Cryptography Course Target Audience.(Supervised Learning EDA)

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Exploratory Data Analysis of an online Cryptography Course Advert.

1) Defining the question.

a) Specifying the question.

Who is the most likely target audience for an online cryptography course?

b) The metric of success.

Finding a specific group of people who are likely to click on the advertisments given the data available with a model that is 90-95% accurate.

c) The context.

Determining which factors make a person one of the target audiences for future forecasting.

d) Experimental design.

i) Loading and reading the data

ii) Data cleaning.

iii) Exploratory analysis.

iv) Implementing the solution.

v) Challenging the solution.

vi) Follow up questions.

e) Appropriateness of the Data Available.

The data available has been collected from previous targeted adverts by the same enterpreneur and is therefore apprpriate for this study.

2) Loading and reading the data.

```
# loading libraries
#
library(data.table)
library(tibble)
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --

## v ggplot2 3.3.6     v dplyr   1.0.9
## v tidyr   1.2.0     v stringr 1.4.0
## v readr   2.1.2     v forcats 0.5.1
## v purrr   0.3.4

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::between()   masks data.table::between()
## x dplyr::filter()    masks stats::filter()
## x dplyr::first()     masks data.table::first()
## x dplyr::lag()       masks stats::lag()
## x dplyr::last()      masks data.table::last()
## x purrr::transpose() masks data.table::transpose()
```

```
library(corrplot)
```

```
## corrplot 0.92 loaded
```

```
library(ggplot2)
library(GGally)
```

```
## Registered S3 method overwritten by 'GGally':
##   method from
##   +.gg   ggplot2
```

```
library(caret)
```

```
## Loading required package: lattice

##
## Attaching package: 'caret'

## The following object is masked from 'package:purrr':
##
##     lift
```

```
library(moments)
library(plyr)
```

```
## ------------------------------------------------------------------------------
```

```
## You have loaded plyr after dplyr - this is likely to cause problems.
## If you need functions from both plyr and dplyr, please load plyr first, then dplyr:
## library(plyr); library(dplyr)
```

```
## ------------------------------------------------------------------------------
```

```
##
## Attaching package: 'plyr'
```

```
## The following objects are masked from 'package:dplyr':
##
##     arrange, count, desc, failwith, id, mutate, rename, summarise,
##     summarize
```

```
## The following object is masked from 'package:purrr':
##
##     compact
```

```
library(dplyr)
library(rpart)
library(datasets)
library(MixGHD)
```

```
## Loading required package: MASS
```

```
##
## Attaching package: 'MASS'
```

```
## The following object is masked from 'package:dplyr':
##
##     select
```

```
library(rpart.plot)
#library()

# loading the dataset.
#
target <- fread('http://bit.ly/IPAdvertisingData')

# checking the top of the dataset.
#
head(target)
```

```
##    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
## 6:                    59.99  23    59761.56               226.74
##                           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
## 6:       Sharable client-driven software      Jamieberg    1     Norway
##              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
## 6: 2016-05-19 14:30:17             0
```

```
# checking the bottom of the dataset
#
tail(target)
```

```
##    Daily Time Spent on Site Age Area Income Daily Internet Usage
## 1:                    43.70  28    63126.96               173.01
## 2:                    72.97  30    71384.57               208.58
## 3:                    51.30  45    67782.17               134.42
## 4:                    51.63  51    42415.72               120.37
## 5:                    55.55  19    41920.79               187.95
## 6:                    45.01  26    29875.80               178.35
##                          Ad Topic Line          City Male
## 1:        Front-line bifurcated ability  Nicholasland    0
## 2:        Fundamental modular algorithm     Duffystad    1
## 3:      Grass-roots cohesive monitoring   New Darlene    1
## 4:         Expanded intangible solution South Jessica    1
## 5: Proactive bandwidth-monitored policy   West Steven    0
## 6:      Virtual 5thgeneration emulation   Ronniemouth    0
##                   Country           Timestamp Clicked on Ad
## 1:                Mayotte 2016-04-04 03:57:48             1
## 2:                Lebanon 2016-02-11 21:49:00             1
## 3: Bosnia and Herzegovina 2016-04-22 02:07:01             1
## 4:               Mongolia 2016-02-01 17:24:57             1
## 5:              Guatemala 2016-03-24 02:35:54             0
## 6:                 Brazil 2016-06-03 21:43:21             1
```

```
# Converting dataset into tibble for easier data manipulation
#
target1 <- tibble(target)
target1
```

```
## # A tibble: 1,000 x 10
```

```
##    `Daily Time Spen~`   Age `Area Income` `Daily Interne~` `Ad Topic Line` City
##                 <dbl> <int>         <dbl>            <dbl> <chr>           <chr>
##  1               69.0    35        61834.             256. Cloned 5thgene~ Wrig~
##  2               80.2    31        68442.             194. Monitored nati~ West~
##  3               69.5    26        59786.             236. Organic bottom~ Davi~
##  4               74.2    29        54806.             246. Triple-buffere~ West~
##  5               68.4    35        73890.             226. Robust logisti~ Sout~
##  6               60.0    23        59762.             227. Sharable clien~ Jami~
##  7               88.9    33        53853.             208. Enhanced dedic~ Bran~
##  8               66      48        24593.             132. Reactive local~ Port~
##  9               74.5    30        68862              222. Configurable c~ West~
## 10               69.9    20        55642.             184. Mandatory homo~ Rami~
## # ... with 990 more rows, and 4 more variables: Male <int>, Country <chr>,
## #   Timestamp <dttm>, `Clicked on Ad` <int>
```

