4  
##   
## $density  
## [1] 0.00475 0.00805 0.00600 0.00560 0.00605 0.00765 0.00805 0.00365 0.00020  
##   
## $mids  
## [1] 110 130 150 170 190 210 230 250 270  
##   
## $xname  
## [1] "i"  
##   
## $equidist  
## [1] TRUE  
##   
## attr(,"class")  
## [1] "histogram"

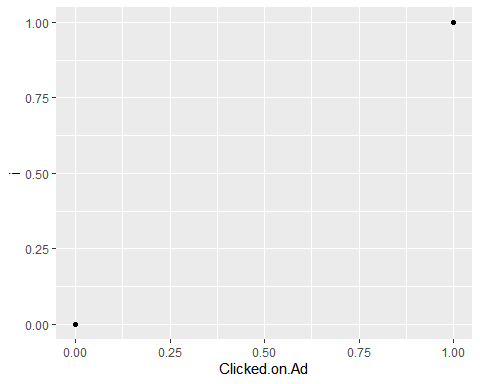
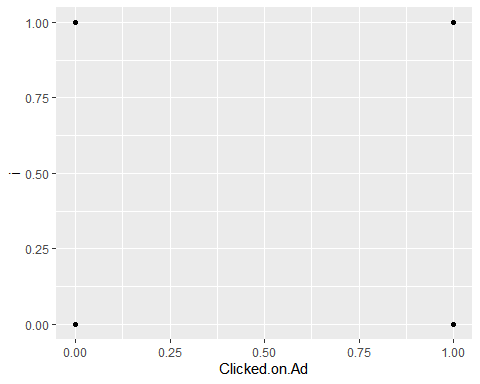
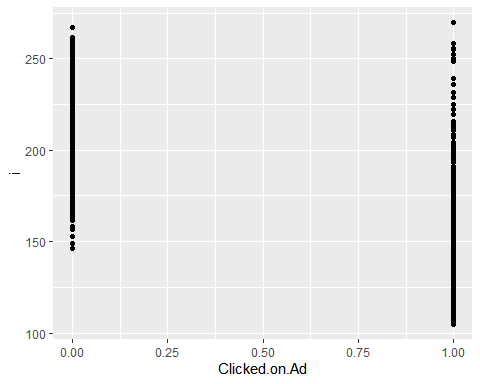
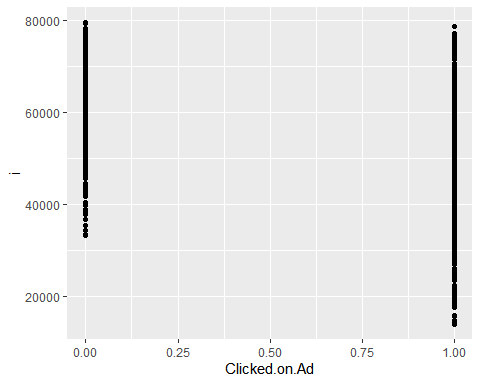
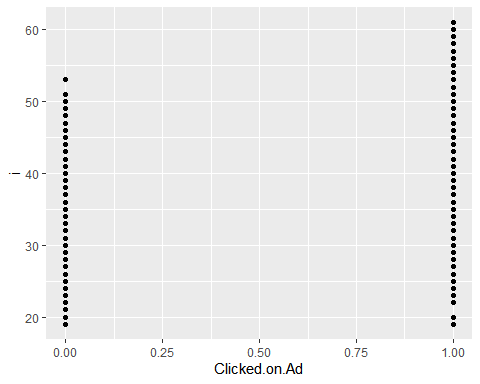
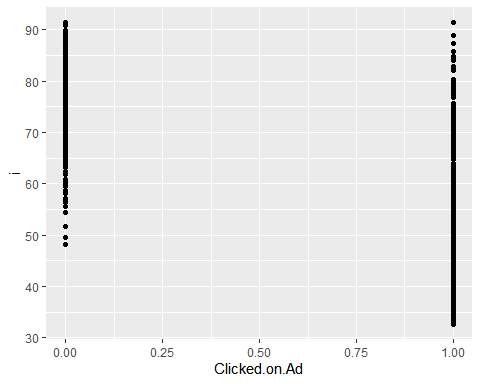