3) Data cleaning.

```
# checking for missing values
#
colSums(is.na(target1))
```

```
## 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
```

```
# The data set contains no missing values
```

```
# checking for duplicates
#
duplicates <- target1[duplicated(target1),]
duplicates
```

```
## # A tibble: 0 x 10
## # ... with 10 variables: Daily Time Spent on Site <dbl>, Age <int>,
## #   Area Income <dbl>, Daily Internet Usage <dbl>, Ad Topic Line <chr>,
## #   City <chr>, Male <int>, Country <chr>, Timestamp <dttm>,
## #   Clicked on Ad <int>
```

```
# handling duplicates
# The data set contains no duplicated rows
```

```
# Adding column "Continent" for easier grouping of countries
#
library(countrycode)
x = c(target1$Country)
x
```

```
##    [1] "Tunisia"
##    [2] "Nauru"
##    [3] "San Marino"
##    [4] "Italy"
##    [5] "Iceland"
##    [6] "Norway"
##    [7] "Myanmar"
##    [8] "Australia"
##    [9] "Grenada"
##   [10] "Ghana"
##   [11] "Qatar"
##   [12] "Burundi"
##   [13] "Egypt"
##   [14] "Bosnia and Herzegovina"
##   [15] "Barbados"
##   [16] "Spain"
##   [17] "Palestinian Territory"
##   [18] "Afghanistan"
##   [19] "British Indian Ocean Territory (Chagos Archipelago)"
##   [20] "Russian Federation"
##   [21] "Cameroon"
##   [22] "Cameroon"
##   [23] "Burundi"
##   [24] "Korea"
##   [25] "Tokelau"
##   [26] "Monaco"
##   [27] "Tuvalu"
##   [28] "Greece"
##   [29] "British Virgin Islands"
##   [30] "Bouvet Island (Bouvetoya)"
##   [31] "Peru"
##   [32] "Aruba"
##   [33] "Maldives"
##   [34] "Senegal"
##   [35] "Dominica"
##   [36] "Luxembourg"
##   [37] "Montenegro"
##   [38] "Ukraine"
##   [39] "Saint Helena"
##   [40] "Liberia"
##   [41] "Russian Federation"
##   [42] "Tunisia"
##   [43] "Turkmenistan"
##   [44] "Saint Helena"
##   [45] "Niger"
##   [46] "Turkmenistan"
##   [47] "Qatar"
##   [48] "Sri Lanka"
##   [49] "Trinidad and Tobago"
##   [50] "Italy"
##   [51] "British Virgin Islands"
##   [52] "United Kingdom"
##   [53] "Guinea-Bissau"
##   [54] "Micronesia"
```

```
##   [55] "Turkey"
##   [56] "Croatia"
##   [57] "Israel"
##   [58] "Svalbard & Jan Mayen Islands"
##   [59] "Azerbaijan"
##   [60] "Iran"
##   [61] "Burundi"
##   [62] "Saint Vincent and the Grenadines"
##   [63] "Burundi"
##   [64] "Bulgaria"
##   [65] "Christmas Island"
##   [66] "Canada"
##   [67] "Rwanda"
##   [68] "Turks and Caicos Islands"
##   [69] "Tunisia"
##   [70] "Norfolk Island"
##   [71] "Bouvet Island (Bouvetoya)"
##   [72] "Turks and Caicos Islands"
##   [73] "Cook Islands"
##   [74] "Turkey"
##   [75] "Guatemala"
##   [76] "Cote d'Ivoire"
##   [77] "Faroe Islands"
##   [78] "Qatar"
##   [79] "Ireland"
##   [80] "Ukraine"
##   [81] "Moldova"
##   [82] "Nicaragua"
##   [83] "Montserrat"
##   [84] "Timor-Leste"
##   [85] "Bouvet Island (Bouvetoya)"
##   [86] "Puerto Rico"
##   [87] "Central African Republic"
##   [88] "Venezuela"
##   [89] "Australia"
##   [90] "Wallis and Futuna"
##   [91] "Jersey"
##   [92] "Puerto Rico"
##   [93] "Samoa"
##   [94] "Greece"
##   [95] "Antarctica (the territory South of 60 deg S)"
##   [96] "Albania"
##   [97] "Hong Kong"
##   [98] "Lithuania"
##   [99] "Egypt"
##  [100] "Bangladesh"
##  [101] "Western Sahara"
##  [102] "Serbia"
##  [103] "Maldives"
##  [104] "Czech Republic"
##  [105] "Guernsey"
##  [106] "Tanzania"
##  [107] "Bhutan"
##  [108] "Christmas Island"
```

```
##  [109] "Guinea"
##  [110] "Micronesia"
##  [111] "Madagascar"
##  [112] "Lebanon"
##  [113] "Eritrea"
##  [114] "Guyana"
##  [115] "Trinidad and Tobago"
##  [116] "Jersey"
##  [117] "United Arab Emirates"
##  [118] "Martinique"
##  [119] "Somalia"
##  [120] "Bhutan"
##  [121] "Greece"
##  [122] "Benin"
##  [123] "Papua New Guinea"
##  [124] "Uzbekistan"
##  [125] "South Africa"
##  [126] "Egypt"
##  [127] "Hungary"
##  [128] "Falkland Islands (Malvinas)"
##  [129] "Dominica"
##  [130] "Jersey"
##  [131] "Lithuania"
##  [132] "Saint Martin"
##  [133] "Cuba"
##  [134] "United States Minor Outlying Islands"
##  [135] "Belize"
##  [136] "Belize"
##  [137] "Antarctica (the territory South of 60 deg S)"
##  [138] "Saint Vincent and the Grenadines"
##  [139] "Kuwait"
##  [140] "Thailand"
##  [141] "Gibraltar"
##  [142] "Holy See (Vatican City State)"
##  [143] "Korea"
##  [144] "Saint Helena"
##  [145] "Turks and Caicos Islands"
##  [146] "Czech Republic"
##  [147] "Netherlands"
##  [148] "Belarus"
##  [149] "Dominica"
##  [150] "South Africa"
##  [151] "New Zealand"
##  [152] "Togo"
##  [153] "Kenya"
##  [154] "Palau"
##  [155] "Timor-Leste"
##  [156] "Cambodia"
##  [157] "Belize"
##  [158] "Cuba"
##  [159] "Costa Rica"
##  [160] "Liechtenstein"
##  [161] "Korea"
##  [162] "Ukraine"
```

```
##  [163] "Angola"
##  [164] "Nauru"
##  [165] "Equatorial Guinea"
##  [166] "Mongolia"
##  [167] "Svalbard & Jan Mayen Islands"
##  [168] "Timor-Leste"
##  [169] "Brazil"
##  [170] "Chad"
##  [171] "Portugal"
##  [172] "Malawi"
##  [173] "Qatar"
##  [174] "Singapore"
##  [175] "Guinea"
##  [176] "Kazakhstan"
##  [177] "Kuwait"
##  [178] "Rwanda"
##  [179] "China"
##  [180] "Bouvet Island (Bouvetoya)"
##  [181] "Vietnam"
##  [182] "Guatemala"
##  [183] "Peru"
##  [184] "Mayotte"
##  [185] "Samoa"
##  [186] "Singapore"
##  [187] "Jamaica"
##  [188] "Bahamas"
##  [189] "Canada"
##  [190] "Algeria"
##  [191] "Fiji"
##  [192] "Kenya"
##  [193] "Argentina"
##  [194] "Bouvet Island (Bouvetoya)"
##  [195] "Philippines"
##  [196] "Senegal"
##  [197] "Suriname"
##  [198] "Liberia"
##  [199] "Guam"
##  [200] "United Arab Emirates"
##  [201] "Antigua and Barbuda"
##  [202] "Argentina"
##  [203] "Georgia"
##  [204] "Jordan"
##  [205] "Saudi Arabia"
##  [206] "South Africa"
##  [207] "Croatia"
##  [208] "Fiji"
##  [209] "Australia"
##  [210] "Sao Tome and Principe"
##  [211] "Fiji"
##  [212] "Cyprus"
##  [213] "Kyrgyz Republic"
##  [214] "Pakistan"
##  [215] "Seychelles"
##  [216] "Samoa"
```

```
##  [217] "Bulgaria"
##  [218] "Mauritania"
##  [219] "Czech Republic"
##  [220] "Chile"
##  [221] "Poland"
##  [222] "Estonia"
##  [223] "Turkmenistan"
##  [224] "Latvia"
##  [225] "Fiji"
##  [226] "Turkey"
##  [227] "Kazakhstan"
##  [228] "Bahrain"
##  [229] "Colombia"
##  [230] "Brunei Darussalam"
##  [231] "Taiwan"
##  [232] "Serbia"
##  [233] "Saint Pierre and Miquelon"
##  [234] "Australia"
##  [235] "Chad"
##  [236] "Norway"
##  [237] "Turks and Caicos Islands"
##  [238] "Finland"
##  [239] "South Africa"
##  [240] "Martinique"
##  [241] "Afghanistan"
##  [242] "Micronesia"
##  [243] "French Southern Territories"
##  [244] "Philippines"
##  [245] "Algeria"
##  [246] "San Marino"
##  [247] "Guernsey"
##  [248] "Sierra Leone"
##  [249] "Tajikistan"
##  [250] "Liechtenstein"
##  [251] "Ecuador"
##  [252] "Switzerland"
##  [253] "Moldova"
##  [254] "Finland"
##  [255] "France"
##  [256] "Venezuela"
##  [257] "Cuba"
##  [258] "Peru"
##  [259] "Turkey"
##  [260] "Albania"
##  [261] "French Southern Territories"
##  [262] "Papua New Guinea"
##  [263] "Liechtenstein"
##  [264] "Thailand"
##  [265] "Malaysia"
##  [266] "Mauritius"
##  [267] "Algeria"
##  [268] "Christmas Island"
##  [269] "Japan"
##  [270] "Greenland"
```

```
##  [271] "Sao Tome and Principe"
##  [272] "Senegal"
##  [273] "Guadeloupe"
##  [274] "Belgium"
##  [275] "Israel"
##  [276] "Honduras"
##  [277] "Estonia"
##  [278] "Paraguay"
##  [279] "Kyrgyz Republic"
##  [280] "Mauritania"
##  [281] "French Guiana"
##  [282] "Northern Mariana Islands"
##  [283] "Lebanon"
##  [284] "Saint Pierre and Miquelon"
##  [285] "American Samoa"
##  [286] "Austria"
##  [287] "Tonga"
##  [288] "Tonga"
##  [289] "French Southern Territories"
##  [290] "Serbia"
##  [291] "New Caledonia"
##  [292] "Taiwan"
##  [293] "United States of America"
##  [294] "Morocco"
##  [295] "Suriname"
##  [296] "Macedonia"
##  [297] "Wallis and Futuna"
##  [298] "Chile"
##  [299] "Gabon"
##  [300] "Gabon"
##  [301] "Holy See (Vatican City State)"
##  [302] "Seychelles"
##  [303] "Mayotte"
##  [304] "Uganda"
##  [305] "Cambodia"
##  [306] "Antigua and Barbuda"
##  [307] "Cameroon"
##  [308] "Somalia"
##  [309] "Lebanon"
##  [310] "Saint Pierre and Miquelon"
##  [311] "Dominica"
##  [312] "Hungary"
##  [313] "Taiwan"
##  [314] "Saint Lucia"
##  [315] "Niue"
##  [316] "France"
##  [317] "Cyprus"
##  [318] "French Southern Territories"
##  [319] "Costa Rica"
##  [320] "Austria"
##  [321] "Zambia"
##  [322] "Congo"
##  [323] "United States of America"
##  [324] "Pitcairn Islands"
```

```
##  [325] "Belize"
##  [326] "Anguilla"
##  [327] "South Africa"
##  [328] "Singapore"
##  [329] "Finland"
##  [330] "Martinique"
##  [331] "Cameroon"
##  [332] "Sweden"
##  [333] "New Caledonia"
##  [334] "Bosnia and Herzegovina"
##  [335] "Singapore"
##  [336] "Falkland Islands (Malvinas)"
##  [337] "Bosnia and Herzegovina"
##  [338] "Mauritius"
##  [339] "Indonesia"
##  [340] "Czech Republic"
##  [341] "Eritrea"
##  [342] "Mexico"
##  [343] "Gibraltar"
##  [344] "Haiti"
##  [345] "Falkland Islands (Malvinas)"
##  [346] "Eritrea"
##  [347] "Hong Kong"
##  [348] "Gambia"
##  [349] "Barbados"
##  [350] "Nauru"
##  [351] "Peru"
##  [352] "El Salvador"
##  [353] "Libyan Arab Jamahiriya"
##  [354] "Cambodia"
##  [355] "Saint Barthelemy"
##  [356] "Reunion"
##  [357] "Antigua and Barbuda"
##  [358] "Samoa"
##  [359] "Afghanistan"
##  [360] "Azerbaijan"
##  [361] "Philippines"
##  [362] "Angola"
##  [363] "Albania"
##  [364] "Hungary"
##  [365] "Faroe Islands"
##  [366] "Czech Republic"
##  [367] "Svalbard & Jan Mayen Islands"
##  [368] "Afghanistan"
##  [369] "Rwanda"
##  [370] "Panama"
##  [371] "Samoa"
##  [372] "United States Minor Outlying Islands"
##  [373] "Greece"
##  [374] "Cote d'Ivoire"
##  [375] "Pakistan"
##  [376] "Anguilla"
##  [377] "Cyprus"
##  [378] "Peru"
```

```
##  [379] "Kenya"
##  [380] "Chad"
##  [381] "Kyrgyz Republic"
##  [382] "Albania"
##  [383] "Gabon"
##  [384] "Dominican Republic"
##  [385] "Zimbabwe"
##  [386] "Croatia"
##  [387] "Cambodia"
##  [388] "Mongolia"
##  [389] "Honduras"
##  [390] "Madagascar"
##  [391] "Qatar"
##  [392] "China"
##  [393] "Bangladesh"
##  [394] "Swaziland"
##  [395] "Tanzania"
##  [396] "Eritrea"
##  [397] "Canada"
##  [398] "Saint Kitts and Nevis"
##  [399] "Burkina Faso"
##  [400] "Tuvalu"
##  [401] "El Salvador"
##  [402] "Madagascar"
##  [403] "Bangladesh"
##  [404] "American Samoa"
##  [405] "Latvia"
##  [406] "Moldova"
##  [407] "Anguilla"
##  [408] "Bangladesh"
##  [409] "Faroe Islands"
##  [410] "Taiwan"
##  [411] "Heard Island and McDonald Islands"
##  [412] "Israel"
##  [413] "Bolivia"
##  [414] "Bahamas"
##  [415] "Costa Rica"
##  [416] "Myanmar"
##  [417] "Netherlands Antilles"
##  [418] "Czech Republic"
##  [419] "Iceland"
##  [420] "Palau"
##  [421] "Libyan Arab Jamahiriya"
##  [422] "Kazakhstan"
##  [423] "French Guiana"
##  [424] "Tuvalu"
##  [425] "Congo"
##  [426] "United Kingdom"
##  [427] "Luxembourg"
##  [428] "French Polynesia"
##  [429] "Papua New Guinea"
##  [430] "Maldives"
##  [431] "Zambia"
##  [432] "Cook Islands"
```

```
##  [433] "Congo"
##  [434] "Senegal"
##  [435] "Myanmar"
##  [436] "Dominican Republic"
##  [437] "Bahrain"
##  [438] "Puerto Rico"
##  [439] "Chile"
##  [440] "Bolivia"
##  [441] "Serbia"
##  [442] "Malaysia"
##  [443] "Estonia"
##  [444] "Greenland"
##  [445] "Trinidad and Tobago"
##  [446] "Thailand"
##  [447] "Philippines"
##  [448] "Niue"
##  [449] "Afghanistan"
##  [450] "Angola"
##  [451] "Egypt"
##  [452] "Fiji"
##  [453] "Portugal"
##  [454] "Austria"
##  [455] "Germany"
##  [456] "Panama"
##  [457] "United States of America"
##  [458] "Christmas Island"
##  [459] "Equatorial Guinea"
##  [460] "Micronesia"
##  [461] "Malta"
##  [462] "Ecuador"
##  [463] "Sudan"
##  [464] "Lao People's Democratic Republic"
##  [465] "Saint Vincent and the Grenadines"
##  [466] "Switzerland"
##  [467] "Spain"
##  [468] "Turks and Caicos Islands"
##  [469] "Indonesia"
##  [470] "Cook Islands"
##  [471] "Australia"
##  [472] "Finland"
##  [473] "Pakistan"
##  [474] "Ireland"
##  [475] "Eritrea"
##  [476] "France"
##  [477] "Austria"
##  [478] "Heard Island and McDonald Islands"
##  [479] "Western Sahara"
##  [480] "Liberia"
##  [481] "Dominican Republic"
##  [482] "Tonga"
##  [483] "Lao People's Democratic Republic"
##  [484] "United States of America"
##  [485] "Belgium"
##  [486] "Indonesia"
```

```
##  [487] "Croatia"
##  [488] "Brunei Darussalam"
##  [489] "American Samoa"
##  [490] "Netherlands Antilles"
##  [491] "Thailand"
##  [492] "Greece"
##  [493] "French Polynesia"
##  [494] "Guernsey"
##  [495] "Isle of Man"
##  [496] "Holy See (Vatican City State)"
##  [497] "El Salvador"
##  [498] "China"
##  [499] "Myanmar"
##  [500] "Macao"
##  [501] "Australia"
##  [502] "United States Virgin Islands"
##  [503] "Mexico"
##  [504] "Djibouti"
##  [505] "Cote d'Ivoire"
##  [506] "Mali"
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##  [508] "Romania"
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##  [514] "Turkey"
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##  [533] "Barbados"
##  [534] "French Polynesia"
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##  [537] "Brazil"
##  [538] "Venezuela"
##  [539] "Myanmar"
##  [540] "Malta"
```

```
##  [541] "Jamaica"
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##  [543] "Algeria"
##  [544] "Tuvalu"
##  [545] "Georgia"
##  [546] "Cambodia"
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##  [549] "Indonesia"
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##  [551] "Belize"
##  [552] "Serbia"
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##  [555] "Christmas Island"
##  [556] "Papua New Guinea"
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##  [558] "Comoros"
##  [559] "Western Sahara"
##  [560] "Nicaragua"
##  [561] "Guam"
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##  [566] "Nepal"
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##  [571] "Yemen"
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##  [574] "United States Virgin Islands"
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##  [576] "French Guiana"
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##  [579] "Honduras"
##  [580] "Seychelles"
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##  [582] "Saint Pierre and Miquelon"
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##  [586] "Micronesia"
##  [587] "Liberia"
##  [588] "Saudi Arabia"
##  [589] "Nepal"
##  [590] "Ghana"
##  [591] "Iran"
##  [592] "New Zealand"
##  [593] "Libyan Arab Jamahiriya"
##  [594] "Sri Lanka"
```

```
##  [595] "United Arab Emirates"
##  [596] "Indonesia"
##  [597] "Saint Vincent and the Grenadines"
##  [598] "Mongolia"
##  [599] "Honduras"
##  [600] "Papua New Guinea"
##  [601] "Kyrgyz Republic"
##  [602] "Ethiopia"
##  [603] "Rwanda"
##  [604] "Kyrgyz Republic"
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##  [606] "Togo"
##  [607] "Pakistan"
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##  [610] "Cayman Islands"
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##  [615] "Cameroon"
##  [616] "Ecuador"
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##  [618] "Guinea-Bissau"
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##  [621] "Cape Verde"
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##  [623] "Saudi Arabia"
##  [624] "France"
##  [625] "Burundi"
##  [626] "Latvia"
##  [627] "Morocco"
##  [628] "Venezuela"
##  [629] "Palau"
##  [630] "Isle of Man"
##  [631] "Peru"
##  [632] "Belgium"
##  [633] "Croatia"
##  [634] "France"
##  [635] "Slovenia"
##  [636] "Peru"
##  [637] "Belarus"
##  [638] "Bolivia"
##  [639] "Benin"
##  [640] "Wallis and Futuna"
##  [641] "Azerbaijan"
##  [642] "Mongolia"
##  [643] "Denmark"
##  [644] "Russian Federation"
##  [645] "Brazil"
##  [646] "Ethiopia"
##  [647] "Guyana"
##  [648] "Ethiopia"
```

```
##  [649] "Mauritius"
##  [650] "Djibouti"
##  [651] "Syrian Arab Republic"
##  [652] "Saint Martin"
##  [653] "Netherlands Antilles"
##  [654] "Greece"
##  [655] "Madagascar"
##  [656] "Senegal"
##  [657] "Burkina Faso"
##  [658] "Czech Republic"
##  [659] "Lao People's Democratic Republic"
##  [660] "Netherlands Antilles"
##  [661] "Qatar"
##  [662] "Andorra"
##  [663] "Liechtenstein"
##  [664] "China"
##  [665] "Vietnam"
##  [666] "Tajikistan"
##  [667] "Eritrea"
##  [668] "Monaco"
##  [669] "Israel"
##  [670] "Hungary"
##  [671] "Singapore"
##  [672] "Cuba"
##  [673] "Reunion"
##  [674] "Zambia"
##  [675] "Gabon"
##  [676] "Dominica"
##  [677] "Bahamas"
##  [678] "Tokelau"
##  [679] "Turkmenistan"
##  [680] "Belgium"
##  [681] "French Guiana"
##  [682] "Martinique"
##  [683] "French Polynesia"
##  [684] "Ecuador"
##  [685] "Puerto Rico"
##  [686] "United Arab Emirates"
##  [687] "Burkina Faso"
##  [688] "Luxembourg"
##  [689] "Jamaica"
##  [690] "Antarctica (the territory South of 60 deg S)"
##  [691] "China"
##  [692] "Western Sahara"
##  [693] "Lebanon"
##  [694] "Hong Kong"
##  [695] "Vanuatu"
##  [696] "Vanuatu"
##  [697] "Guatemala"
##  [698] "Greenland"
##  [699] "Syrian Arab Republic"
##  [700] "Saint Helena"
##  [701] "Lebanon"
##  [702] "Malta"
```

```
##  [703] "Christmas Island"
##  [704] "Ukraine"
##  [705] "Malta"
##  [706] "Italy"
##  [707] "Japan"
##  [708] "Mauritius"
##  [709] "Turkey"
##  [710] "Namibia"
##  [711] "China"
##  [712] "Netherlands"
##  [713] "Gibraltar"
##  [714] "Congo"
##  [715] "Senegal"
##  [716] "Hungary"
##  [717] "Pitcairn Islands"
##  [718] "Slovakia (Slovak Republic)"
##  [719] "United States Virgin Islands"
##  [720] "Monaco"
##  [721] "Portugal"
##  [722] "Turkey"
##  [723] "Uganda"
##  [724] "Norfolk Island"
##  [725] "Niue"
##  [726] "Ukraine"
##  [727] "Vanuatu"
##  [728] "United States Minor Outlying Islands"
##  [729] "Armenia"
##  [730] "Sweden"
##  [731] "Timor-Leste"
##  [732] "French Southern Territories"
##  [733] "Finland"
##  [734] "Saint Vincent and the Grenadines"
##  [735] "Senegal"
##  [736] "Burundi"
##  [737] "Bahamas"
##  [738] "Sweden"
##  [739] "Svalbard & Jan Mayen Islands"
##  [740] "Tonga"
##  [741] "Korea"
##  [742] "Kyrgyz Republic"
##  [743] "Costa Rica"
##  [744] "Liechtenstein"
##  [745] "Zimbabwe"
##  [746] "Costa Rica"
##  [747] "Hungary"
##  [748] "Fiji"
##  [749] "Netherlands"
##  [750] "Sweden"
##  [751] "Barbados"
##  [752] "Paraguay"
##  [753] "Italy"
##  [754] "Belarus"
##  [755] "South Georgia and the South Sandwich Islands"
##  [756] "Anguilla"
```

```
##  [757] "Sierra Leone"
##  [758] "Saint Martin"
##  [759] "Uganda"
##  [760] "Saudi Arabia"
##  [761] "Greenland"
##  [762] "Venezuela"
##  [763] "Liberia"
##  [764] "Mali"
##  [765] "Bosnia and Herzegovina"
##  [766] "Brunei Darussalam"
##  [767] "South Georgia and the South Sandwich Islands"
##  [768] "Czech Republic"
##  [769] "El Salvador"
##  [770] "Tokelau"
##  [771] "France"
##  [772] "Gabon"
##  [773] "Bulgaria"
##  [774] "Burkina Faso"
##  [775] "Mayotte"
##  [776] "Somalia"
##  [777] "Albania"
##  [778] "Bolivia"
##  [779] "Jersey"
##  [780] "British Virgin Islands"
##  [781] "Saint Helena"
##  [782] "Bosnia and Herzegovina"
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##  [784] "Georgia"
##  [785] "United States Minor Outlying Islands"
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##  [787] "Ghana"
##  [788] "Samoa"
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##  [791] "Northern Mariana Islands"
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##  [793] "Grenada"
##  [794] "Poland"
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##  [798] "Namibia"
##  [799] "Cyprus"
##  [800] "Japan"
##  [801] "Zimbabwe"
##  [802] "Andorra"
##  [803] "Luxembourg"
##  [804] "Cyprus"
##  [805] "Turkey"
##  [806] "Hong Kong"
##  [807] "Netherlands"
##  [808] "United States Virgin Islands"
##  [809] "Marshall Islands"
##  [810] "Western Sahara"
```

```
##  [811] "Saint Vincent and the Grenadines"
##  [812] "United States of America"
##  [813] "Angola"
##  [814] "Cayman Islands"
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##  [816] "Wallis and Futuna"
##  [817] "Zimbabwe"
##  [818] "Chad"
##  [819] "Saint Martin"
##  [820] "Rwanda"
##  [821] "Moldova"
##  [822] "Gabon"
##  [823] "Denmark"
##  [824] "Svalbard & Jan Mayen Islands"
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##  [826] "Fiji"
##  [827] "Philippines"
##  [828] "Vietnam"
##  [829] "Jersey"
##  [830] "Indonesia"
##  [831] "Palestinian Territory"
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##  [833] "Malta"
##  [834] "Afghanistan"
##  [835] "Austria"
##  [836] "Micronesia"
##  [837] "Mexico"
##  [838] "Chile"
##  [839] "Cuba"
##  [840] "Belarus"
##  [841] "Malawi"
##  [842] "Afghanistan"
##  [843] "Luxembourg"
##  [844] "South Africa"
##  [845] "Nepal"
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##  [850] "Uganda"
##  [851] "Vanuatu"
##  [852] "Anguilla"
##  [853] "Switzerland"
##  [854] "Zimbabwe"
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##  [857] "Egypt"
##  [858] "Greece"
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##  [862] "Greenland"
##  [863] "Moldova"
##  [864] "Poland"
```

```
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##  [869] "Armenia"
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##  [871] "Eritrea"
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##  [884] "Mayotte"
##  [885] "South Africa"
##  [886] "Macao"
##  [887] "France"
##  [888] "Equatorial Guinea"
##  [889] "Mali"
##  [890] "Mayotte"
##  [891] "Pakistan"
##  [892] "Guadeloupe"
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##  [894] "New Zealand"
##  [895] "Netherlands Antilles"
##  [896] "Belarus"
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##  [898] "El Salvador"
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##  [902] "Burundi"
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##  [905] "Luxembourg"
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##  [907] "San Marino"
##  [908] "Madagascar"
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##  [914] "Heard Island and McDonald Islands"
##  [915] "Ethiopia"
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##  [917] "Niger"
##  [918] "Timor-Leste"
```

```
##  [919] "Uruguay"
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##  [938] "Brazil"
##  [939] "Syrian Arab Republic"
##  [940] "Palestinian Territory"
##  [941] "Grenada"
##  [942] "Ghana"
##  [943] "Brunei Darussalam"
##  [944] "Lithuania"
##  [945] "Maldives"
##  [946] "Lesotho"
##  [947] "Czech Republic"
##  [948] "Iceland"
##  [949] "Philippines"
##  [950] "Cayman Islands"
##  [951] "Haiti"
##  [952] "Colombia"
##  [953] "Luxembourg"
##  [954] "United Arab Emirates"
##  [955] "Ireland"
##  [956] "Canada"
##  [957] "Svalbard & Jan Mayen Islands"
##  [958] "Malta"
##  [959] "Sudan"
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##  [966] "Iran"
##  [967] "Bulgaria"
##  [968] "Afghanistan"
##  [969] "Liberia"
##  [970] "Netherlands Antilles"
##  [971] "Hong Kong"
##  [972] "Palau"
```

```
##  [973] "Malawi"
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##  [991] "Tonga"
##  [992] "Comoros"
##  [993] "Montenegro"
##  [994] "Isle of Man"
##  [995] "Mayotte"
##  [996] "Lebanon"
##  [997] "Bosnia and Herzegovina"
##  [998] "Mongolia"
##  [999] "Guatemala"
## [1000] "Brazil"
```

```
target1$Continent <- countrycode(sourcevar = x,
                                 origin = "country.name",
                                 destination = "continent")
```

```
## Warning in countrycode_convert(sourcevar = sourcevar, origin = origin, destination = dest, : Some va
```

```
target1$Continent[is.na(target1$Continent)] <- "Antarctica"

target1
```

```
## # A tibble: 1,000 x 11
##    `Daily Time Spen~`   Age `Area Income` `Daily Interne~` `Ad Topic Line` City
##                 <dbl> <int>         <dbl>            <dbl> <chr>           <chr>
##  1               69.0    35        61834.             256. Cloned 5thgene~ Wrig~
##  2               80.2    31        68442.             194. Monitored nati~ West~
##  3               69.5    26        59786.             236. Organic bottom~ Davi~
##  4               74.2    29        54806.             246. Triple-buffere~ West~
##  5               68.4    35        73890.             226. Robust logisti~ Sout~
##  6               60.0    23        59762.             227. Sharable clien~ Jami~
##  7               88.9    33        53853.             208. Enhanced dedic~ Bran~
##  8               66      48        24593.             132. Reactive local~ Port~
##  9               74.5    30        68862              222. Configurable c~ West~
## 10               69.9    20        55642.             184. Mandatory homo~ Rami~
## # ... with 990 more rows, and 5 more variables: Male <int>, Country <chr>,
## #   Timestamp <dttm>, `Clicked on Ad` <int>, Continent <chr>
```

```r
# removing blanks from column names
#
names(target1) <- make.names(names(target1), unique=TRUE)
target1
```

```
## # A tibble: 1,000 x 11
##    Daily.Time.Spen~   Age Area.Income Daily.Internet.~ Ad.Topic.Line City   Male
##               <dbl> <int>       <dbl>            <dbl> <chr>         <chr> <int>
##  1             69.0    35      61834.             256. Cloned 5thge~ Wrig~     0
##  2             80.2    31      68442.             194. Monitored na~ West~     1
##  3             69.5    26      59786.             236. Organic bott~ Davi~     0
##  4             74.2    29      54806.             246. Triple-buffe~ West~     1
##  5             68.4    35      73890.             226. Robust logis~ Sout~     0
##  6             60.0    23      59762.             227. Sharable cli~ Jami~     1
##  7             88.9    33      53853.             208. Enhanced ded~ Bran~     0
##  8             66      48      24593.             132. Reactive loc~ Port~     1
##  9             74.5    30      68862              222. Configurable~ West~     1
## 10             69.9    20      55642.             184. Mandatory ho~ Rami~     1
## # ... with 990 more rows, and 4 more variables: Country <chr>,
## #   Timestamp <dttm>, Clicked.on.Ad <int>, Continent <chr>
```

```r
# dropping redundant variables
#
drop <- c("Timestamp", "Ad.Topic.Line", "City")
target2 = target1[,!(names(target1) %in% drop)]
target2
```

```
## # A tibble: 1,000 x 8
##    Daily.Time.Spent.on.Site   Age Area.Income Daily.Internet.Usage  Male Country
##                       <dbl> <int>       <dbl>                <dbl> <int> <chr>
##  1                     69.0    35      61834.                256.     0 Tunisia
##  2                     80.2    31      68442.                194.     1 Nauru
##  3                     69.5    26      59786.                236.     0 San Ma~
##  4                     74.2    29      54806.                246.     1 Italy
##  5                     68.4    35      73890.                226.     0 Iceland
##  6                     60.0    23      59762.                227.     1 Norway
##  7                     88.9    33      53853.                208.     0 Myanmar
##  8                     66      48      24593.                132.     1 Austra~
##  9                     74.5    30      68862                 222.     1 Grenada
## 10                     69.9    20      55642.                184.     1 Ghana
## # ... with 990 more rows, and 2 more variables: Clicked.on.Ad <int>,
## #   Continent <chr>
```

```r
# getting rows where clicked on ad is 1 for analysis on those who clicked on adverts
#
target_ad <- target2 %>% filter(target2$Clicked.on.Ad == 1)
target_ad
```

```
## # A tibble: 500 x 8
##    Daily.Time.Spent.on.Site   Age Area.Income Daily.Internet.Usage  Male Country
##                       <dbl> <int>       <dbl>                <dbl> <int> <chr>
##  1                     66      48      24593.                132.     1 Austra~
```

```
##  2                    47.6    49      45633.                  122.     0 Qatar
##  3                    69.6    48      51637.                  113.     1 Egypt
##  4                    43.0    33      30976                   144.     0 Barbad~
##  5                    63.4    23      52182.                  141.     1 Spain
##  6                    55.4    37      23937.                  129.     0 Palest~
##  7                    54.7    36      31088.                  118.     1 Britis~
##  8                    74.6    40      23822.                  136.     1 Russia~
##  9                    41.5    52      32636.                  165.     0 Burundi
## 10                    41.4    41      68962.                  167.     0 Tokelau
## # ... with 490 more rows, and 2 more variables: Clicked.on.Ad <int>,
## #   Continent <chr>
```

4) Exploratory Analysis.

Univariate Analysis.

The data set has been reduced to rows where clicked on ad is 1, for better exploratory data analysis.

```
#calculating mean
#
mean(target_ad$Daily.Time.Spent.on.Site)
```

Measures of Central Tendency.

```
## [1] 53.14578
```

```
mean(target_ad$Age)
```

```
## [1] 40.334
```

```
mean(target_ad$Area.Income)
```

```
## [1] 48614.41
```

```
mean(target_ad$Daily.Internet.Usage)
```

```
## [1] 145.4865
```

```
#Calculating median
#
median(target_ad$Daily.Time.Spent.on.Site)
```

```
## [1] 51.53
```

```
median(target_ad$Age)
```

```
## [1] 40
```

```
median(target_ad$Area.Income)
```

```
## [1] 49417.26
```

```
median(target_ad$Daily.Internet.Usage)
```

```
## [1] 138.79
```

```
# Calculating mode
#
getmode <- function(v) {
   uniqv <- unique(v)
   uniqv[which.max(tabulate(match(v, uniqv)))]
}
getmode(target_ad$Daily.Time.Spent.on.Site)
```

```
## [1] 75.55
```

```
getmode(target_ad$Age)
```

```
## [1] 45
```

```
getmode(target_ad$Area.Income)
```

```
## [1] 24593.33
```

```
getmode(target_ad$Daily.Internet.Usage)
```

```
## [1] 167.22
```

```
getmode(target_ad$Male)
```

```
## [1] 0
```

```
# calculating minimum values
#
min(target_ad$Daily.Time.Spent.on.Site)
```

Measures of Dispersion.

```
## [1] 32.6
```

```
min(target_ad$Age)
```

```
## [1] 19
```

```
min(target_ad$Area.Income)
```

```
## [1] 13996.5
```

```
min(target_ad$Daily.Internet.Usage)
```

```
## [1] 104.78
```

```
'---------------'
```

```
## [1] "---------------"
```

```
#calculating maximum values
#
max(target_ad$Daily.Time.Spent.on.Site)
```

```
## [1] 91.37
```

```
max(target_ad$Age)
```

```
## [1] 61
```

```
max(target_ad$Area.Income)
```

```
## [1] 78520.99
```

```
max(target_ad$Daily.Internet.Usage)
```

```
## [1] 269.96
```

```
# Get range, 1st and 3rd quartiles
#
quantile(target_ad$Daily.Time.Spent.on.Site)
```

```
##      0%     25%     50%     75%    100%
## 32.6000 42.8375 51.5300 62.0750 91.3700
```

```
quantile(target_ad$Age)
```

```
##   0%  25%  50%  75% 100%
##   19   34   40   47   61
```

```
quantile(target_ad$Area.Income)
```

```
##       0%      25%      50%      75%     100%
## 13996.50 39106.62 49417.26 59241.04 78520.99
```

```
quantile(target_ad$Daily.Internet.Usage)
```

```
##       0%      25%      50%      75%     100%
## 104.7800 123.5925 138.7900 161.1600 269.9600
```

```
# variance and standard deviation
#
var(target_ad$Daily.Time.Spent.on.Site)
```

```
## [1] 164.406
```

```
var(target_ad$Age)
```

```
## [1] 78.43932
```

```
var(target_ad$Area.Income)
```

```
## [1] 199268295
```

```
var(target_ad$Daily.Internet.Usage)
```

```
## [1] 901.5502
```

```
'------------'
```

```
## [1] "------------"
```

```
sd(target_ad$Daily.Time.Spent.on.Site)
```

```
## [1] 12.82209
```

```
sd(target_ad$Age)
```

```
## [1] 8.856598
```

```
sd(target_ad$Area.Income)
```

```
## [1] 14116.24
```

```
sd(target_ad$Daily.Internet.Usage)
```

```
## [1] 30.02583
```

```
# calculating skewness and kurtosis
#
skewness(target_ad$Daily.Time.Spent.on.Site)
```

```
## [1] 0.5337215
```

```
skewness(target_ad$Age)
```

```
## [1] 0.02515906
```

```
skewness(target_ad$Area.Income)
```

```
## [1] -0.1701452
```

```
skewness(target_ad$Daily.Internet.Usage)
```

```
## [1] 1.236424
```

```
'------------'
```

```
## [1] "------------"
```

```
kurtosis(target_ad$Daily.Time.Spent.on.Site)
```

```
## [1] 2.561506
```

```
kurtosis(target_ad$Age)
```

```
## [1] 2.303378
```

```
kurtosis(target_ad$Area.Income)
```

```
## [1] 2.37065
```

```
kurtosis(target_ad$Daily.Internet.Usage)
```

```
## [1] 4.816968
```

```
# frequency of categorical variables
#
country_freq = count(target_ad,  'Country')
country_freq
```

```
##                                                Country freq
## 1                                          Afghanistan    5
## 2                                              Albania    4
## 3                                              Algeria    3
## 4                                       American Samoa    3
## 5                                              Andorra    2
## 6                                               Angola    1
## 7                                             Anguilla    3
## 8          Antarctica (the territory South of 60 deg S)    2
## 9                                    Antigua and Barbuda    4
## 10                                           Argentina    1
## 11                                             Armenia    1
## 12                                           Australia    7
## 13                                             Austria    1
## 14                                          Azerbaijan    1
## 15                                             Bahamas    4
## 16                                             Bahrain    2
## 17                                          Bangladesh    2
## 18                                            Barbados    2
## 19                                             Belarus    3
## 20                                             Belgium    2
## 21                                              Belize    3
## 22                                               Benin    1
## 23                                              Bhutan    1
## 24                                Bosnia and Herzegovina    3
## 25                            Bouvet Island (Bouvetoya)    2
## 26                                              Brazil    3
## 27  British Indian Ocean Territory (Chagos Archipelago)    1
## 28                                British Virgin Islands    1
## 29                                     Brunei Darussalam    2
## 30                                              Bulgaria    4
## 31                                          Burkina Faso    1
## 32                                               Burundi    2
## 33                                              Cambodia    2
## 34                                                Canada    3
## 35                                          Cayman Islands    3
## 36                               Central African Republic    1
## 37                                                  Chad    2
## 38                                                 Chile    3
## 39                                                 China    4
## 40                                       Christmas Island    4
## 41                                              Colombia    1
## 42                                               Comoros    1
## 43                                                 Congo    3
## 44                                          Cook Islands    1
## 45                                            Costa Rica    2
## 46                                         Cote d'Ivoire    3
## 47                                                  Cuba    4
## 48                                                Cyprus    4
## 49                                        Czech Republic    4
## 50                                               Denmark    2
## 51                                              Djibouti    1
## 52                                              Dominica    2
## 53                                    Dominican Republic    2
```

```
## 54                                      Ecuador    2
## 55                                        Egypt    3
## 56                                  El Salvador    4
## 57                            Equatorial Guinea    3
## 58                                      Eritrea    3
## 59                                      Estonia    1
## 60                                     Ethiopia    7
## 61                  Falkland Islands (Malvinas)    2
## 62                                Faroe Islands    2
## 63                                         Fiji    3
## 64                                      Finland    1
## 65                                       France    5
## 66                                French Guiana    3
## 67                              French Polynesia    1
## 68                  French Southern Territories    1
## 69                                       Gambia    1
## 70                                      Georgia    2
## 71                                      Germany    1
## 72                                        Ghana    2
## 73                                       Greece    3
## 74                                    Greenland    1
## 75                                      Grenada    2
## 76                                   Guadeloupe    1
## 77                                         Guam    2
## 78                                    Guatemala    3
## 79                                     Guernsey    2
## 80                                       Guinea    2
## 81                                Guinea-Bissau    1
## 82                                       Guyana    3
## 83                                        Haiti    1
## 84          Heard Island and McDonald Islands    2
## 85              Holy See (Vatican City State)    1
## 86                                     Honduras    2
## 87                                    Hong Kong    4
## 88                                      Hungary    5
## 89                                      Iceland    1
## 90                                    Indonesia    4
## 91                                         Iran    3
## 92                                      Ireland    1
## 93                                    Isle of Man    1
## 94                                         Israel    2
## 95                                          Italy    1
## 96                                        Jamaica    2
## 97                                          Japan    2
## 98                                         Jersey    4
## 99                                     Kazakhstan    2
## 100                                         Kenya    4
## 101                                      Kiribati    1
## 102                                         Korea    3
## 103                                        Kuwait    1
## 104                           Kyrgyz Republic    1
## 105         Lao People's Democratic Republic    2
## 106                                       Latvia    4
## 107                                      Lebanon    4
```

```
## 108                                 Liberia    6
## 109                   Libyan Arab Jamahiriya    2
## 110                           Liechtenstein    6
## 111                               Lithuania    3
## 112                              Luxembourg    3
## 113                                   Macao    3
## 114                                Macedonia    1
## 115                              Madagascar    2
## 116                                  Malawi    2
## 117                                Maldives    2
## 118                                    Mali    1
## 119                                   Malta    3
## 120                         Marshall Islands    1
## 121                                Martinique    3
## 122                                Mauritania    1
## 123                                 Mauritius    1
## 124                                   Mayotte    5
## 125                                    Mexico    4
## 126                                Micronesia    4
## 127                                   Moldova    2
## 128                                    Monaco    1
## 129                                  Mongolia    4
## 130                                Montenegro    2
## 131                                Montserrat    1
## 132                                   Morocco    1
## 133                                   Myanmar    1
## 134                                   Namibia    1
## 135                                     Nauru    1
## 136                               Netherlands    3
## 137                       Netherlands Antilles    2
## 138                             New Caledonia    2
## 139                               New Zealand    2
## 140                                     Niger    2
## 141                            Norfolk Island    2
## 142                 Northern Mariana Islands    2
## 143                                    Norway    1
## 144                                  Pakistan    1
## 145                                     Palau    2
## 146                      Palestinian Territory    2
## 147                          Papua New Guinea    3
## 148                                  Paraguay    1
## 149                                      Peru    5
## 150                               Philippines    3
## 151                            Pitcairn Islands    1
## 152                                    Poland    3
## 153                                  Portugal    1
## 154                               Puerto Rico    3
## 155                                     Qatar    2
## 156                                   Romania    1
## 157                        Russian Federation    1
## 158                                    Rwanda    2
## 159                          Saint Barthelemy    2
## 160                              Saint Helena    2
## 161                       Saint Kitts and Nevis    1
```

```
## 162                                      Saint Lucia    1
## 163                                      Saint Martin    2
## 164                          Saint Pierre and Miquelon    3
## 165                 Saint Vincent and the Grenadines    3
## 166                                            Samoa    4
## 167                                       San Marino    1
## 168                           Sao Tome and Principe    2
## 169                                     Saudi Arabia    3
## 170                                          Senegal    5
## 171                                           Serbia    3
## 172                                       Seychelles    1
## 173                                     Sierra Leone    2
## 174                                        Singapore    1
## 175                                         Slovenia    1
## 176                                          Somalia    2
## 177                                     South Africa    6
## 178     South Georgia and the South Sandwich Islands    1
## 179                                            Spain    3
## 180                                         Suriname    1
## 181                 Svalbard & Jan Mayen Islands    4
## 182                                           Sweden    1
## 183                                      Switzerland    3
## 184                          Syrian Arab Republic    1
## 185                                           Taiwan    4
## 186                                       Tajikistan    2
## 187                                         Tanzania    1
## 188                                         Thailand    2
## 189                                      Timor-Leste    1
## 190                                             Togo    1
## 191                                          Tokelau    3
## 192                                            Tonga    2
## 193                           Trinidad and Tobago    2
## 194                                          Tunisia    1
## 195                                           Turkey    7
## 196                                     Turkmenistan    2
## 197                      Turks and Caicos Islands    3
## 198                                           Tuvalu    3
## 199                                           Uganda    4
## 200                                          Ukraine    1
## 201                          United Arab Emirates    3
## 202                                United Kingdom    2
## 203          United States Minor Outlying Islands    2
## 204                       United States of America    3
## 205                United States Virgin Islands    2
## 206                                          Uruguay    1
## 207                                       Uzbekistan    1
## 208                                          Vanuatu    1
## 209                                        Venezuela    3
## 210                                          Vietnam    2
## 211                              Wallis and Futuna    1
## 212                                 Western Sahara    4
## 213                                           Yemen    2
## 214                                          Zambia    3
## 215                                        Zimbabwe    4
```

```
sorted_by_freq <- country_freq[order(-country_freq$freq),]
sorted_by_freq
```

```
##                                          Country freq
## 12                                         Australia    7
## 60                                          Ethiopia    7
## 195                                           Turkey    7
## 108                                          Liberia    6
## 110                                    Liechtenstein    6
## 177                                     South Africa    6
## 1                                        Afghanistan    5
## 65                                            France    5
## 88                                           Hungary    5
## 124                                          Mayotte    5
## 149                                             Peru    5
## 170                                          Senegal    5
## 2                                            Albania    4
## 9                                  Antigua and Barbuda    4
## 15                                           Bahamas    4
## 30                                          Bulgaria    4
## 39                                             China    4
## 40                                   Christmas Island    4
## 47                                              Cuba    4
## 48                                            Cyprus    4
## 49                                    Czech Republic    4
## 56                                       El Salvador    4
## 87                                         Hong Kong    4
## 90                                         Indonesia    4
## 98                                            Jersey    4
## 100                                            Kenya    4
## 106                                            Latvia    4
## 107                                           Lebanon    4
## 125                                            Mexico    4
## 126                                        Micronesia    4
## 129                                          Mongolia    4
## 166                                             Samoa    4
## 181                      Svalbard & Jan Mayen Islands    4
## 185                                            Taiwan    4
## 199                                            Uganda    4
## 212                                    Western Sahara    4
## 215                                          Zimbabwe    4
## 3                                            Algeria    3
## 4                                     American Samoa    3
## 7                                            Anguilla    3
## 19                                            Belarus    3
## 21                                             Belize    3
## 24                         Bosnia and Herzegovina    3
## 26                                             Brazil    3
## 34                                             Canada    3
## 35                                      Cayman Islands    3
## 38                                              Chile    3
## 43                                              Congo    3
## 46                                      Cote d'Ivoire    3
```

```
## 55                                        Egypt    3
## 57                                Equatorial Guinea    3
## 58                                          Eritrea    3
## 63                                             Fiji    3
## 66                                     French Guiana    3
## 73                                           Greece    3
## 78                                        Guatemala    3
## 82                                           Guyana    3
## 91                                             Iran    3
## 102                                           Korea    3
## 111                                       Lithuania    3
## 112                                      Luxembourg    3
## 113                                           Macao    3
## 119                                           Malta    3
## 121                                      Martinique    3
## 136                                     Netherlands    3
## 147                                 Papua New Guinea    3
## 150                                     Philippines    3
## 152                                          Poland    3
## 154                                     Puerto Rico    3
## 164                         Saint Pierre and Miquelon    3
## 165                 Saint Vincent and the Grenadines    3
## 169                                    Saudi Arabia    3
## 171                                          Serbia    3
## 179                                           Spain    3
## 183                                     Switzerland    3
## 191                                         Tokelau    3
## 197                          Turks and Caicos Islands    3
## 198                                          Tuvalu    3
## 201                              United Arab Emirates    3
## 204                          United States of America    3
## 209                                       Venezuela    3
## 214                                          Zambia    3
## 5                                           Andorra    2
## 8          Antarctica (the territory South of 60 deg S)    2
## 16                                          Bahrain    2
## 17                                       Bangladesh    2
## 18                                         Barbados    2
## 20                                          Belgium    2
## 25                          Bouvet Island (Bouvetoya)    2
## 29                                  Brunei Darussalam    2
## 32                                          Burundi    2
## 33                                         Cambodia    2
## 37                                             Chad    2
## 45                                       Costa Rica    2
## 50                                          Denmark    2
## 52                                         Dominica    2
## 53                                Dominican Republic    2
## 54                                          Ecuador    2
## 61                       Falkland Islands (Malvinas)    2
## 62                                     Faroe Islands    2
## 70                                          Georgia    2
## 72                                            Ghana    2
## 75                                          Grenada    2
```

```
## 77                                            Guam    2
## 79                                        Guernsey    2
## 80                                          Guinea    2
## 84                  Heard Island and McDonald Islands    2
## 86                                        Honduras    2
## 94                                          Israel    2
## 96                                         Jamaica    2
## 97                                           Japan    2
## 99                                      Kazakhstan    2
## 105                 Lao People's Democratic Republic    2
## 109                       Libyan Arab Jamahiriya    2
## 115                                      Madagascar    2
## 116                                          Malawi    2
## 117                                        Maldives    2
## 127                                         Moldova    2
## 130                                      Montenegro    2
## 137                        Netherlands Antilles    2
## 138                                  New Caledonia    2
## 139                                     New Zealand    2
## 140                                           Niger    2
## 141                                  Norfolk Island    2
## 142                       Northern Mariana Islands    2
## 145                                           Palau    2
## 146                          Palestinian Territory    2
## 155                                           Qatar    2
## 158                                          Rwanda    2
## 159                               Saint Barthelemy    2
## 160                                   Saint Helena    2
## 163                                   Saint Martin    2
## 168                        Sao Tome and Principe    2
## 173                                   Sierra Leone    2
## 176                                        Somalia    2
## 186                                     Tajikistan    2
## 188                                       Thailand    2
## 192                                          Tonga    2
## 193                           Trinidad and Tobago    2
## 196                                   Turkmenistan    2
## 202                                 United Kingdom    2
## 203          United States Minor Outlying Islands    2
## 205                  United States Virgin Islands    2
## 210                                       Vietnam    2
## 213                                         Yemen    2
## 6                                           Angola    1
## 10                                        Argentina    1
## 11                                          Armenia    1
## 13                                          Austria    1
## 14                                       Azerbaijan    1
## 22                                            Benin    1
## 23                                           Bhutan    1
## 27  British Indian Ocean Territory (Chagos Archipelago)    1
## 28                           British Virgin Islands    1
## 31                                     Burkina Faso    1
## 36                       Central African Republic    1
## 41                                         Colombia    1
```

```
## 42                                        Comoros    1
## 44                                   Cook Islands    1
## 51                                       Djibouti    1
## 59                                        Estonia    1
## 64                                        Finland    1
## 67                                French Polynesia    1
## 68                  French Southern Territories    1
## 69                                         Gambia    1
## 71                                        Germany    1
## 74                                      Greenland    1
## 76                                     Guadeloupe    1
## 81                                   Guinea-Bissau    1
## 83                                          Haiti    1
## 85                  Holy See (Vatican City State)    1
## 89                                        Iceland    1
## 92                                        Ireland    1
## 93                                     Isle of Man    1
## 95                                           Italy    1
## 101                                       Kiribati    1
## 103                                        Kuwait    1
## 104                                 Kyrgyz Republic    1
## 114                                       Macedonia    1
## 118                                            Mali    1
## 120                                 Marshall Islands    1
## 122                                       Mauritania    1
## 123                                        Mauritius    1
## 128                                           Monaco    1
## 131                                       Montserrat    1
## 132                                          Morocco    1
## 133                                          Myanmar    1
## 134                                          Namibia    1
## 135                                            Nauru    1
## 143                                           Norway    1
## 144                                         Pakistan    1
## 148                                         Paraguay    1
## 151                                  Pitcairn Islands    1
## 153                                         Portugal    1
## 156                                          Romania    1
## 157                               Russian Federation    1
## 161                             Saint Kitts and Nevis    1
## 162                                      Saint Lucia    1
## 167                                        San Marino    1
## 172                                        Seychelles    1
## 174                                         Singapore    1
## 175                                          Slovenia    1
## 178       South Georgia and the South Sandwich Islands    1
## 180                                         Suriname    1
## 182                                           Sweden    1
## 184                             Syrian Arab Republic    1
## 187                                         Tanzania    1
## 189                                       Timor-Leste    1
## 190                                             Togo    1
## 194                                          Tunisia    1
## 200                                          Ukraine    1
```

```
## 206                                          Uruguay    1
## 207                                       Uzbekistan    1
## 208                                          Vanuatu    1
## 211                                  Wallis and Futuna    1
```