## $breaks  
## [1] 0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0  
##   
## $counts  
## [1] 519 0 0 0 0 0 0 0 0 481  
##   
## $density  
## [1] 5.19 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 4.81  
##   
## $mids  
## [1] 0.05 0.15 0.25 0.35 0.45 0.55 0.65 0.75 0.85 0.95  
##   
## $xname  
## [1] "i"  
##   
## $equidist  
## [1] TRUE  
##   
## attr(,"class")  
## [1] "histogram"



## $breaks  
## [1] 0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0  
##   
## $counts  
## [1] 500 0 0 0 0 0 0 0 0 500  
##   
## $density  
## [1] 5 0 0 0 0 0 0 0 0 5  
##   
## $mids  
## [1] 0.05 0.15 0.25 0.35 0.45 0.55 0.65 0.75 0.85 0.95  
##   
## $xname  
## [1] "i"  
##   
## $equidist  
## [1] TRUE  
##   
## attr(,"class")  
## [1] "histogram"

#scatter plot showing relationship between those who clicked on the ad and all the other variables in adver dataframe.  
library(ggplot2)  
for (i in adver)  
{print(ggplot(data = adver, aes(x = Clicked.on.Ad, y = i)) +  
 geom\_point())}

 *summary*

summary(ad)

## Daily.Time.Spent.on.Site Age Area.Income Daily.Internet.Usage  
## Min. :32.60 Min. :19.00 Min. :13996 Min. :104.8   
## 1st Qu.:51.36 1st Qu.:29.00 1st Qu.:47032 1st Qu.:138.8   
## Median :68.22 Median :35.00 Median :57012 Median :183.1   
## Mean :65.00 Mean :36.01 Mean :55000 Mean :180.0   
## 3rd Qu.:78.55 3rd Qu.:42.00 3rd Qu.:65471 3rd Qu.:218.8   
## Max. :91.43 Max. :61.00 Max. :79485 Max. :270.0   
## Ad.Topic.Line City Male Country   
## Length:1000 Length:1000 Min. :0.000 Length:1000   
## Class :character Class :character 1st Qu.:0.000 Class :character   
## Mode :character Mode :character Median :0.000 Mode :character   
## Mean :0.481   
## 3rd Qu.:1.000   
## Max. :1.000   
## Timestamp Clicked.on.Ad  
## Length:1000 Min. :0.0   
## Class :character 1st Qu.:0.0   
## Mode :character Median :0.5   
## Mean :0.5   
## 3rd Qu.:1.0   
## Max. :1.0

**mean**

#Mean of Daily.Time.Spent.on.Site,Age,Area.Income,Daily.Internet.Usage,Male,Clicked.on.Ad respectively.  
for(i in adver)  
{print(mean(i))}

## [1] 65.0002  
## [1] 36.009  
## [1] 55000  
## [1] 180.0001  
## [1] 0.481  
## [1] 0.5

**Mode**

#Finding the mode of age  
getmode <- function(v) {  
 uniqv <- unique(v)  
 uniqv[which.max(tabulate(match(v, uniqv)))]  
}  
  
adver.Age.mode <- getmode(adver$Age)  
adver.Age.mode

## [1] 31

*31 years is the age that appears mostly*

#Finding the mode of Country  
getmode <- function(v) {  
 uniqv <- unique(v)  
 uniqv[which.max(tabulate(match(v, uniqv)))]  
}  
  