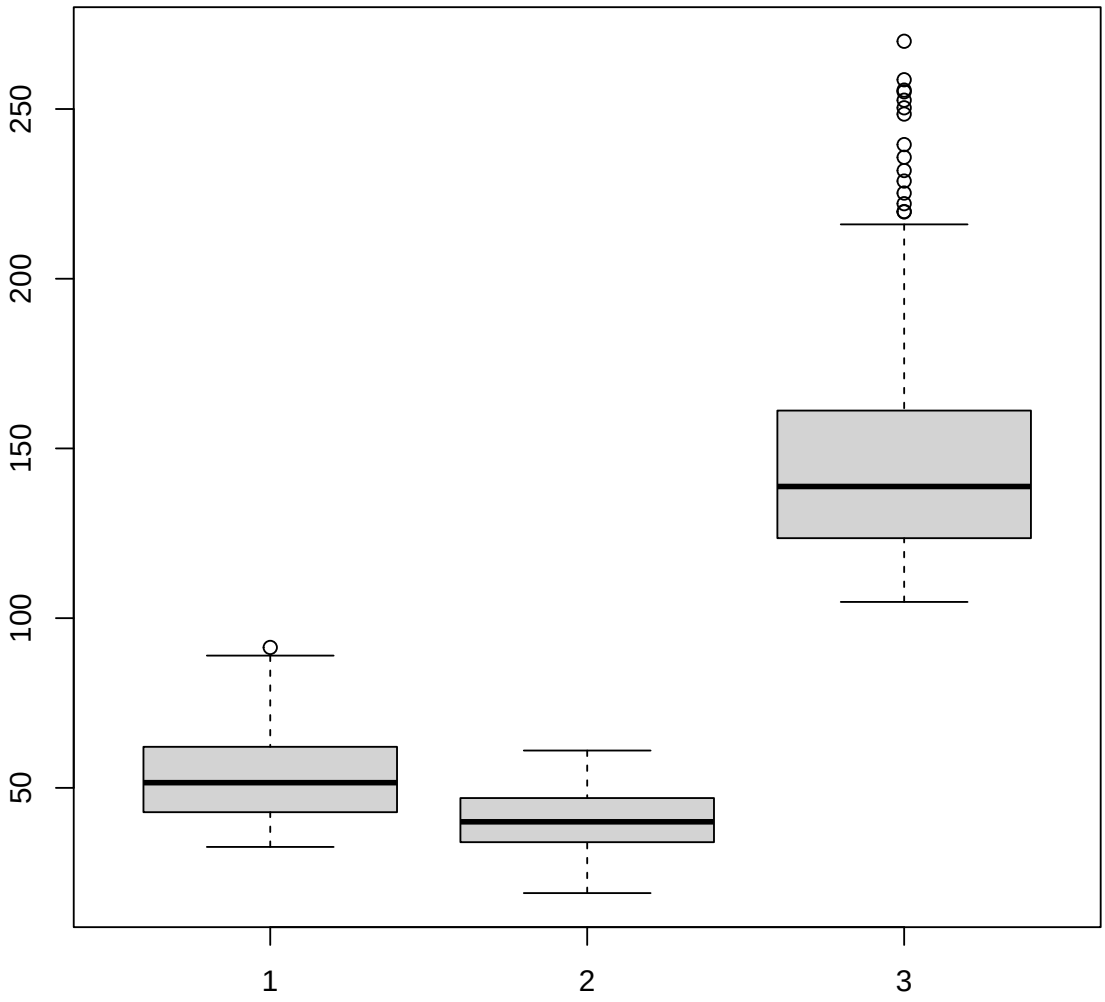
```
cont_freq = count(target_ad,  'Continent')
cont_freq
```

```
##    Continent freq
## 1     Africa  109
## 2   Americas  111
## 3 Antarctica   17
## 4       Asia  103
## 5     Europe  108
## 6    Oceania   52
```

```
sort_by_freq <- cont_freq[order(-cont_freq$freq),]
sort_by_freq
```

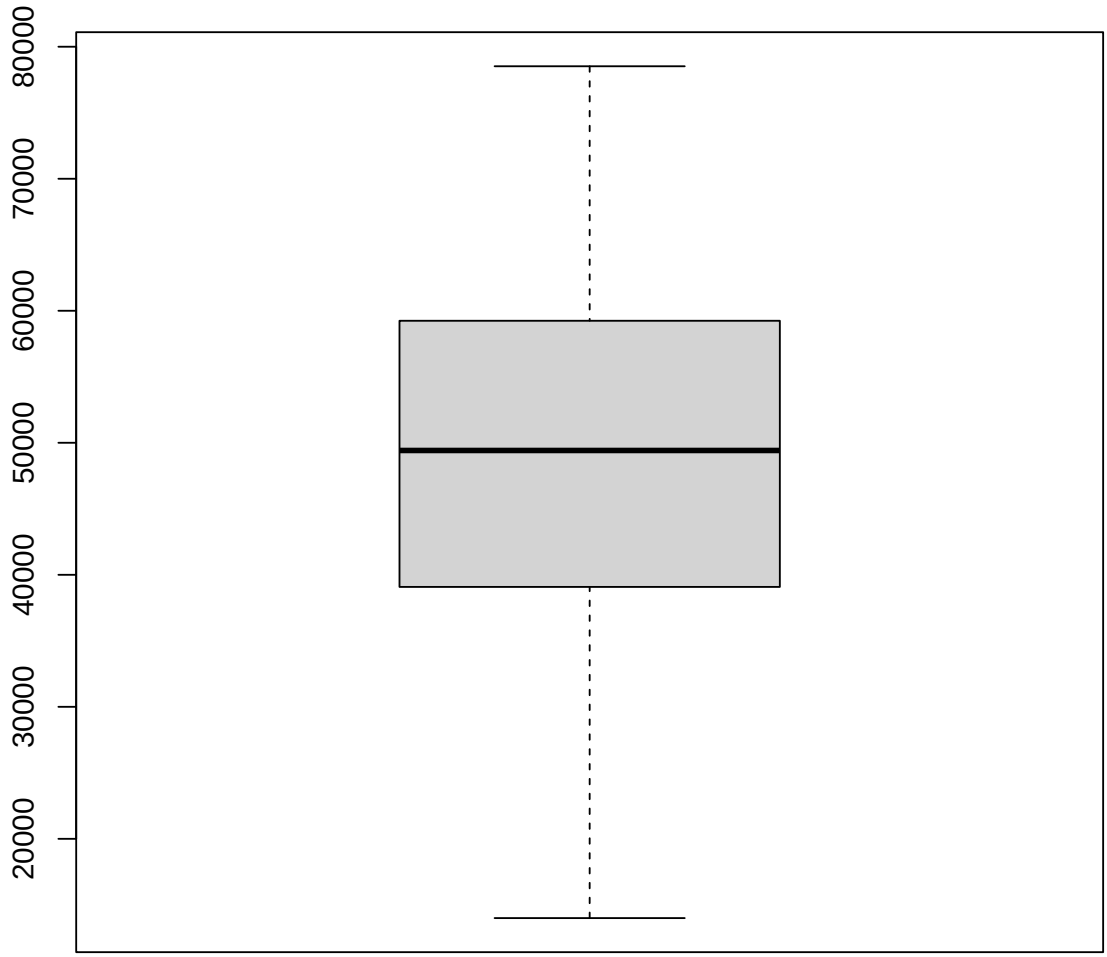
```
##    Continent freq
## 2   Americas  111
## 1     Africa  109
## 5     Europe  108
## 4       Asia  103
## 6    Oceania   52
## 3 Antarctica   17
```

```
#summary of above using boxplots
# area income is visualized differently due to the difference in scale
#
boxplot(target_ad$Daily.Time.Spent.on.Site, target_ad$Age, target_ad$Daily.Internet.Usage)
```

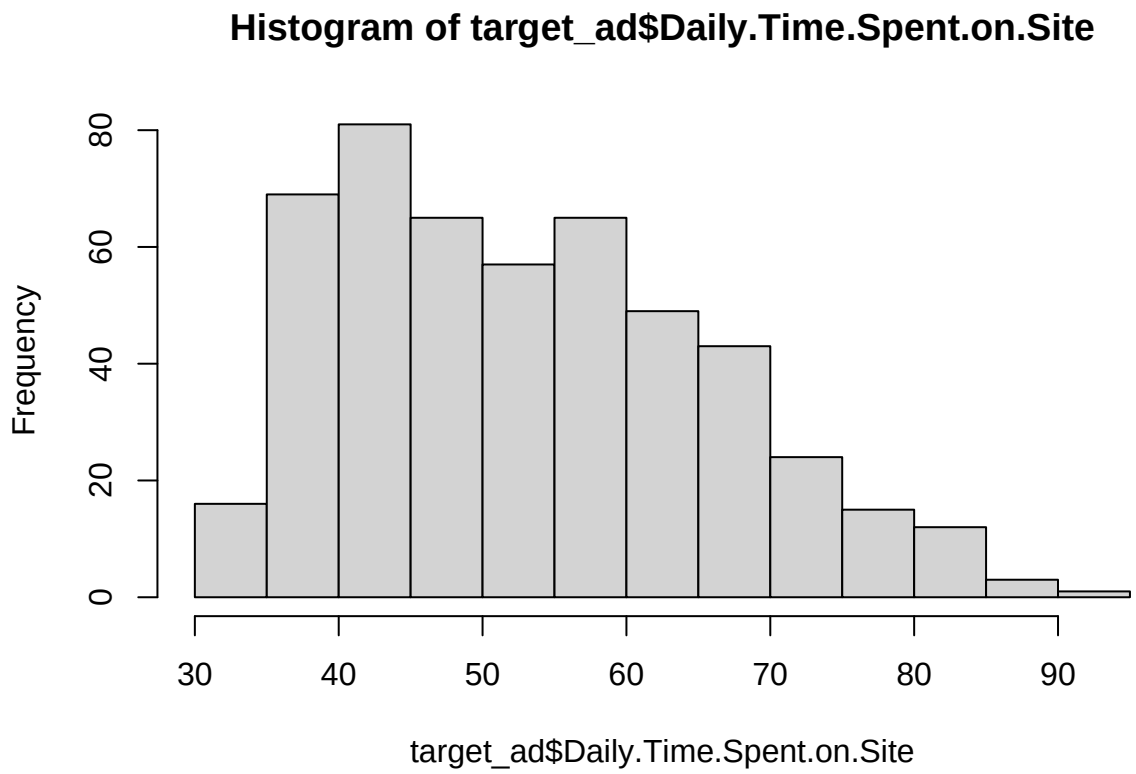


Visualization.

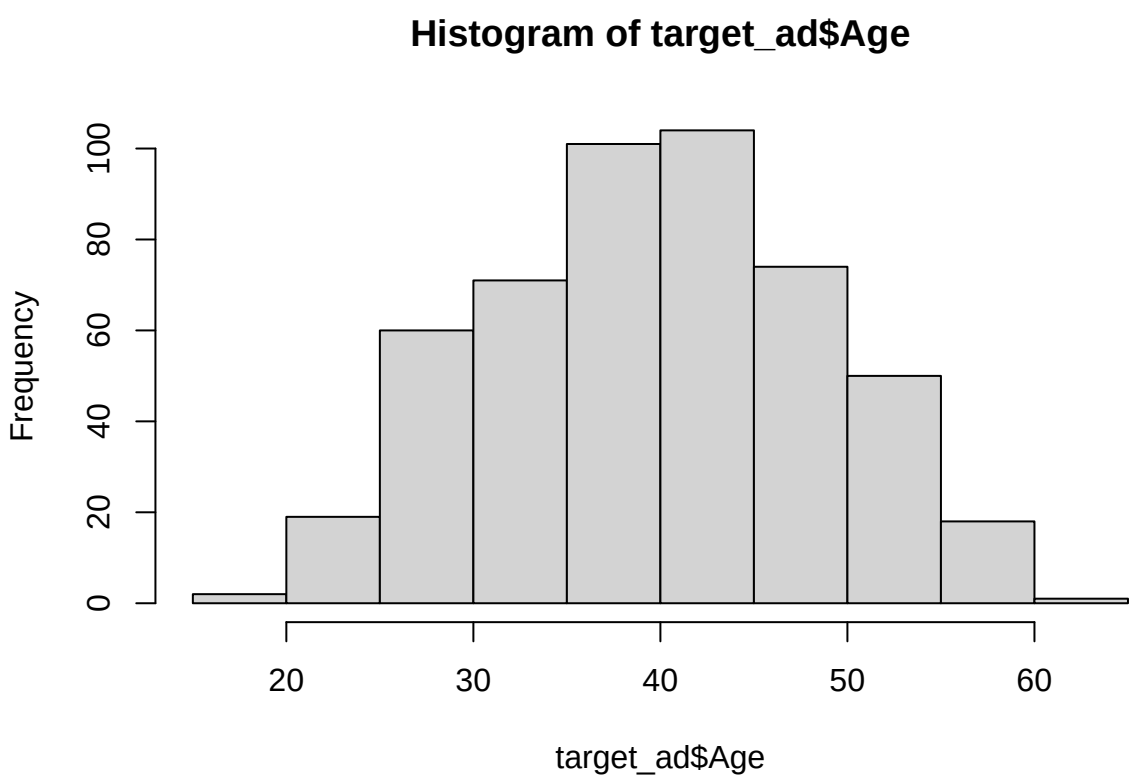
```
boxplot(target_ad$Area.Income)
```



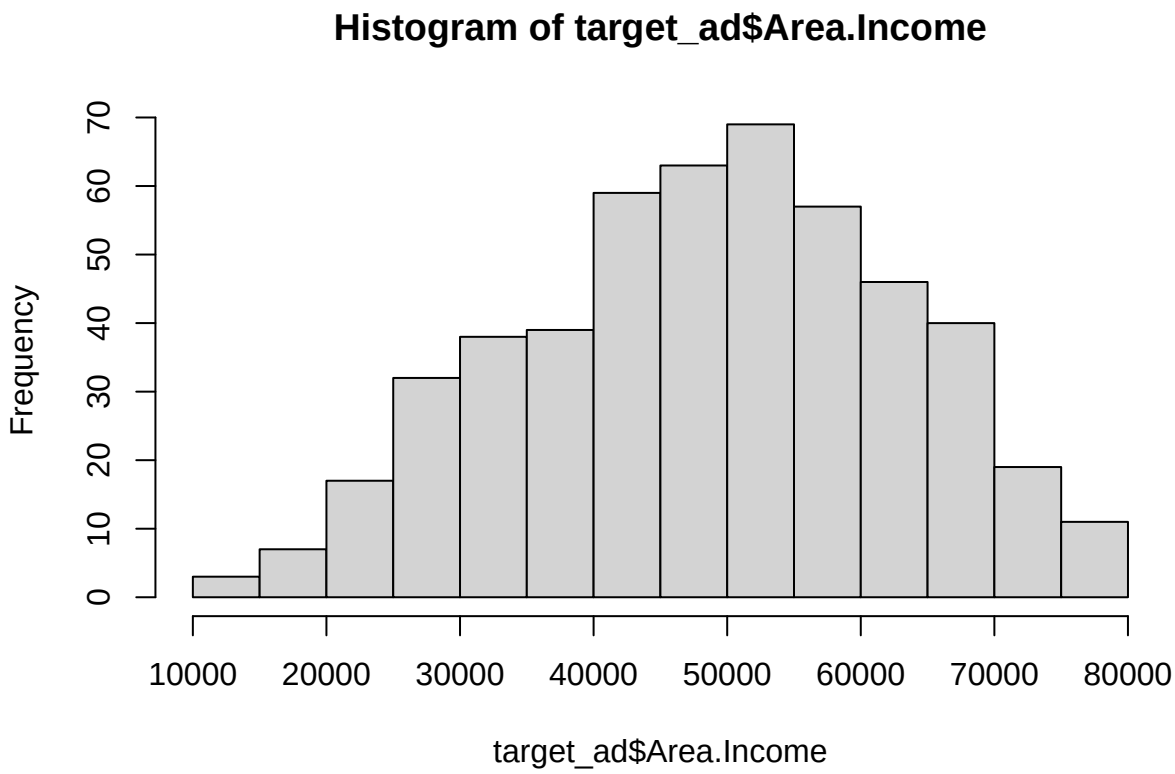

```
# visualisation of numeric variables using a histogam
#
hist(target_ad$Daily.Time.Spent.on.Site)
```



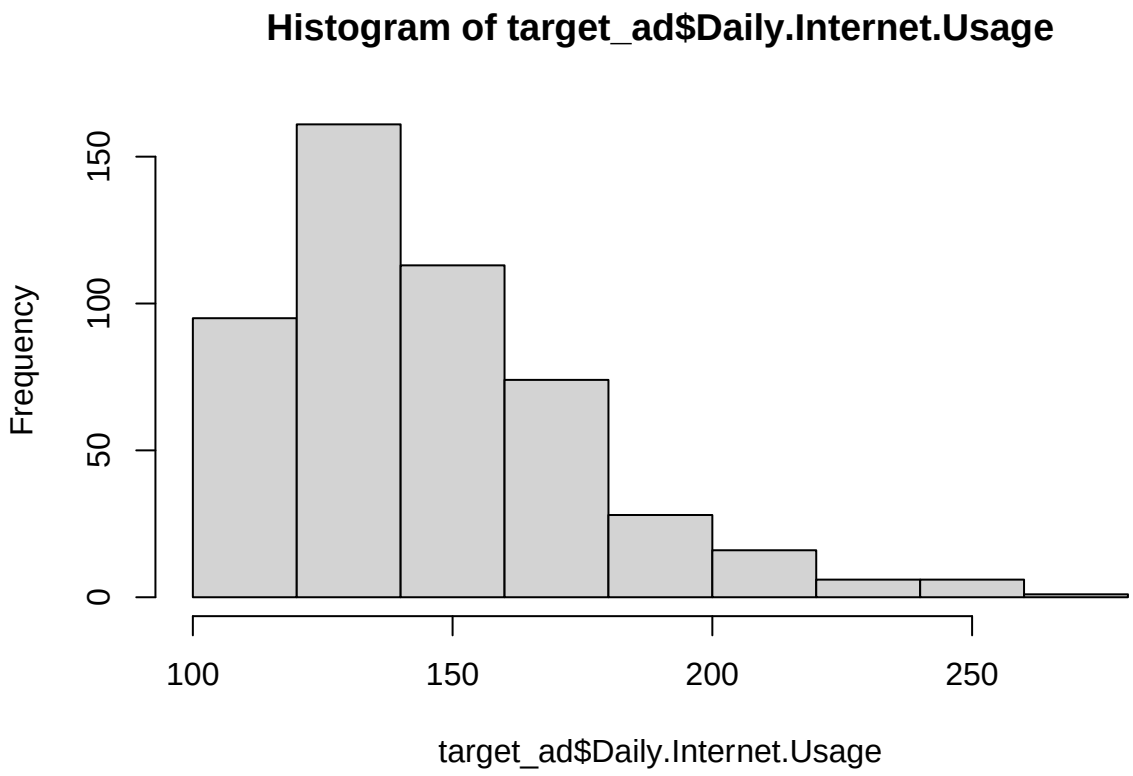

```
hist(target_ad$Age)
```




```
hist(target_ad$Area.Income)
```



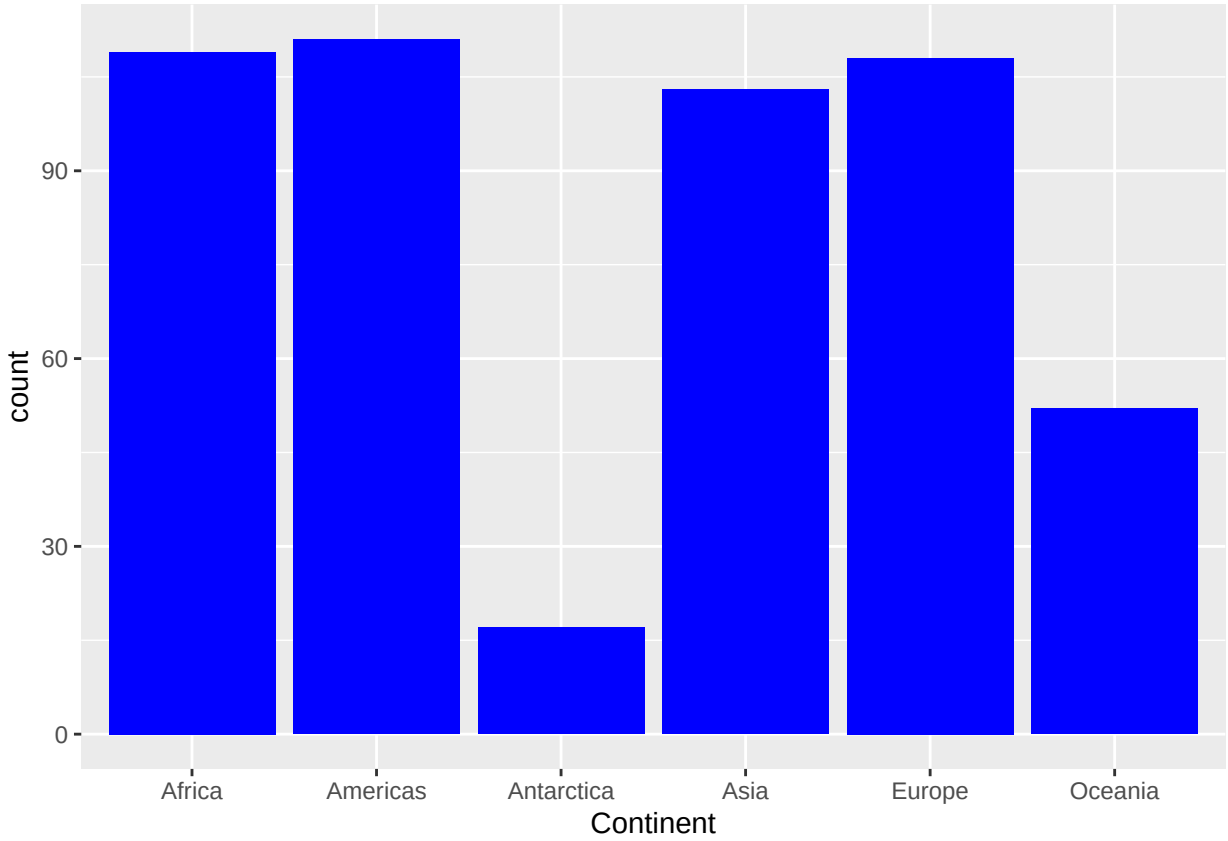

```
hist(target_ad$Daily.Internet.Usage)
```




```
hist
```

```
## function (x, ...)
## UseMethod("hist")
## <bytecode: 0x00000225d4be08e8>
## <environment: namespace:graphics>
```

```
# Barplot of continents
#
ggplot(target_ad, aes(x=Continent)) +
  geom_bar(fill='blue')
```



Countries will be analyzed numerically by frequency since the elements are too many to vizualise.

Bivariate Analysis and Multivariate Analysis.

```
# Covariance of numeric variables
#
drop <- c("Country", "City", "Continent", "Clicked.on.Ad")
target4 = target_ad[,!(names(target_ad) %in% drop)]
target4
```

Covariance and Correlation.

```
## # A tibble: 500 x 5
##    Daily.Time.Spent.on.Site   Age Area.Income Daily.Internet.Usage  Male
##                       <dbl> <int>       <dbl>                <dbl> <int>
##  1                     66      48      24593.                132.      1
##  2                     47.6    49      45633.                122.      0
##  3                     69.6    48      51637.                113.      1
##  4                     43.0    33      30976                 144.      0
##  5                     63.4    23      52182.                141.      1
##  6                     55.4    37      23937.                129.      0
##  7                     54.7    36      31088.                118.      1
##  8                     74.6    40      23822.                136.      1
##  9                     41.5    52      32636.                165.      0
```

```
## 10                     41.4    41      68962.                 167.     0
## # ... with 490 more rows
```

```
cov(target4)
```

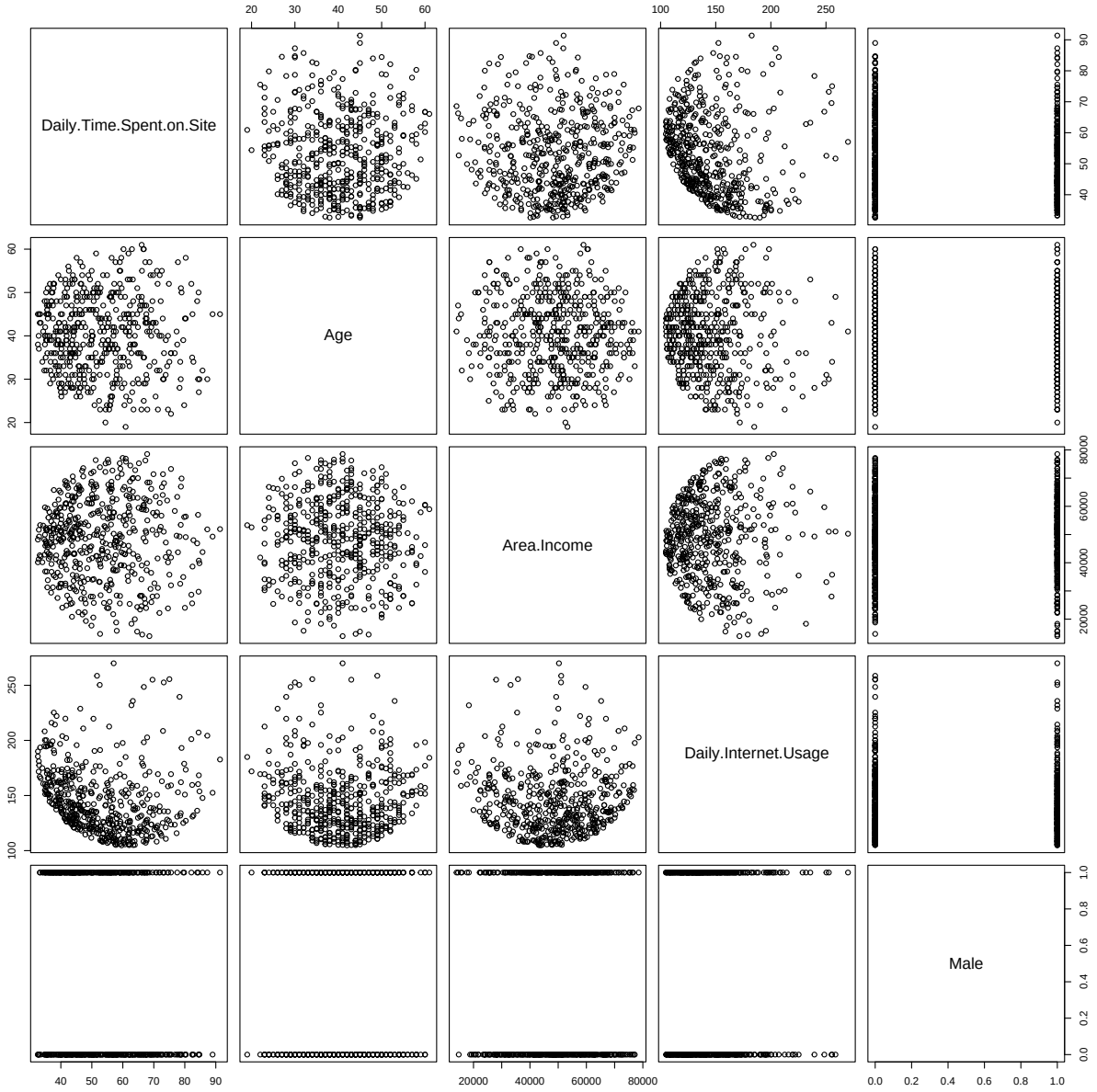
```
##                           Daily.Time.Spent.on.Site           Age   Area.Income
## Daily.Time.Spent.on.Site              164.4060128    -1.4535977  1.444803e+03
## Age                                    -1.4535977    78.4393226 -2.963240e+03
## Area.Income                          1444.8025096 -2963.2398489  1.992683e+08
## Daily.Internet.Usage                  -65.8016949   -15.1403984 -4.526677e+03
## Male                                   -0.6791487     0.1399719  2.206117e+02
##                           Daily.Internet.Usage         Male
## Daily.Time.Spent.on.Site        -6.580169e+01  -0.67914866
## Age                             -1.514040e+01   0.13997194
## Area.Income                     -4.526677e+03 220.61169551
## Daily.Internet.Usage             9.015502e+02  -0.02842136
## Male                            -2.842136e-02   0.24905411
```

```
#correlation matrix
#
correlation = cor(target4)
correlation
```

```
##                           Daily.Time.Spent.on.Site         Age  Area.Income
## Daily.Time.Spent.on.Site              1.000000000 -0.01280025  0.007982346
## Age                                  -0.012800250  1.00000000 -0.023701770
## Area.Income                           0.007982346 -0.02370177  1.000000000
## Daily.Internet.Usage                 -0.170916216 -0.05693449 -0.010679858
## Male                                 -0.106135127  0.03166848  0.031315733
##                           Daily.Internet.Usage         Male
## Daily.Time.Spent.on.Site         -0.170916216 -0.106135127
## Age                              -0.056934489  0.031668480
## Area.Income                      -0.010679858  0.031315733
## Daily.Internet.Usage              1.000000000 -0.001896719
## Male                             -0.001896719  1.000000000
```

```
# With a scatter plot matrix
#

plot(target4)
```



Visualization.

```
# visualization of the correlation matrix
#
corrplot(correlation, method = 'color', addCoef.col = 'brown', col = COL2('PuOr'),
         number.cex = 0.9, tl.cex = 0.9, tl.col = 'black')
```

5) Implementing the solution.

With knn:

```
# Dropping counrties
#
drop <- c("Country")
target3 = target2[,!(names(target2) %in% drop)]
target3
```

The data set that has all rows of 'Clicked on Ad' will be used for knn classification.

```
## # A tibble: 1,000 x 7
```

```
##    Daily.Time.Spent.on.S~   Age Area.Income Daily.Internet.~  Male Clicked.on.Ad
##                     <dbl> <int>       <dbl>            <dbl> <int>         <int>
##  1                   69.0    35      61834.             256.     0             0
##  2                   80.2    31      68442.             194.     1             0
##  3                   69.5    26      59786.             236.     0             0
##  4                   74.2    29      54806.             246.     1             0
##  5                   68.4    35      73890.             226.     0             0
##  6                   60.0    23      59762.             227.     1             0
##  7                   88.9    33      53853.             208.     0             0
##  8                   66      48      24593.             132.     1             1
##  9                   74.5    30      68862              222.     1             0
## 10                   69.9    20      55642.             184.     1             0
## # ... with 990 more rows, and 1 more variable: Continent <chr>
```

```
# Changing columns to numeric
#
target3$Continent <- as.numeric(factor(target3$Continent))
target3
```

```
## # A tibble: 1,000 x 7
##    Daily.Time.Spent.on.S~   Age Area.Income Daily.Internet.~  Male Clicked.on.Ad
##                     <dbl> <int>       <dbl>            <dbl> <int>         <int>
##  1                   69.0    35      61834.             256.     0             0
##  2                   80.2    31      68442.             194.     1             0
##  3                   69.5    26      59786.             236.     0             0
##  4                   74.2    29      54806.             246.     1             0
##  5                   68.4    35      73890.             226.     0             0
##  6                   60.0    23      59762.             227.     1             0
##  7                   88.9    33      53853.             208.     0             0
##  8                   66      48      24593.             132.     1             1
##  9                   74.5    30      68862              222.     1             0
## 10                   69.9    20      55642.             184.     1             0
## # ... with 990 more rows, and 1 more variable: Continent <dbl>
```

```
# Rearranging columns
#
target4 <- target3 %>% relocate(Continent)
target4
```

```
## # A tibble: 1,000 x 7
##    Continent Daily.Time.Spent.on.Site   Age Area.Income Daily.Internet.Us~  Male
##        <dbl>                    <dbl> <int>       <dbl>              <dbl> <int>
##  1         1                     69.0    35      61834.              256.     0
##  2         6                     80.2    31      68442.              194.     1
##  3         5                     69.5    26      59786.              236.     0
##  4         5                     74.2    29      54806.              246.     1
##  5         5                     68.4    35      73890.              226.     0
##  6         5                     60.0    23      59762.              227.     1
##  7         4                     88.9    33      53853.              208.     0
##  8         6                     66      48      24593.              132.     1
##  9         2                     74.5    30      68862               222.     1
## 10         1                     69.9    20      55642.              184.     1
## # ... with 990 more rows, and 1 more variable: Clicked.on.Ad <int>
```

```
# Randomizing the rows, creates a uniform distribution of 1000
#
set.seed(1234)

random <- runif(1000)
target_random <- target4[order(random),]

head(target_random)
```

```
## # A tibble: 6 x 7
##   Continent Daily.Time.Spent.on.Site   Age Area.Income Daily.Internet.Usa~  Male
##       <dbl>                    <dbl> <int>       <dbl>                <dbl> <int>
## 1         4                     80.5    29      56909.                231.     0
## 2         4                     78.4    24      55015.                207.     0
## 3         2                     58.0    50      62466.                125.     0
## 4         4                     73.0    30      71385.                209.     1
## 5         1                     77.7    29      67081.                168.     0
## 6         4                     38.9    33      56370.                151.     1
## # ... with 1 more variable: Clicked.on.Ad <int>
```

```
# normalize data
#library(caTools)
#
normal <- function(x) (
  return( ((x - min(x)) /(max(x)-min(x))) )
)
normal(1:7)
```

```
## [1] 0.0000000 0.1666667 0.3333333 0.5000000 0.6666667 0.8333333 1.0000000
```

```
target_adv <- as.data.frame(lapply(target_random[,-7], normal))
target_adv
```

```
##      Continent Daily.Time.Spent.on.Site        Age Area.Income
## 1          0.6              0.813530512 0.23809524 0.655274301
## 2          0.6              0.778004420 0.11904762 0.626349745
## 3          0.2              0.431582526 0.73809524 0.740126099
## 4          0.6              0.686214516 0.26190476 0.876310272
## 5          0.0              0.765935747 0.23809524 0.810594259
## 6          0.6              0.107258202 0.33333333 0.647035272
## 7          0.0              0.303926568 0.73809524 0.100727764
## 8          0.2              0.126806051 0.45238095 0.653333191
## 9          0.0              0.357470678 0.83333333 0.554865831
## 10         1.0              0.265510794 0.50000000 0.914459682
## 11         0.6              0.957164712 0.33333333 0.608602605
## 12         1.0              0.605983342 0.33333333 0.954119438
## 13         0.6              0.441951385 0.00000000 0.465634167
## 14         0.2              0.562978072 0.40476190 0.218038642
## 15         0.4              0.497535271 0.38095238 0.803702493
## 16         0.8              0.908720041 0.30952381 0.726916869
## 17         1.0              0.386707462 0.47619048 0.939299234
## 18         0.0              0.365119837 0.40476190 0.595777261
```

```
## 19        0.6             0.864864865 0.28571429 0.692405972
## 20        1.0             0.677205507 0.35714286 0.863523103
## 21        0.0             0.741798402 0.50000000 0.939530878
## 22        0.6             0.242733299 0.83333333 0.449673606
## 23        0.6             0.688424273 0.21428571 0.656885886
## 24        0.2             0.521842597 0.45238095 0.749368055
## 25        0.8             0.736698963 0.19047619 0.596228792
## 26        0.8             0.124766276 0.52380952 0.777706705
## 27        0.8             0.828148904 0.14285714 0.586664794
## 28        0.8             0.691313955 0.21428571 0.813960509
## 29        0.0             0.726160122 0.21428571 0.702446086
## 30        1.0             0.469998300 0.38095238 0.624225243
## 31        1.0             0.465068842 0.33333333 0.964250255
## 32        0.8             0.734829169 0.19047619 0.817238652
## 33        0.2             0.734489206 0.50000000 0.872836064
## 34        0.8             0.715791263 0.64285714 0.365130718
## 35        0.0             0.766445691 0.07142857 0.532248967
## 36        0.6             0.832568417 0.14285714 0.392476671
## 37        0.0             0.151113378 0.80952381 0.274112322
## 38        0.8             0.780384158 0.14285714 0.688819530
## 39        0.4             0.704062553 0.30952381 0.889874985
## 40        0.0             0.400475948 0.14285714 0.800652025
## 41        0.0             0.187829339 0.47619048 0.758189478
## 42        0.0             0.332653408 0.59523810 0.665740293
## 43        1.0             0.745198028 0.21428571 0.701967985
## 44        0.0             0.800101989 0.21428571 0.680726481
## 45        0.6             0.459119497 0.04761905 0.712205386
## 46        0.6             0.929627741 0.40476190 0.727339387
## 47        0.2             0.904980452 0.35714286 0.773545198
## 48        1.0             0.481217066 0.00000000 0.600307383
## 49        0.4             0.738058814 0.07142857 0.491438471
## 50        0.0             0.551929288 0.11904762 0.664989929
## 51        0.2             0.373108958 0.59523810 0.420702935
## 52        0.6             0.653238144 0.85714286 0.216682217
## 53        0.6             0.128675846 0.16666667 0.509945288
## 54        0.4             0.802651708 0.16666667 0.572868131
## 55        1.0             0.939146694 0.28571429 0.583042773
## 56        0.0             0.435322115 0.42857143 0.512747162
## 57        0.0             0.733299337 0.14285714 0.717828528
## 58        0.8             0.371069182 0.42857143 0.934269175
## 59        0.6             0.242903281 0.69047619 0.894166439
## 60        0.8             0.730069692 0.40476190 0.274892156
## 61        0.2             0.199388067 0.52380952 0.448775888
## 62        0.2             0.657487676 0.42857143 0.814052739
## 63        0.2             0.075641679 0.47619048 0.545842998
## 64        0.8             0.409654938 0.69047619 0.744993380
## 65        0.2             0.668026517 0.23809524 0.888822278
## 66        0.8             0.405575387 0.16666667 0.796952738
## 67        0.6             0.045045045 0.73809524 0.504739320
## 68        0.6             0.852116267 0.33333333 0.619119140
## 69        0.8             0.040115587 0.54761905 0.349940524
## 70        0.0             0.581166072 0.97619048 0.711264302
## 71        0.6             0.908720041 0.28571429 0.607293517
## 72        0.2             0.689784124 0.09523810 0.725774680
```

```
## 73         0.6             0.582695903 0.38095238 0.745086680
## 74         0.0             0.594594595 0.52380952 0.779499391
## 75         0.2             0.370049295 0.45238095 0.888705158
## 76         0.2             0.741288458 0.28571429 0.791568418
## 77         0.8             0.423423423 0.45238095 0.514378599
## 78         0.2             0.024477307 0.35714286 0.399862876
## 79         0.0             0.074791773 0.69047619 0.347938181
## 80         0.6             0.154682985 0.47619048 0.441326313
## 81         0.0             0.147543770 0.73809524 0.564430288
## 82         0.0             0.613292538 0.35714286 0.965423137
## 83         1.0             0.853136155 0.35714286 0.519195795
## 84         1.0             0.695053544 0.45238095 0.811380964
## 85         0.2             0.099609043 0.54761905 0.674724187
## 86         0.6             0.274179840 0.19047619 0.308371572
## 87         0.6             0.814720381 0.23809524 0.799358053
## 88         0.6             0.651028387 0.21428571 0.881546933
## 89         0.0             0.830358661 0.28571429 0.794505431
## 90         0.8             0.859425463 0.52380952 0.857993871
## 91         0.8             0.594764576 0.61904762 0.682277445
## 92         0.8             0.537140914 0.19047619 0.797157049
## 93         0.0             0.646948836 0.57142857 0.755164816
## 94         0.6             0.520822710 0.80952381 0.782317299
## 95         0.2             0.622131566 0.54761905 0.183658608
## 96         0.6             0.177970423 0.40476190 0.711371650
## 97         0.6             0.591364950 0.59523810 0.568968197
## 98         0.0             0.778684345 0.33333333 0.631749030
## 99         0.0             0.853306136 0.26190476 0.683788860
## 100        1.0             0.432262451 0.28571429 0.219747955
## 101        0.4             0.188169301 0.28571429 0.178502725
## 102        0.2             0.506884243 0.45238095 0.923045491
## 103        0.2             0.714431413 0.16666667 0.579934278
## 104        0.0             0.677545470 0.50000000 0.651823608
## 105        0.0             0.408635050 0.23809524 0.641158650
## 106        0.2             0.196328404 0.21428571 0.532479389
## 107        0.0             0.831378548 0.52380952 0.601875755
## 108        0.6             0.998980112 0.61904762 0.579095655
## 109        0.0             0.617882033 0.38095238 0.730472466
## 110        0.0             0.157402686 0.47619048 0.596217492
## 111        0.8             0.815740269 0.42857143 0.820727672
## 112        0.2             0.670916199 0.28571429 0.850747538
## 113        0.6             0.203467619 0.28571429 0.371872228
## 114        0.8             0.785993541 0.16666667 0.650456646
## 115        0.0             0.285908550 0.80952381 0.480524765
## 116        0.2             0.696413395 0.26190476 0.860928288
## 117        0.0             0.689274180 0.14285714 0.773187272
## 118        0.6             0.874383818 0.45238095 0.560820330
## 119        0.4             0.229984702 0.28571429 0.706270738
## 120        0.0             0.802821690 0.23809524 0.637792247
## 121        0.2             0.229984702 0.64285714 0.364068391
## 122        1.0             0.102498725 0.69047619 0.668525676
## 123        0.0             0.881353051 0.73809524 0.240215275
## 124        0.8             0.102838688 0.28571429 0.577449865
## 125        0.2             0.316845147 0.40476190 0.952411499
## 126        0.2             0.810810811 0.92857143 0.535882135
```

```
## 127        0.6             0.769845317 0.16666667 0.766426980
## 128        0.2             0.477647459 0.71428571 0.442781077
## 129        1.0             0.166411695 0.54761905 0.802350191
## 130        0.0             0.774944756 0.26190476 0.740277118
## 131        0.0             0.903960564 0.35714286 0.550360141
## 132        0.8             0.297127316 0.50000000 0.765806411
## 133        0.8             0.757096719 0.11904762 0.706805338
## 134        0.6             0.970763216 0.69047619 0.572695886
## 135        1.0             0.961244263 0.54761905 0.700737078
## 136        0.8             0.576066633 0.02380952 0.654899272
## 137        1.0             0.636240014 0.16666667 0.767583675
## 138        0.8             0.231174571 0.42857143 0.569855684
## 139        1.0             0.191058984 0.40476190 0.864220174
## 140        0.0             0.121706612 0.21428571 0.326074276
## 141        0.2             0.408635050 0.45238095 0.727702964
## 142        0.2             0.821689614 0.40476190 0.714730723
## 143        0.8             0.049124596 0.66666667 0.349493421
## 144        1.0             0.878633350 0.52380952 0.712216991
## 145        0.2             0.848036716 0.61904762 0.376386316
## 146        0.6             0.505014448 0.66666667 0.744042371
## 147        1.0             0.570797212 0.38095238 0.847173006
## 148        0.6             0.673635900 0.14285714 0.497209731
## 149        1.0             0.596464389 0.59523810 0.356534526
## 150        0.2             0.810640830 0.28571429 0.541485731
## 151        0.0             0.151113378 0.78571429 0.284618779
## 152        1.0             0.426653068 0.35714286 0.438248817
## 153        1.0             0.206187319 0.38095238 0.630959576
## 154        0.8             0.634030257 0.57142857 0.876431821
## 155        0.2             0.140744518 0.33333333 0.527696550
## 156        0.0             0.584565698 0.66666667 0.202570688
## 157        0.0             0.666836648 0.50000000 0.125354300
## 158        0.0             0.745198028 0.16666667 0.684452948
## 159        0.8             0.200577936 0.80952381 0.444007250
## 160        0.0             0.331973483 0.73809524 0.411225059
## 161        0.6             0.765425803 0.23809524 0.643120527
## 162        0.2             0.942376339 0.61904762 0.742015597
## 163        0.2             0.652048275 0.28571429 0.628987926
## 164        0.0             0.832228455 0.16666667 0.570585280
## 165        0.6             0.581845997 0.64285714 0.975368883
## 166        0.2             0.425633180 0.90476190 0.482291035
## 167        0.8             0.386197518 0.57142857 0.819777273
## 168        0.6             0.752507224 0.19047619 0.622680234
## 169        0.6             0.751997280 0.30952381 0.792307786
## 170        0.4             0.375658678 0.40476190 0.260978526
## 171        0.8             0.281998980 0.45238095 0.717807761
## 172        0.8             0.501784804 0.42857143 0.560025226
## 173        0.6             0.519802822 0.61904762 0.385030456
## 174        0.6             0.827638960 0.21428571 0.293834166
## 175        0.0             0.714091450 0.45238095 0.871281130
## 176        0.8             0.832568417 0.52380952 0.633443226
## 177        1.0             0.131565528 0.23809524 0.283309385
## 178        0.0             0.657317695 0.04761905 0.552025629
## 179        0.0             0.887132415 0.33333333 0.729525732
## 180        0.6             0.734999150 0.04761905 0.527432839
```

```
## 181        0.8             0.222675506 0.33333333 0.815226689
## 182        0.6             0.201597824 0.54761905 0.251815668
## 183        0.8             0.794832568 0.35714286 0.660635717
## 184        0.2             0.210946796 0.16666667 0.242475373
## 185        0.2             0.803841577 0.26190476 0.555206961
## 186        0.4             0.649158593 0.28571429 0.924431387
## 187        0.8             0.701852796 0.47619048 0.506411527
## 188        0.0             0.321264661 0.35714286 0.810124251
## 189        0.2             0.683324834 0.38095238 0.756702648
## 190        0.8             0.466938637 0.54761905 0.793529073
## 191        0.6             0.157742648 0.50000000 0.461474492
## 192        0.8             0.212646609 0.92857143 0.394012824
## 193        0.2             0.712051674 0.21428571 0.687139840
## 194        0.8             0.504164542 0.80952381 0.653159267
## 195        0.2             0.393846677 0.71428571 0.640504334
## 196        0.8             0.890872004 0.23809524 0.699378973
## 197        0.8             0.604793473 0.04761905 0.524973774
## 198        1.0             0.457419684 0.92857143 0.383826424
## 199        0.8             0.187489376 0.52380952 0.575152203
## 200        0.6             0.939146694 0.35714286 0.577504226
## 201        0.0             0.542410335 0.54761905 1.000000000
## 202        0.2             0.554479007 0.26190476 0.798110044
## 203        0.2             0.704742478 0.73809524 0.716803307
## 204        0.6             0.218935917 0.71428571 0.600721961
## 205        0.8             0.132925378 0.61904762 0.399876772
## 206        0.0             0.290158083 0.19047619 0.214123592
## 207        1.0             0.530341662 0.45238095 0.336561340
## 208        0.2             0.414584396 0.50000000 0.362152171
## 209        0.8             0.738058814 0.50000000 0.903637596
## 210        0.4             0.904980452 0.30952381 0.736138058
## 211        0.4             0.044365120 0.47619048 0.585503059
## 212        1.0             0.149413565 0.52380952 0.839322749
## 213        0.2             0.618731939 0.30952381 0.896142517
## 214        0.6             0.572157063 0.66666667 0.008422268
## 215        0.8             0.838857726 0.28571429 0.774215852
## 216        0.2             0.672785994 0.26190476 0.846586948
## 217        1.0             0.734829169 0.11904762 0.672229085
## 218        0.4             0.932517423 0.42857143 0.717877850
## 219        0.0             0.411014788 0.21428571 0.396145418
## 220        0.2             0.917559069 0.30952381 0.704786504
## 221        0.0             0.780894102 0.38095238 0.893722390
## 222        0.6             0.601903791 0.14285714 0.830094231
## 223        0.2             0.244773075 0.88095238 0.557274353
## 224        0.8             0.713581506 0.50000000 0.150030158
## 225        1.0             0.567737549 0.69047619 0.161812568
## 226        0.6             0.755906850 0.50000000 0.466692982
## 227        0.6             0.797552269 0.19047619 0.767942976
## 228        0.6             0.867924528 0.45238095 0.838020227
## 229        0.8             0.380248173 0.28571429 0.578783233
## 230        1.0             0.227095020 0.61904762 0.798386277
## 231        1.0             0.964983852 0.35714286 0.439219219
## 232        0.8             0.609722930 0.21428571 0.809867411
## 233        0.2             0.546489886 0.40476190 0.748294428
## 234        0.0             0.833078361 0.33333333 0.743201610
```