adv.Country.mode <- getmode(ad$Country)  
adv.Country.mode

## [1] "Czech Republic"

*Czech Republic is most popular country*

#Finding the mode of City  
getmode <- function(v) {  
 uniqv <- unique(v)  
 uniqv[which.max(tabulate(match(v, uniqv)))]  
}  
  
adv.City.mode <- getmode(ad$City)  
adv.City.mode

## [1] "Lisamouth"

*Lisamouth is the most popular city*

#finding median of daily internet usage  
getmode <- function(v) {  
 uniqv <- unique(v)  
 uniqv[which.max(tabulate(match(v, uniqv)))]  
}  
  
adver.Daily.Internet.Usage.mode <- getmode(adver$Daily.Internet.Usage)  
adver.Daily.Internet.Usage.mode

## [1] 167.22

*most individuals had an internet usage of 167.22*

#finding median of area income.  
getmode <- function(v) {  
 uniqv <- unique(v)  
 uniqv[which.max(tabulate(match(v, uniqv)))]  
}  
  
adver.Area.Income.mode <- getmode(adver$Area.Income)  
adver.Area.Income.mode

## [1] 61833.9

*most individuals had an income of 61,833.9 dollars*

#finding median of gender.  
getmode <- function(v) {  
 uniqv <- unique(v)  
 uniqv[which.max(tabulate(match(v, uniqv)))]  
}  
  
adver.Male.mode <- getmode(adver$Male)  
adver.Male.mode

## [1] 0

*most individuals were female*

#finding median of Time.  
getmode <- function(v) {  
 uniqv <- unique(v)  
 uniqv[which.max(tabulate(match(v, uniqv)))]  
}  
  
adv.Timestamp.mode <- getmode(ad$Timestamp)  
adv.Timestamp.mode

## [1] "2016-03-27 00:53:11"

*most popular time was the year 2016 March on the 27th 53minutes and 11 seconds past midnight*

**median**

# Median of Daily.Time.Spent.on.Site,Age,Area.Income,Daily.Internet.Usage,Male,Clicked.on.Ad respectively.  
for(i in adver)  
 {print(median(i))}

## [1] 68.215  
## [1] 35  
## [1] 57012.3  
## [1] 183.13  
## [1] 0  
## [1] 0.5

**variance**

#Variance of Daily.Time.Spent.on.Site,Age,Area.Income,Daily.Internet.Usage,Male,Clicked.on.Ad respectively.  
for(i in adver)  
 {print(var(i))}

## [1] 251.3371  
## [1] 77.18611  
## [1] 179952406  
## [1] 1927.415  
## [1] 0.2498889  
## [1] 0.2502503

**Standard Deviation**

#standard deviation of Daily.Time.Spent.on.Site,Age,Area.Income,Daily.Internet.Usage,Male,Clicked.on.Ad respectively.  
for(i in adver)  
{print(sd(i))}

## [1] 15.85361  
## [1] 8.785562  
## [1] 13414.63  
## [1] 43.90234  
## [1] 0.4998889  
## [1] 0.5002502

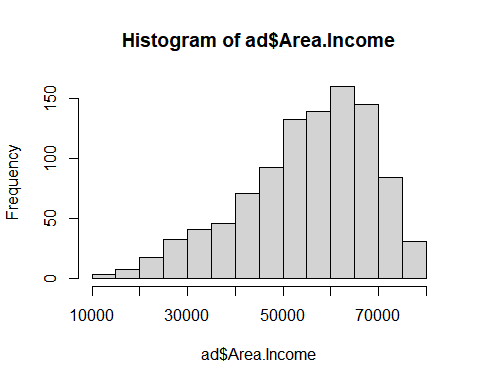
\*\*Range\*

#Range of Daily.Time.Spent.on.Site,Age,Area.Income,Daily.Internet.Usage,Male,Clicked.on.Ad respectively.  
for(i in adver)  
{print(range(i))}

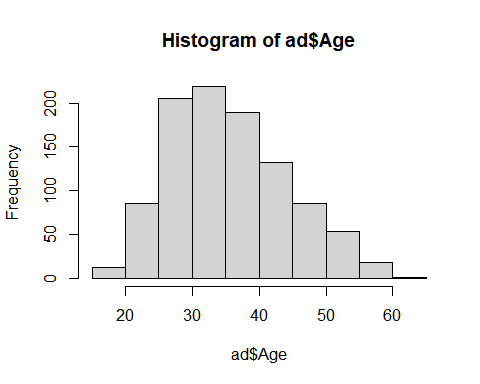
## [1] 32.60 91.43  
## [1] 19 61  
## [1] 13996.5 79484.8  
## [1] 104.78 269.96  
## [1] 0 1  
## [1] 0 1

*Time spent on the site ranges from 32 minutes and 60 seconds to 91 minutes and 43 seconds.* Age ranges from the age of 19 to 61 years. *Income ranges from 13,996.5 to 79,484.8 dollars.* Internet Usage ranges from 104.78 to 269.96

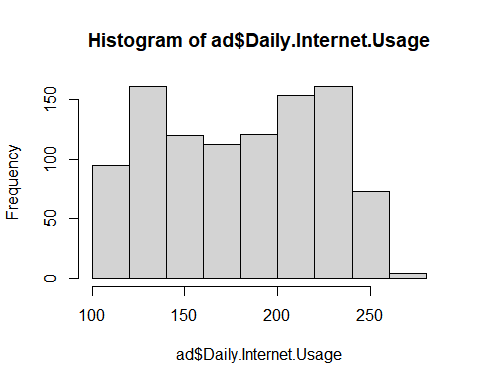
#histogram of Area Income  
hist(ad$Area.Income)



#histogram of Age  
hist(ad$Age)



#histogram of Daily.Internet.Usage  
hist(ad$Daily.Internet.Usage)



##Bivariate Analysis ###Covariance

#covariance of age and those who clicked on the ad  
age <- adver$Age  
click <- adver$Clicked.on.Ad  
  
cov(age, click)

## [1] 2.164665

*There is a linear positive relation between age and those who clicked on the ad,those who clicked on the advert increases as age increases*

#covariance of age and those who clicked on the ad and gender  
gender<-adver$Male  
click <- adver$Clicked.on.Ad  
cov(gender,click)

## [1] -0.00950951

*There is a negative relation between gender and those who clicked on the ad*

#covariance of area income and those who clicked on the ad  
income <- adver$Area.Income  
click <- adver$Clicked.on.Ad  
cov(income, click)

## [1] -3195.989

*There is a negative relation between area income and those who clicked on the ad meaning income increases as the number of those who clicked decreases*

#covariance of daily internet usage and those who clicked on the ad  
usage <- adver$Daily.Internet.Usage  
click <- adver$Clicked.on.Ad  
  
cov(usage, click)

## [1] -17.27409

*There is a negative relation between daily internet usage and those who clicked on the ad meaning as daily internet usage the number of those who clicked on the ad decreases*

#covariance of daiky internet usage and age  
usage <- adver$Daily.Internet.Usage  
age <- adver$Age  
cov(age,usage)

## [1] -141.6348

*There is a negative relation between daily internet usage and age meaning as daily internet usage,age decreases*

###Correlation

#correlation between age and those who clicked on the ad  
cor(age, click)

## [1] 0.4925313

*There is a moderate positive correlation between age and those who clicked on the advertisement*

#correlation between area income and those who clicked on the ad  
cor(income, click)

## [1] -0.4762546

*There is a moderate negative correlation between area income and those who clicked on the advertisement*

#correlation between internet usage and those who clicked on the ad  
cor(usage, click)

## [1] -0.7865392

*There is a strong negative correlation between daily internet usage and those who clicked on the advertisement*

#correlation between gender and those who clicked on the ad  
cor(gender,click)