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## 235       0.2             0.199388067 0.42857143 0.591355097
## 236       0.4             0.358320585 0.66666667 0.644152162
## 237       0.2             0.176950535 0.38095238 0.524538582
## 238       0.0             0.521162672 0.23809524 0.622872635
## 239       0.4             0.752507224 0.40476190 0.900195302
## 240       0.0             0.295087540 0.85714286 0.717259724
## 241       0.8             0.810980792 0.59523810 0.646991600
## 242       0.0             0.791772905 0.28571429 0.678708869
## 243       0.6             0.684684685 0.59523810 0.763720542
## 244       0.8             0.552439232 0.71428571 0.694185374
## 245       0.0             0.183749788 0.21428571 0.689398259
## 246       0.0             0.927757947 0.28571429 0.676324779
## 247       0.0             0.174060853 0.78571429 0.199681012
## 248       0.2             0.734319225 0.40476190 0.873833952
## 249       0.6             0.294917559 0.47619048 0.835893587
## 250       0.6             0.855855856 0.47619048 0.852201080
## 251       0.0             0.005269420 0.42857143 0.575599764
## 252       0.0             0.057453680 0.61904762 0.446574121
## 253       0.0             0.483426823 0.52380952 0.943811643
## 254       0.8             0.564677885 0.47619048 0.953434430
## 255       0.2             0.821179670 0.30952381 0.727026507
## 256       0.8             0.882882883 0.33333333 0.777329233
## 257       0.6             0.731599524 0.23809524 0.850864811
## 258       0.4             0.059153493 0.61904762 0.418712503
## 259       0.2             0.914669386 0.21428571 0.482489697
## 260       0.6             0.828998810 0.16666667 0.596334612
## 261       0.6             0.840217576 0.52380952 0.878242068
## 262       0.0             0.776644569 0.45238095 0.669561739
## 263       0.6             0.177120517 0.59523810 0.552820427
## 264       0.6             0.187489376 0.45238095 0.729300043
## 265       0.6             0.596804352 0.14285714 0.754849798
## 266       0.2             0.673635900 0.69047619 0.591553453
## 267       0.6             0.866054734 0.47619048 0.791284550
## 268       0.8             0.613972463 0.19047619 0.807246027
## 269       0.6             0.885432602 0.28571429 0.491143151
## 270       0.2             0.497705252 0.54761905 0.705882119
## 271       0.8             0.229134795 0.26190476 0.806072382
## 272       0.6             0.974162842 0.50000000 0.696262691
## 273       0.6             0.157912630 0.45238095 0.832567955
## 274       0.8             0.344042155 0.76190476 0.376322183
## 275       0.8             0.723270440 0.07142857 0.580477734
## 276       0.6             0.873703893 0.69047619 0.501952715
## 277       0.0             0.628420874 0.69047619 0.574765569
## 278       0.0             0.798402176 0.28571429 0.721214171
## 279       0.8             0.799082101 0.28571429 0.677161111
## 280       0.8             0.683664797 0.35714286 0.943272615
## 281       0.6             0.157062723 0.71428571 0.360501189
## 282       0.6             0.387387387 0.42857143 0.151788335
## 283       0.8             0.454869964 0.71428571 0.502907084
## 284       1.0             0.854496005 0.42857143 0.823693240
## 285       0.8             0.596464389 0.42857143 0.953020463
## 286       0.6             0.851436342 0.23809524 0.720201777
## 287       0.2             0.175930648 0.33333333 0.259275321
## 288       0.2             0.751827299 0.21428571 0.824488344
```

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## 289        0.6             0.809450960 0.26190476 0.730051169
## 290        1.0             0.724800272 0.11904762 0.584171676
## 291        0.6             0.168451470 0.26190476 0.622389190
## 292        0.6             0.223015468 0.40476190 0.129436556
## 293        1.0             0.899881013 0.19047619 0.530852687
## 294        0.8             0.672955975 0.30952381 0.718770834
## 295        0.6             0.611932687 0.33333333 0.831483486
## 296        0.6             0.828998810 0.33333333 0.800380221
## 297        0.0             0.073261941 0.69047619 0.620701713
## 298        0.0             0.883732789 0.38095238 0.702706743
## 299        0.6             0.920618732 0.21428571 0.529606663
## 300        0.4             0.905320415 0.35714286 0.750039931
## 301        0.6             0.449600544 0.90476190 0.176929161
## 302        0.6             0.969913310 0.35714286 0.592565084
## 303        0.6             0.689954105 0.14285714 0.767639105
## 304        0.2             0.777664457 0.64285714 0.598409792
## 305        0.6             0.723950365 0.28571429 0.297855800
## 306        0.8             0.513173551 0.40476190 0.066761086
## 307        0.8             0.561788203 0.26190476 0.888914356
## 308        0.8             0.753017168 0.21428571 0.795735116
## 309        0.8             0.460649329 0.21428571 0.536920335
## 310        0.0             0.531871494 0.50000000 0.569885460
## 311        0.0             0.564337923 0.14285714 0.715346405
## 312        0.0             0.051164372 0.64285714 0.578307117
## 313        0.8             0.804691484 0.21428571 0.679961764
## 314        0.2             0.886112528 0.26190476 0.394636141
## 315        0.0             0.563827979 0.04761905 0.430098201
## 316        0.2             0.341662417 0.35714286 0.680235095
## 317        1.0             0.355940847 0.47619048 0.508761870
## 318        0.6             0.848546660 0.30952381 0.802828750
## 319        0.0             0.758456570 0.26190476 0.775800105
## 320        0.0             0.671086181 0.23809524 0.873926182
## 321        0.6             0.051844297 0.50000000 0.263699775
## 322        0.8             0.590855006 0.42857143 0.902572979
## 323        0.2             0.112017678 0.83333333 0.589184022
## 324        0.6             0.323474418 0.76190476 0.433958738
## 325        0.8             0.400135985 0.45238095 0.285433276
## 326        0.6             0.390956995 0.59523810 0.793382329
## 327        0.0             0.919428863 0.35714286 0.736651890
## 328        0.0             0.814040456 0.50000000 0.812206761
## 329        0.0             0.341662417 0.52380952 0.413251527
## 330        0.8             0.822539521 0.16666667 0.328690468
## 331        0.6             0.742308346 0.19047619 0.703731201
## 332        0.8             0.691823899 0.40476190 0.827855510
## 333        0.0             0.813700493 0.14285714 0.664594134
## 334        0.2             0.517423083 0.19047619 0.851882703
## 335        0.6             0.040795512 0.50000000 0.489205400
## 336        0.8             0.481727010 0.52380952 0.960436292
## 337        0.0             0.774604793 0.19047619 0.782296838
## 338        0.6             0.362400136 0.52380952 0.179308212
## 339        0.6             0.038415774 0.45238095 0.548894383
## 340        0.8             0.832738399 0.38095238 0.791439540
## 341        1.0             0.474757777 0.23809524 0.652986564
## 342        0.2             0.879313276 0.52380952 0.625965707
```