## [1] -0.03802747

*There is a weak negative correlation between gender and those who clicked on the ad*

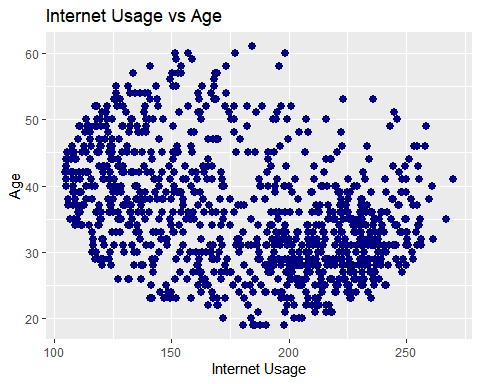
#correlation between internet usage and age.  
cor(age,usage)

## [1] -0.3672086

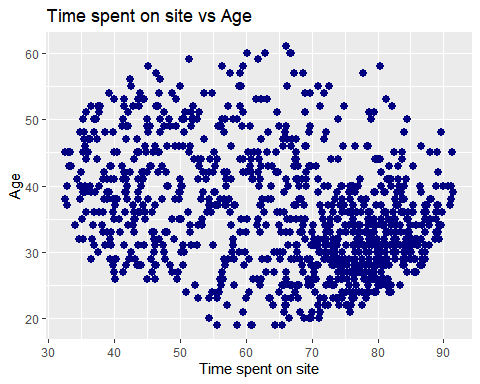
*There is a moderate negative correlation between age and daily internet usage*

###Graphical Technique.

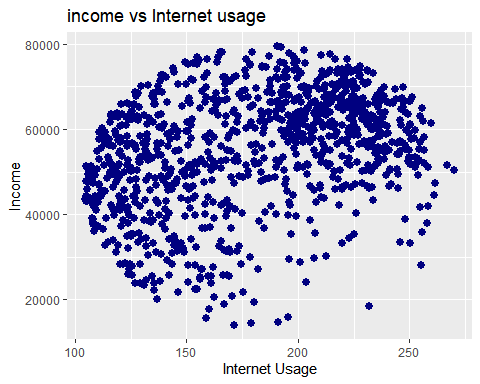
#scatter plot showing Internet Usage vs Age  
 ggplot(adver, aes(x= Daily.Internet.Usage, y = Age)) + geom\_point(size = 2.5, color="navy") + xlab("Internet Usage") + ylab("Age") + ggtitle("Internet Usage vs Age")

 *most young people spend more internet on the site*

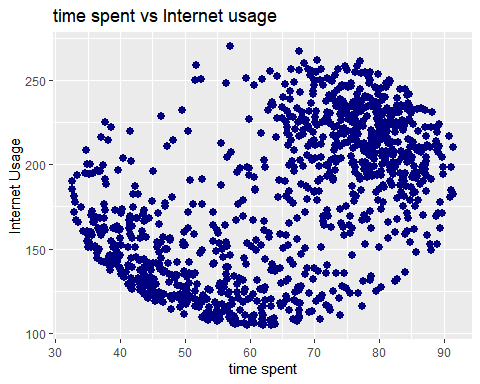
#scatter plot showing Time spent on site vs Age  
 ggplot(adver, aes(x= Daily.Time.Spent.on.Site, y = Age)) + geom\_point(size = 2.5, color="navy") + xlab("Time spent on site") + ylab("Age") + ggtitle("Time spent on site vs Age")

 *mostly young people spend more time on the site*

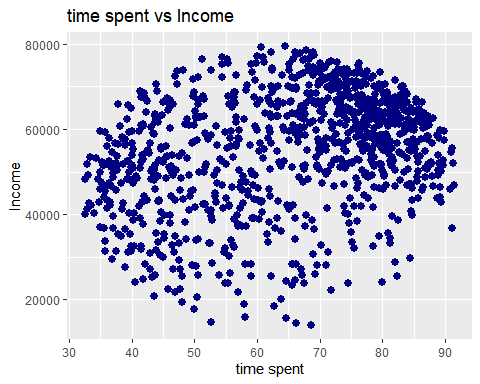
#scatter plot showing income vs Internet usage  
 ggplot(adver, aes(y= Area.Income, x= Daily.Internet.Usage)) + geom\_point(size = 2.5, color="navy") + xlab("Internet Usage") + ylab("Income") + ggtitle("income vs Internet usage")

 *Those with higher income spend most of it on internet*

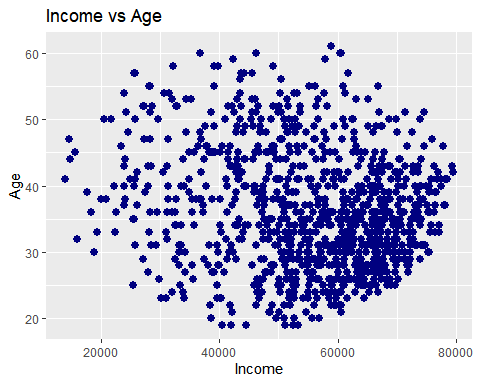
#scatter plot showing time spent vs Internet usage  
 ggplot(adver, aes(x= Daily.Time.Spent.on.Site, y= Daily.Internet.Usage)) + geom\_point(size = 2.5, color="navy") + ylab("Internet Usage") + xlab("time spent") + ggtitle("time spent vs Internet usage")

 *those with high internet usage spend more time on the site*

#scatter plot showing time spent vs Income  
 ggplot(adver, aes(x= Daily.Time.Spent.on.Site, y= Area.Income)) + geom\_point(size = 2.5, color="navy") + ylab("Income") + xlab("time spent") + ggtitle("time spent vs Income")

 *most individuals with higher income spend more time on the internet*

#scatter plot showing Time spent on Income vs Age  
 ggplot(adver, aes(x= Area.Income, y = Age)) + geom\_point(size = 2.5, color="navy") + xlab("Income") + ylab("Age") + ggtitle("Income vs Age")



#CONCLUSION.

1. Univariate Analysis. *Czech Republic is most popular country* LisaMouth is most popular city *Time spent on the site ranges from 32 minutes and 60 seconds to 91 minutes and 43 seconds.* Age ranges from the age of 19 to 61 years and 31 years is the age that appears the most. *Income ranges from 13,996.5 to 79,484.8 dollars and most individuals had an income of 61,833.9 dollars* Internet Usage ranges from 104.78 to 269.96 and most individuals had internet usage of 167.22 \*most of the visitors were female.

2.Bivariate Analysis. +Covariance. *There is a linear positive relation between age and those who clicked on the ad,those who clicked on the advert increases as age increases* There is a negative relation between area income,daily usage,gender and those who clicked on the ad meaning as one variable increases the other decreases. *There is a negative relation between daily usage and age meaning as one variable increases the other decreases. +Correlation* There is a moderate negative correlation between area income and those who clicked on the advertisement and age and daily internet usage. *There is a weak negative correlation between gender and those who clicked on the ad* There is a moderate positive correlation between age and those who clicked on the advertisement +Graphical Technique *those with high internet usage spend more time on the site* most individuals with higher income spend more time on the internet *Those with higher income spend most of it on internet* mostly young people spend more time on the site. \*mostly young people have more income

## RECOMMENDATIONS.

* Make advertisement that cater to mostly their female customers as well as their male customers.
* Make advertisement that will cater to customers of age range 25 to 42 since they spend most time on the internet and have more income to spend on internet and hence on the advertisement site. *Make advertisement to cater for their Czech Republic Customers and LisaMouth city as well as other countries and cities.* Make advertisements that do not run for more than 15 seconds since most customers spend 32 minutes to 91minutes on the site.