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## 343        1.0             0.704742478 0.09523810 0.402346526
## 344        0.2             0.896991331 0.40476190 0.798098134
## 345        0.8             0.074961754 0.73809524 0.531845230
## 346        0.0             0.522862485 0.69047619 0.855981450
## 347        0.4             0.825599184 0.26190476 0.659651571
## 348        0.2             0.353221146 0.38095238 0.714736373
## 349        0.0             0.834098249 0.21428571 0.747178656
## 350        0.2             0.882712902 0.19047619 0.408723848
## 351        0.2             0.817950025 0.28571429 0.834018901
## 352        0.8             0.635220126 0.21428571 0.626754703
## 353        0.0             0.429372769 0.26190476 0.073644300
## 354        0.0             0.230154683 0.21428571 0.392855976
## 355        0.6             0.293047765 0.45238095 0.821288841
## 356        0.2             0.620091790 0.52380952 0.969082569
## 357        0.0             0.202107768 0.80952381 0.749807676
## 358        0.4             0.781913989 0.64285714 0.424070101
## 359        0.2             0.815060343 0.38095238 0.824886277
## 360        0.6             0.791432942 0.30952381 0.848486829
## 361        1.0             0.759646439 0.19047619 0.798140126
## 362        0.2             0.072582016 0.40476190 0.235188728
## 363        0.2             0.788033316 0.73809524 0.853159725
## 364        0.2             0.234064253 0.78571429 0.287853403
## 365        0.2             0.484276730 0.16666667 0.631252911
## 366        0.0             0.067312596 0.23809524 0.440411341
## 367        0.2             0.305966344 0.26190476 0.308370045
## 368        0.8             0.262281149 0.50000000 0.177165234
## 369        0.0             0.844807071 0.28571429 0.652625431
## 370        0.8             0.929117797 0.38095238 0.749203293
## 371        0.2             0.813530512 0.19047619 0.727295868
## 372        0.2             0.742478327 0.33333333 0.590792096
## 373        1.0             0.822029577 0.47619048 0.822596555
## 374        1.0             0.633350331 0.14285714 0.557503249
## 375        0.2             0.125956145 0.80952381 0.572112423
## 376        0.6             0.404385518 0.19047619 0.379012740
## 377        0.2             0.762706102 0.40476190 0.862964682
## 378        0.8             0.292537821 0.38095238 0.656808315
## 379        0.6             0.000000000 0.45238095 0.399501896
## 380        0.2             0.107768146 0.52380952 0.665622714
## 381        0.2             0.276389597 0.83333333 0.598460946
## 382        0.8             0.690294068 0.26190476 0.565244021
## 383        0.8             0.579466259 0.38095238 0.530818787
## 384        0.0             0.545130036 0.76190476 0.157587080
## 385        0.0             0.763386028 0.40476190 0.910143949
## 386        0.8             0.790243073 0.30952381 0.847255922
## 387        0.8             0.646098929 0.21428571 0.888069777
## 388        0.0             0.718680945 0.19047619 0.813026907
## 389        0.2             0.341322455 0.09523810 0.391207284
## 390        0.0             0.962264151 0.33333333 0.459345257
## 391        0.2             0.878633350 0.26190476 0.656416337
## 392        0.2             0.764915859 0.11904762 0.674248224
## 393        0.2             0.920958695 0.26190476 0.625392933
## 394        0.6             0.185109638 0.61904762 0.518746402
## 395        0.0             0.252932177 0.28571429 0.234586941
## 396        0.2             0.605983342 0.23809524 0.860127687
```

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## 397        0.2             0.238993711 0.61904762 0.536052547
## 398        1.0             0.875063743 0.26190476 0.738145440
## 399        0.2             0.797722251 0.76190476 0.490708722
## 400        0.6             0.730069692 0.07142857 0.425341321
## 401        0.2             0.672955975 0.33333333 0.721940866
## 402        0.4             0.693183750 0.14285714 0.596479218
## 403        0.0             0.133775285 0.45238095 0.153957730
## 404        0.8             0.566037736 0.07142857 0.710877516
## 405        0.6             0.658337583 0.09523810 0.260747950
## 406        1.0             0.477647459 0.57142857 0.997671798
## 407        0.6             0.885772565 0.30952381 0.727054298
## 408        0.8             0.748597654 0.47619048 0.797406712
## 409        0.2             0.114907360 0.23809524 0.587365071
## 410        0.6             0.046574877 0.61904762 0.499283994
## 411        0.0             0.889852116 0.35714286 0.647181252
## 412        0.6             0.145843957 0.57142857 0.425572965
## 413        0.6             0.826279109 0.40476190 0.754301303
## 414        0.0             0.593404725 0.57142857 0.151876137
## 415        0.0             0.594254632 0.28571429 0.737870429
## 416        0.8             0.769675336 0.42857143 0.631516011
## 417        0.4             0.732619412 0.23809524 0.819030880
## 418        0.6             0.477987421 0.59523810 0.442816503
## 419        0.6             0.806221316 0.59523810 0.153211490
## 420        1.0             0.839537651 0.33333333 0.721863905
## 421        0.6             0.710691824 0.16666667 0.769593195
## 422        0.0             0.037055924 0.69047619 0.440764534
## 423        0.2             0.298827129 0.38095238 0.748372457
## 424        1.0             0.378718341 0.11904762 0.275015843
## 425        0.6             0.743158253 0.38095238 0.918786104
## 426        0.8             0.570797212 0.85714286 0.217983060
## 427        0.6             0.169981302 0.85714286 0.627977058
## 428        0.0             0.669896311 0.28571429 0.668216918
## 429        0.0             0.253782084 0.26190476 0.294122614
## 430        1.0             0.434812171 0.14285714 0.841621175
## 431        0.2             0.350501445 0.59523810 0.462841149
## 432        1.0             0.592724800 0.11904762 0.710318484
## 433        0.0             0.628590855 0.57142857 0.214270946
## 434        0.8             0.637939827 0.28571429 0.868753350
## 435        0.0             0.380078191 0.54761905 0.693609087
## 436        0.0             0.798912120 0.47619048 0.906967810
## 437        0.0             0.764235934 0.45238095 0.753422367
## 438        0.6             0.921468638 0.23809524 0.562302579
## 439        0.8             0.916709162 0.64285714 0.496326977
## 440        0.2             0.886622472 0.26190476 0.718336405
## 441        0.2             0.802481727 0.11904762 0.644360290
## 442        1.0             0.125106238 0.38095238 0.609305632
## 443        0.6             0.392826789 0.42857143 0.668967281
## 444        0.2             0.595614482 0.38095238 0.572266802
## 445        1.0             0.397926228 0.16666667 0.493870661
## 446        0.6             0.961754207 0.42857143 0.494846866
## 447        0.6             0.269590345 0.71428571 0.721251430
## 448        0.6             0.783103859 0.16666667 0.753164916
## 449        0.8             0.800951895 0.21428571 0.794471837
## 450        0.6             0.339282679 0.28571429 0.292429182
```

```
## 451        0.8             0.765765766 0.21428571 0.797121929
## 452        0.4             0.210096889 0.73809524 0.592556228
## 453        0.2             0.293897671 0.47619048 0.056704480
## 454        0.4             0.839367670 0.35714286 0.815962393
## 455        0.2             0.594254632 0.66666667 0.559364192
## 456        0.2             0.694543600 0.21428571 0.788796930
## 457        0.6             0.914159442 0.50000000 0.799575191
## 458        0.8             0.634880163 0.21428571 0.652467235
## 459        0.8             0.826449091 0.80952381 0.310173573
## 460        0.2             0.771885093 0.16666667 0.744146664
## 461        0.6             0.123236444 0.45238095 0.264885331
## 462        0.4             0.763216046 0.21428571 0.717705911
## 463        0.8             0.038585756 0.50000000 0.696682003
## 464        0.0             0.868094510 0.59523810 0.705411806
## 465        0.2             0.802311746 0.21428571 0.659406489
## 466        1.0             0.054224035 0.59523810 0.302597258
## 467        0.6             0.448920619 0.26190476 0.935578722
## 468        0.0             0.903790583 0.19047619 0.584306357
## 469        0.2             0.712901581 0.11904762 0.664580238
## 470        0.8             0.581336053 0.23809524 0.697630875
## 471        0.6             0.897501275 0.57142857 0.810254962
## 472        0.0             0.505354411 0.57142857 0.836647004
## 473        0.6             0.319224885 0.95238095 0.433145921
## 474        0.0             0.927417984 0.42857143 0.560637244
## 475        0.0             0.155192929 0.66666667 0.714879910
## 476        0.0             0.709161992 0.33333333 0.733926671
## 477        0.6             0.553969063 0.40476190 0.935409531
## 478        0.6             0.738738739 0.09523810 0.681604653
## 479        0.2             0.642699303 0.19047619 0.803528417
## 480        0.2             0.401155873 0.71428571 0.603977199
## 481        1.0             0.750637430 0.14285714 0.556921771
## 482        0.6             0.783613802 0.26190476 0.602324232
## 483        0.2             0.349141594 0.45238095 0.536202192
## 484        0.6             0.086350501 0.78571429 0.604367192
## 485        0.8             0.871324154 0.28571429 0.765417029
## 486        0.2             0.959544450 0.61904762 0.669920276
## 487        0.8             0.815910250 0.28571429 0.816682064
## 488        0.4             0.301376849 0.73809524 0.743049216
## 489        0.8             0.792452830 0.19047619 0.754832237
## 490        0.2             0.255991841 0.23809524 0.199881506
## 491        0.2             0.305966344 0.69047619 0.793427376
## 492        0.0             0.390956995 0.09523810 0.247853128
## 493        0.2             0.046404895 0.30952381 0.572830261
## 494        0.0             0.344042155 0.57142857 0.221393898
## 495        0.2             0.647288798 0.28571429 0.922814915
## 496        0.6             0.553289138 0.23809524 0.417469075
## 497        0.2             0.835458100 0.57142857 0.588261567
## 498        0.8             0.500764916 0.50000000 0.755815924
## 499        0.0             0.873363930 0.40476190 0.829299432
## 500        0.8             0.738908720 0.40476190 0.825140369
## 501        0.0             0.191738909 0.83333333 0.267629332
## 502        0.8             0.684004759 0.16666667 0.595094391
## 503        0.8             0.784633690 0.11904762 0.495145850
## 504        0.0             0.568417474 0.19047619 0.883903537
```

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## 505        0.6             0.432602414 0.30952381 0.028747120
## 506        0.2             0.653238144 0.30952381 0.669588003
## 507        0.0             0.633690294 0.02380952 0.635927639
## 508        0.8             0.670236274 0.35714286 0.867138710
## 509        0.8             0.306476288 0.73809524 0.179736838
## 510        0.6             0.066122727 0.78571429 0.429692479
## 511        0.8             0.943736189 0.45238095 0.498673045
## 512        0.0             0.535441101 0.07142857 0.709580490
## 513        0.8             0.701002890 0.28571429 0.428266576
## 514        0.8             0.068332483 0.30952381 0.566871182
## 515        0.2             0.416624171 0.07142857 0.697546585
## 516        1.0             0.270780214 0.21428571 0.367555426
## 517        0.6             0.631990481 0.23809524 0.861430362
## 518        0.2             0.624681285 0.23809524 0.602166341
## 519        0.2             0.846676866 0.40476190 0.792298930
## 520        0.2             0.749617542 0.40476190 0.872522115
## 521        0.0             0.972293048 0.40476190 0.661704915
## 522        0.2             0.304606493 0.21428571 0.808274608
## 523        0.0             0.113037566 0.47619048 0.738781584
## 524        0.2             0.713581506 0.40476190 0.865876958
## 525        0.2             0.195648479 0.52380952 0.444581857
## 526        0.0             0.151793303 0.54761905 0.818140340
## 527        0.6             0.823559408 0.35714286 0.611542673
## 528        0.6             0.617712052 0.83333333 0.255461815
## 529        0.2             0.964473908 0.30952381 0.553068411
## 530        0.0             0.857895631 0.42857143 0.740506472
## 531        0.2             0.808261091 0.14285714 0.629106421
## 532        1.0             0.781574027 0.33333333 0.576837084
## 533        0.2             0.721230665 0.35714286 0.332395100
## 534        0.8             0.846166922 0.38095238 0.177244332
## 535        0.6             0.888662247 0.30952381 0.762400612
## 536        0.2             0.582865885 0.09523810 0.770175589
## 537        0.6             0.995240524 0.45238095 0.348727025
## 538        0.2             0.496685365 0.95238095 0.670053277
## 539        0.8             0.890362060 0.23809524 0.667225291
## 540        0.8             0.730069692 0.40476190 0.904564174
## 541        0.6             0.698963114 0.30952381 0.582448162
## 542        0.2             0.195988441 0.50000000 0.299371643
## 543        0.6             0.544450110 0.61904762 0.024459178
## 544        0.0             0.502124766 0.52380952 0.693274829
## 545        0.8             0.129015808 0.42857143 0.631599538
## 546        1.0             0.861125276 0.50000000 0.858612913
## 547        0.6             0.777834438 0.11904762 0.685984214
## 548        0.0             0.670406255 0.07142857 0.707196247
## 549        0.2             0.179500255 0.23809524 0.559947349
## 550        0.6             0.804181540 0.30952381 0.744803576
## 551        0.2             0.823219446 0.21428571 0.759387555
## 552        1.0             0.780724120 0.35714286 0.283111334
## 553        0.2             0.160632330 0.76190476 0.219287567
## 554        0.8             0.526942036 0.09523810 0.578244816
## 555        0.6             0.393336733 0.42857143 0.185291571
## 556        0.8             0.651368349 0.52380952 0.549703229
## 557        1.0             0.751487336 0.21428571 0.781448289
## 558        0.0             0.839367670 0.50000000 0.785871980
```

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## 559        0.8             0.240863505 0.30952381 0.261060831
## 560        0.0             0.080231175 0.73809524 0.652614895
## 561        0.0             0.651368349 0.47619048 0.802071362
## 562        0.0             0.768315485 0.90476190 0.453705166
## 563        0.6             0.871834098 0.21428571 0.705345535
## 564        1.0             0.561788203 0.14285714 0.761711939
## 565        0.8             0.126466089 0.19047619 0.520739735
## 566        0.8             0.381438042 0.54761905 0.456344568
## 567        0.8             0.418833928 0.78571429 0.495915148
## 568        0.0             0.548699643 0.54761905 0.855252160
## 569        0.0             0.415604284 0.52380952 0.554028582
## 570        0.8             0.851266361 0.33333333 0.743233371
## 571        0.0             0.612102669 0.90476190 0.729501911
## 572        0.0             0.335713072 0.14285714 0.294667597
## 573        1.0             0.568247493 0.07142857 0.693650163
## 574        0.8             0.341152473 0.59523810 0.011895255
## 575        0.0             0.784633690 0.76190476 0.809057038
## 576        0.0             0.667006629 0.66666667 0.946840428
## 577        1.0             0.640659527 0.28571429 0.656270051
## 578        0.6             0.497705252 0.61904762 0.370514886
## 579        0.6             0.479857216 0.00000000 0.404382615
## 580        0.6             0.864694884 0.47619048 0.770386008
## 581        0.2             0.774774775 0.09523810 0.590873332
## 582        0.2             0.459629441 0.76190476 0.877395199
## 583        0.0             0.590685025 0.23809524 0.511754313
## 584        0.0             0.212136665 0.45238095 0.326054578
## 585        0.6             0.450960394 0.59523810 0.542522405
## 586        0.2             0.082440931 0.66666667 0.263932794
## 587        0.6             0.437701853 0.42857143 0.858725146
## 588        0.6             0.840897501 0.11904762 0.554930117
## 589        0.8             0.486486486 0.61904762 0.761774393
## 590        0.2             0.100628931 0.45238095 0.436486059
## 591        0.8             0.631820500 0.83333333 0.666859424
## 592        0.8             0.702702703 0.16666667 0.632396321
## 593        0.6             0.298997110 0.50000000 0.305257122
## 594        0.8             0.452320245 0.38095238 0.906286619
## 595        0.2             0.515893252 0.97619048 0.347477946
## 596        0.8             0.887472378 0.30952381 0.447455958
## 597        0.2             0.204657488 0.40476190 0.638145745
## 598        0.2             0.824409315 0.23809524 0.720366386
## 599        0.8             0.087370389 0.50000000 0.790629624
## 600        0.6             0.702702703 0.19047619 0.829713246
## 601        1.0             0.806561278 0.14285714 0.488077412
## 602        0.8             0.070202278 0.35714286 0.499949457
## 603        0.8             0.883732789 0.40476190 0.506543001
## 604        0.6             0.547169811 0.26190476 0.431452488
## 605        0.2             0.662077172 0.40476190 0.942014986
## 606        0.8             0.626721061 0.16666667 0.699200315
## 607        0.6             0.322624511 0.33333333 0.547063827
## 608        0.6             0.731769505 0.47619048 0.763877670
## 609        0.8             0.812170661 0.26190476 0.628119221
## 610        0.6             0.327553969 0.73809524 0.578322693
## 611        0.6             0.160462349 0.71428571 0.814290492
## 612        0.6             0.903110658 0.30952381 0.454774059
```

```
## 613        0.0             0.123406425 0.21428571 0.567654528
## 614        0.0             0.407445181 0.16666667 0.648040948
## 615        0.0             0.829168791 0.28571429 0.777743658
## 616        1.0             0.809620942 0.28571429 0.831375223
## 617        0.8             0.324324324 0.71428571 0.566071191
## 618        0.8             0.706272310 0.23809524 0.623159862
## 619        0.8             0.428692844 0.64285714 0.532474656
## 620        0.0             0.000000000 0.61904762 0.522376363
## 621        0.0             0.354241033 0.54761905 0.441474126
## 622        0.0             0.727859935 0.16666667 0.753985063
## 623        0.2             0.865714771 0.40476190 0.819835910
## 624        0.6             0.560768315 0.66666667 0.217890982
## 625        0.6             0.301206867 0.50000000 0.213291535
## 626        0.8             0.082780894 0.59523810 0.484361023
## 627        0.6             0.785993541 0.30952381 0.739583254
## 628        1.0             0.186469488 0.40476190 0.564608182
## 629        1.0             0.702532721 0.59523810 0.918996981
## 630        0.6             0.667856536 0.09523810 0.727175389
## 631        0.2             0.770865205 0.28571429 0.741756619
## 632        1.0             0.238143804 0.78571429 0.202243912
## 633        0.2             0.760836308 0.52380952 0.543617410
## 634        0.4             0.154173041 0.40476190 0.608055485
## 635        0.0             0.812340643 0.28571429 0.798203496
## 636        0.0             0.108108108 0.45238095 0.343583816
## 637        0.6             0.035016148 0.30952381 0.522995711
## 638        0.2             0.758966514 0.19047619 0.639879490
## 639        0.8             0.492435832 0.80952381 0.324599661
## 640        1.0             0.297127316 0.26190476 0.421958732
## 641        0.0             0.838007819 0.52380952 0.805904719
## 642        0.6             0.755566888 0.19047619 0.803625991
## 643        0.8             0.465578786 0.09523810 0.698828035
## 644        0.0             0.309026007 0.76190476 0.549113353
## 645        0.0             0.310555839 0.11904762 0.747354871
## 646        0.8             0.775794663 0.09523810 0.612471388
## 647        0.0             0.537820840 0.26190476 0.699173440
## 648        0.2             0.685704572 0.28571429 0.918686086
## 649        0.2             0.746047935 0.09523810 0.648367876
## 650        0.0             0.504164542 0.16666667 0.858279112
## 651        1.0             0.304606493 0.28571429 0.889844140
## 652        1.0             0.280979092 0.30952381 0.413824607
## 653        0.2             0.494985552 0.16666667 0.813619532
## 654        0.2             0.896651368 0.42857143 0.767144818
## 655        0.8             0.598334183 0.26190476 0.394164912
## 656        0.2             0.452490226 0.85714286 0.383809474
## 657        0.0             0.824579296 0.47619048 0.644696381
## 658        0.8             0.585585586 0.14285714 0.785253091
## 659        0.2             0.408975013 0.54761905 0.896159161
## 660        0.6             0.625871154 0.14285714 0.790899596
## 661        0.8             0.677375489 0.23809524 0.890684443
## 662        0.2             0.574536801 0.50000000 0.970728359
## 663        1.0             0.179500255 0.38095238 0.173695454
## 664        0.0             0.028896821 0.52380952 0.598140126
## 665        0.8             0.084650688 0.78571429 0.574208981
## 666        0.0             0.953935067 0.30952381 0.456173240
```

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## 667        0.6             0.853136155 0.30952381 0.617402956
## 668        0.8             0.369709332 0.54761905 0.961816233
## 669        0.0             0.608703043 0.45238095 0.724277161
## 670        0.2             0.713751487 0.09523810 0.399133280
## 671        0.2             0.712731600 0.26190476 0.837790873
## 672        0.0             0.089580146 0.78571429 0.647418241
## 673        0.8             0.382967874 0.61904762 0.635371815
## 674        1.0             0.322284549 0.64285714 0.749839132
## 675        0.6             0.469658338 0.97619048 0.492341991
## 676        0.2             0.706782254 0.21428571 0.853246763
## 677        0.0             0.569777324 0.71428571 0.382287981
## 678        0.6             0.193268740 0.40476190 0.837820649
## 679        0.4             0.518612953 0.35714286 0.749926017
## 680        0.2             0.407275200 0.16666667 0.836591422
## 681        0.6             0.629270780 0.02380952 0.564791726
## 682        0.2             0.570627231 0.33333333 0.853177743
## 683        0.2             0.457589665 0.59523810 0.817174365
## 684        0.8             0.631310556 0.71428571 0.802102055
## 685        0.2             0.057453680 0.66666667 0.641292872
## 686        0.4             0.826959035 0.33333333 0.781667565
## 687        0.2             0.257351691 0.33333333 0.129176357
## 688        0.6             0.865034846 0.33333333 0.802853334
## 689        1.0             0.064082951 0.50000000 0.509135830
## 690        0.6             0.891211967 0.26190476 0.708159167
## 691        0.2             0.123576407 0.69047619 0.518158663
## 692        0.6             0.785823559 0.40476190 0.794861525
## 693        0.0             0.413564508 0.42857143 0.670213458
## 694        0.6             0.255651878 0.71428571 0.483078809
## 695        1.0             0.702872684 0.38095238 0.820273545
## 696        0.0             0.188679245 0.21428571 0.750217367
## 697        0.4             0.211626721 0.54761905 0.799416842
## 698        0.6             0.718001020 0.42857143 0.775384305
## 699        0.0             0.351861295 0.35714286 0.471797405
## 700        0.6             0.901240864 0.23809524 0.657153415
## 701        0.6             0.747237804 0.26190476 0.825089062
## 702        0.0             0.284718681 0.71428571 0.462794576
## 703        0.2             0.506884243 0.23809524 0.914887087
## 704        0.6             0.218255992 0.57142857 0.526155817
## 705        0.2             0.533571307 0.57142857 0.897960704
## 706        1.0             0.213666497 0.69047619 0.311835702
## 707        0.6             0.809620942 0.28571429 0.826076566
## 708        0.6             0.797892232 0.59523810 0.862689977
## 709        0.0             0.720720721 0.23809524 0.763016600
## 710        0.2             0.282338943 0.64285714 0.537651764
## 711        1.0             0.929287778 0.26190476 0.577622415
## 712        0.0             0.578446371 0.97619048 0.707559671
## 713        0.0             0.449600544 0.78571429 0.551085766
## 714        0.0             0.012408635 0.61904762 0.600925814
## 715        0.0             0.118306986 0.52380952 0.690916698
## 716        0.2             0.840897501 0.14285714 0.499716285
## 717        0.8             0.502804691 0.33333333 0.792556533
## 718        1.0             0.293047765 0.47619048 0.485643695
## 719        0.0             0.435492096 0.23809524 0.356532999
## 720        0.6             0.814380418 0.21428571 0.763679161
```

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## 721        0.0             0.781404046 0.40476190 0.764249950
## 722        0.0             0.817780044 0.16666667 0.679206362
## 723        0.2             0.425633180 0.40476190 0.354506683
## 724        1.0             0.253442121 0.76190476 0.606277304
## 725        0.0             0.701682815 0.23809524 0.749954419
## 726        0.6             0.805201428 0.59523810 0.862024820
## 727        0.8             0.398436172 0.71428571 0.780664027
## 728        0.6             0.800781914 0.35714286 0.846873869
## 729        0.0             0.123406425 0.40476190 0.283975764
## 730        0.2             0.698793133 0.09523810 0.650629502
## 731        0.2             0.767465579 0.28571429 0.687930669
## 732        0.8             0.910929798 0.28571429 0.666881107
## 733        0.2             0.642359340 0.30952381 0.509417560
## 734        0.8             0.065272820 0.47619048 0.586431164
## 735        0.2             0.755566888 0.28571429 0.735471222
## 736        0.2             0.370389257 0.02380952 0.588910080
## 737        0.6             0.882712902 0.38095238 0.622668324
## 738        0.2             0.791262961 0.16666667 0.737776519
## 739        0.0             0.645588985 0.16666667 0.651988523
## 740        0.6             0.747747748 0.23809524 0.817404330
## 741        0.2             0.750807411 0.40476190 0.677249371
## 742        0.0             0.497025327 0.61904762 0.489061252
## 743        0.8             0.841747408 0.78571429 0.224214554
## 744        0.8             0.210436852 0.71428571 0.585450225
## 745        0.6             0.114567398 0.57142857 0.262938265
## 746        0.8             0.189869114 0.78571429 0.534958611
## 747        0.8             0.679075302 0.07142857 0.686481555
## 748        0.8             0.846506884 0.40476190 0.805459143
## 749        0.6             0.589495156 0.57142857 0.950558497
## 750        0.2             0.403535611 0.73809524 0.835526346
## 751        0.0             0.687404386 0.42857143 0.911475790
## 752        0.6             0.665306816 0.38095238 0.892181810
## 753        0.6             0.958694544 0.42857143 0.581518836
## 754        0.8             0.879993201 0.26190476 0.723686521
## 755        0.8             0.873193949 0.50000000 0.798542182
## 756        0.8             0.450790413 0.33333333 0.217039227
## 757        1.0             0.049124596 0.69047619 0.457761005
## 758        0.8             0.261941186 0.64285714 0.615218291
## 759        0.6             0.760666327 0.35714286 0.890755601
## 760        0.8             0.317865035 0.61904762 0.821301973
## 761        0.8             0.113887472 0.30952381 0.524348624
## 762        0.6             0.636409995 0.28571429 0.928169459
## 763        0.6             0.863505014 0.35714286 0.804643425
## 764        0.2             0.379398266 0.83333333 0.152376073
## 765        0.2             0.820499745 0.21428571 0.756353425
## 766        0.6             0.085840558 0.76190476 0.556748457
## 767        0.8             0.125106238 0.61904762 0.696526097
## 768        0.8             0.685364610 0.23809524 0.846444785
## 769        1.0             0.928607853 0.23809524 0.565270590
## 770        1.0             0.396396396 0.11904762 0.304712903
## 771        0.4             0.263301037 0.33333333 0.081676574
## 772        1.0             0.413224545 0.73809524 0.118749761
## 773        0.4             0.050144484 0.47619048 0.574101939
## 774        0.6             0.010368859 0.57142857 0.437541057
```

```
## 775       0.8             0.175760666 0.42857143 0.651798107
## 776       1.0             0.956824749 0.38095238 0.556480929
## 777       0.2             0.665646779 0.38095238 0.844260578
## 778       1.0             0.074451810 0.28571429 0.390237493
## 779       1.0             0.868434472 0.40476190 0.835576737
## 780       1.0             0.404385518 0.92857143 0.278765520
## 781       0.8             0.260071392 0.54761905 0.526371581
## 782       0.2             0.478497365 0.54761905 0.851743747
## 783       0.0             0.872174061 0.23809524 0.598993713
## 784       0.0             0.794832568 0.33333333 0.738059317
## 785       0.8             0.503144654 0.14285714 0.174255707
## 786       0.6             0.579126296 0.33333333 0.896516935
## 787       0.6             0.958184600 0.61904762 0.538622624
## 788       0.0             0.560258372 0.14285714 0.849767821
## 789       1.0             1.000000000 0.47619048 0.503412213
## 790       0.2             0.611592725 0.52380952 0.000000000
## 791       0.8             0.589155193 0.90476190 0.178446379
## 792       0.8             0.616692164 0.42857143 0.979152001
## 793       0.2             0.802481727 0.42857143 0.577977440
## 794       0.6             0.420703723 0.23809524 0.417781650
## 795       0.2             0.458779534 0.54761905 0.452990840
## 796       0.4             0.117287098 0.28571429 0.548414755
## 797       0.8             0.173890872 0.35714286 0.615808167
## 798       0.6             0.682644909 0.33333333 0.800683023
## 799       0.0             0.878973313 0.23809524 0.506085973
## 800       0.0             0.371749108 0.09523810 0.500602245
## 801       0.0             0.570117287 0.52380952 0.978746585
## 802       0.8             0.656637770 0.78571429 0.420300725
## 803       0.0             0.107598164 0.47619048 0.206325557
## 804       1.0             0.777154513 0.21428571 0.539220594
## 805       0.6             0.783273840 0.23809524 0.797535132
## 806       0.6             0.758116607 0.33333333 0.539470104
## 807       0.8             0.784293728 0.21428571 0.776192083
## 808       0.6             0.797382288 0.47619048 0.319839727
## 809       0.8             0.228454870 0.30952381 0.786452389
## 810       0.8             0.266190719 0.73809524 0.451640369
## 811       0.0             0.603603604 0.45238095 0.914483656
## 812       0.0             0.714261431 0.40476190 0.904140892
## 813       0.6             0.219785824 0.23809524 0.643372786
## 814       0.8             0.474757777 0.11904762 0.807432778
## 815       0.8             0.929797722 0.38095238 0.677077890
## 816       0.0             0.667346592 0.30952381 0.574710903
## 817       0.0             0.755566888 0.35714286 0.790368050
## 818       0.8             0.732789393 0.35714286 0.734685432
## 819       0.8             0.941186469 0.38095238 0.533256322
## 820       1.0             0.784803672 0.21428571 0.755877309
## 821       0.8             0.295597484 0.52380952 0.718781217
## 822       0.2             0.160802312 0.35714286 0.446563585
## 823       0.2             0.782593915 0.28571429 0.706797550
## 824       0.2             0.639129696 0.35714286 0.285737147
## 825       0.2             0.053714091 0.76190476 0.481398051
## 826       0.8             0.500764916 0.59523810 0.460811320
## 827       0.2             0.207037226 0.61904762 0.753822286
## 828       0.0             0.238143804 0.54761905 0.791900843
```

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## 829        0.8             0.620601734 0.54761905 0.910276950
## 830        0.8             0.851946286 0.28571429 0.789580582
## 831        0.8             0.956144824 0.50000000 0.677473992
## 832        0.8             0.524392317 0.09523810 0.583092400
## 833        0.6             0.621281659 0.64285714 0.342480107
## 834        1.0             0.097739249 0.33333333 0.510799486
## 835        0.2             0.849566548 0.45238095 0.786404289
## 836        0.2             0.233044365 0.90476190 0.461945416
## 837        0.2             0.994390617 0.50000000 0.633749693
## 838        0.6             0.627231005 0.16666667 0.829957260
## 839        0.4             0.714771375 0.21428571 0.819574794
## 840        0.0             0.813700493 0.54761905 0.862880240
## 841        0.6             0.156722760 0.52380952 0.165776177
## 842        1.0             0.557538671 0.33333333 0.804763904
## 843        0.2             0.186979432 0.45238095 0.104752147
## 844        0.0             0.540200578 0.00000000 0.588404341
## 845        0.8             0.323814380 0.28571429 0.687146559
## 846        0.2             0.570627231 0.16666667 0.757138603
## 847        0.2             0.895121537 0.30952381 0.632597578
## 848        0.8             0.608023117 0.38095238 0.914567793
## 849        0.0             0.992180860 0.42857143 0.618792059
## 850        0.6             0.805201428 0.16666667 0.729160476
## 851        0.8             0.052014278 0.40476190 0.690867529
## 852        0.6             0.741118477 0.11904762 0.507908894
## 853        0.0             0.504164542 0.42857143 0.977154851
## 854        0.0             0.901070882 0.19047619 0.514777754
## 855        0.0             0.704912460 0.07142857 0.564280032
## 856        0.2             0.918408975 0.47619048 0.759949182
## 857        0.6             0.734319225 0.45238095 0.863957379
## 858        0.2             0.052014278 0.61904762 0.491707526
## 859        0.0             0.894781574 0.28571429 0.730569583
## 860        0.8             0.150603434 0.54761905 0.583018646
## 861        0.8             0.352371239 0.35714286 0.462351748
## 862        0.0             0.708312086 0.42857143 0.781581901
## 863        0.6             0.927417984 0.33333333 0.714775464
## 864        1.0             0.418154003 0.54761905 0.667944198
## 865        0.8             0.796192419 0.16666667 0.715380457
## 866        0.6             0.093489716 0.35714286 0.712258373
## 867        0.8             0.807241203 0.28571429 0.803812895
## 868        0.6             0.795512494 0.38095238 0.763040421
## 869        0.4             0.188169301 0.80952381 0.488756159
## 870        0.0             0.863505014 0.47619048 0.715898565
## 871        0.0             0.235084141 0.21428571 0.609665085
## 872        0.2             0.551929288 0.35714286 0.915360606
## 873        0.8             0.637259901 0.04761905 0.621933536
## 874        0.8             0.655107938 0.26190476 0.851477439
## 875        0.2             0.524052354 0.23809524 0.801786884
## 876        1.0             0.248682645 0.45238095 0.864063504
## 877        0.2             0.618901921 0.64285714 0.924551561
## 878        0.2             0.006629271 0.61904762 0.538819453
## 879        1.0             0.412884583 0.42857143 0.356373276
## 880        0.2             0.427672956 0.52380952 0.517121837
## 881        0.2             0.394186639 0.11904762 0.695598298
## 882        0.2             0.751147374 0.19047619 0.636459032
```

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## 883        0.6             0.868774435 0.61904762 0.772161898
## 884        0.4             0.098079211 0.40476190 0.415840081
## 885        1.0             0.463708992 0.26190476 0.939689074
## 886        0.8             0.754547000 0.28571429 0.652533048
## 887        0.2             0.747237804 0.35714286 0.857903015
## 888        0.0             0.701852796 0.38095238 0.862736397
## 889        0.8             0.816590175 0.16666667 0.503565522
## 890        0.2             0.185109638 0.66666667 0.554892401
## 891        0.8             0.328913819 0.78571429 0.676446327
## 892        0.0             0.288628251 0.16666667 0.653479324
## 893        0.4             0.276389597 0.38095238 0.740089451
## 894        0.8             0.196498385 0.54761905 0.728289328
## 895        0.0             0.117797042 0.33333333 0.400794035
## 896        0.6             0.137174911 0.38095238 0.533172643
## 897        0.6             0.748767636 0.28571429 0.719533107
## 898        0.2             0.150773415 0.28571429 0.717035409
## 899        0.2             0.206017338 0.64285714 0.404225335
## 900        0.2             0.741118477 0.42857143 0.932194758
## 901        0.6             0.221315655 0.57142857 0.605471664
## 902        0.0             0.653578106 0.02380952 0.542813144
## 903        0.8             0.797552269 0.11904762 0.576333941
## 904        0.6             0.559748428 0.00000000 0.565795264
## 905        0.0             0.600713921 0.57142857 0.831456459
## 906        0.8             0.773584906 0.19047619 0.752811876
## 907        0.4             0.165221826 0.23809524 0.761888612
## 908        0.8             0.736359001 0.07142857 0.373061448
## 909        1.0             0.845996940 0.26190476 0.758422802
## 910        0.0             0.877953425 0.30952381 0.762578964
## 911        0.6             0.710181880 0.50000000 0.916623427
## 912        0.0             0.835458100 0.11904762 0.590328807
## 913        1.0             0.882712902 0.33333333 0.731818661
## 914        0.0             0.894611593 0.40476190 0.767193682
## 915        0.6             0.242053374 0.61904762 0.319250462
## 916        0.8             0.600203978 0.09523810 0.626150778
## 917        1.0             0.567907530 0.09523810 0.307393993
## 918        0.0             0.186809451 0.40476190 0.684905090
## 919        0.2             0.569097399 1.00000000 0.686683270
## 920        0.6             0.747577766 0.64285714 0.425849197
## 921        0.2             0.741798402 0.19047619 0.763188844
## 922        0.2             0.744858066 0.16666667 0.707281911
## 923        0.8             0.447900731 0.85714286 0.645095383
## 924        0.8             0.955634880 0.40476190 0.681682835
## 925        0.6             0.087540371 0.40476190 0.327849402
## 926        0.8             0.472378038 0.61904762 0.381608929
## 927        0.0             0.926228115 0.40476190 0.667920987
## 928        0.6             0.227604963 0.33333333 0.567530994
## 929        0.0             0.599184090 0.52380952 0.985282715
## 930        0.6             0.679925208 0.85714286 0.806541627
## 931        0.0             0.224715281 0.19047619 0.769821480
## 932        0.2             0.145503995 0.71428571 0.694046723
## 933        0.0             0.597654258 0.28571429 0.796790724
## 934        0.0             0.531701513 0.45238095 0.091546429
## 935        0.0             0.762196158 0.21428571 0.788289664
## 936        0.2             0.640659527 0.16666667 0.733823752
```

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## 937        0.8             0.636579976 0.33333333 0.940078609
## 938        0.6             0.015638280 0.57142857 0.430536600
## 939        0.8             0.232534421 0.16666667 0.550614843
## 940        0.8             0.560428353 0.64285714 0.143754686
## 941        0.0             0.652728200 0.07142857 0.642418264
## 942        0.6             0.759986401 0.30952381 0.745109126
## 943        0.2             0.148733639 0.19047619 0.384754987
## 944        0.2             0.384157743 0.47619048 0.955347596
## 945        0.6             0.659527452 0.26190476 0.888592313
## 946        1.0             0.402855686 0.71428571 0.815939030
## 947        0.8             0.830528642 0.23809524 0.574753353
## 948        0.0             0.063063063 0.66666667 0.671674177
## 949        1.0             0.900220976 0.23809524 0.605857535
## 950        0.6             0.859595445 0.57142857 0.614694228
## 951        0.2             0.390107088 0.00000000 0.426401204
## 952        0.8             0.863844977 0.14285714 0.547487414
## 953        0.8             0.244433112 0.73809524 0.116790480
## 954        0.2             0.785143634 0.30952381 0.829582994
## 955        0.6             0.580826109 0.14285714 0.684863861
## 956        0.6             0.167261601 0.88095238 0.449753773
## 957        0.0             0.774264831 0.33333333 0.886362144
## 958        0.2             0.615672276 0.02380952 0.375833546
## 959        0.8             0.930647629 0.38095238 0.673674534
## 960        1.0             0.678735339 0.42857143 0.908228187
## 961        0.0             0.116777155 0.57142857 0.787614734
## 962        0.6             0.190889002 0.61904762 0.331178546
## 963        0.2             0.617882033 0.76190476 0.925764908
## 964        0.8             0.635050144 0.28571429 0.907297487
## 965        1.0             0.441951385 0.73809524 0.479536039
## 966        0.2             0.042665307 0.38095238 0.513707029
## 967        0.8             0.723270440 0.33333333 0.874968048
## 968        0.8             0.668026517 0.83333333 0.721235091
## 969        0.2             0.873193949 0.21428571 0.656456650
## 970        0.6             0.797722251 0.33333333 0.724874978
## 971        0.0             0.643209247 0.11904762 0.783096523
## 972        0.6             0.388577257 0.42857143 0.428815376
## 973        0.2             0.292027877 0.64285714 0.881409504
## 974        0.0             0.340302567 0.73809524 0.914159476
## 975        0.0             0.988441271 0.50000000 0.487863939
## 976        0.6             0.927078021 0.28571429 0.675520818
## 977        1.0             0.693693694 0.28571429 0.901730538
## 978        0.8             0.083460819 0.26190476 0.581795832
## 979        0.2             0.603433622 0.50000000 0.930042618
## 980        0.8             0.523032466 0.57142857 0.445250373
## 981        0.0             0.128335883 0.45238095 0.377911627
## 982        0.8             0.784293728 0.19047619 0.571292124
## 983        0.8             0.798912120 0.21428571 0.650094139
## 984        0.8             0.621621622 0.50000000 0.797047870
## 985        0.8             0.575726670 0.28571429 0.672504249
## 986        0.8             0.248682645 0.57142857 0.909194314
## 987        0.6             0.941356451 0.45238095 0.651125316
## 988        0.2             0.004079551 0.50000000 0.415897038
## 989        0.2             0.691313955 0.30952381 0.811090836
## 990        1.0             0.097739249 0.52380952 0.318980795
```

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## 991        0.2              0.495665477 0.35714286 0.298639604
## 992        0.0              0.851606323 0.38095238 0.723599330
## 993        0.0              0.303076662 0.64285714 0.663162275
## 994        0.0              0.469658338 0.38095238 0.447671263
## 995        0.2              0.784633690 0.30952381 0.855363935
## 996        1.0              0.765765766 0.19047619 0.752476091
## 997        0.8              0.817100119 0.35714286 0.685815023
## 998        0.2              0.155192929 0.21428571 0.719912259
## 999        0.2              0.718510964 0.78571429 0.453547122
## 1000       0.6              0.128845827 0.23809524 0.561378597
##      Daily.Internet.Usage Male
## 1              0.762804214    0
## 2              0.620474634    0
## 3              0.119869234    0
## 4              0.628405376    1
## 5              0.383642087    0
## 6              0.278605158    1
## 7              0.349013198    0
## 8              0.205230657    1
## 9              0.130221576    1
## 10             0.663215886    0
## 11             0.627073496    0
## 12             0.569560479    1
## 13             0.563930258    1
## 14             0.092868386    0
## 15             0.880372927    1
## 16             0.448843686    1
## 17             0.292953142    1
## 18             0.037776971    1
## 19             0.714008960    1
## 20             0.758929653    0
## 21             0.566291319    1
## 22             0.192880494    0
## 23             0.832970093    0
## 24             0.069076159    0
## 25             0.800217944    1
## 26             0.311902167    0
## 27             0.368507083    0
## 28             0.674779029    1
## 29             0.779876498    1
## 30             0.030209468    0
## 31             0.562295677    0
## 32             0.580033902    0
## 33             0.753178351    0
## 34             0.927957380    1
## 35             0.394115510    1
## 36             0.572769100    0
## 37             0.389877709    0
## 38             0.611030391    1
## 39             0.640271219    0
## 40             0.360031481    1
## 41             0.206380918    0
## 42             0.064111878    1
## 43             0.774306817    1
```

```
## 44           0.738648747    0
## 45           0.567078339    1
## 46           0.636578278    1
## 47           0.533660249    1
## 48           0.485288776    0
## 49           0.635912338    0
## 50           0.781389999    0
## 51           0.025790047    0
## 52           0.278423538    0
## 53           0.402772733    1
## 54           0.717399201    1
## 55           0.638636639    1
## 56           0.007022642    0
## 57           0.668785567    1
## 58           0.302457925    1
## 59           0.435888122    1
## 60           0.114602252    1
## 61           0.095955927    0
## 62           0.859305001    1
## 63           0.230233684    1
## 64           0.111090931    0
## 65           0.535839690    1
## 66           0.283629979    0
## 67           0.542801792    0
## 68           0.812507568    1
## 69           0.337268434    1
## 70           0.566170239    1
## 71           0.695846955    1
## 72           0.556544376    1
## 73           0.088933285    1
## 74           0.913125076    1
## 75           0.217883521    0
## 76           0.751664850    1
## 77           0.005630222    0
## 78           0.424385519    1
## 79           0.323525851    1
## 80           0.134217218    0
## 81           0.215583000    0
## 82           0.497941639    1
## 83           0.165274246    0
## 84           0.844230536    0
## 85           0.249424870    1
## 86           0.225572103    0
## 87           0.501634580    0
## 88           0.521673326    0
## 89           0.611817411    1
## 90           0.545889333    0
## 91           0.053941155    0
## 92           0.743734108    1
## 93           0.097893207    1
## 94           0.793074222    1
## 95           0.115147112    0
## 96           0.198873956    1
## 97           0.014590144    0
```

```
## 98           0.868446543    1
## 99           0.716914881    1
## 100          0.148625742    0
## 101          0.372381644    1
## 102          0.237074706    0
## 103          0.794345562    1
## 104          0.052972515    0
## 105          0.111756871    1
## 106          0.225087783    1
## 107          0.879343746    0
## 108          0.471425112    1
## 109          0.916030996    0
## 110          0.144327400    1
## 111          0.723150502    0
## 112          0.736590386    0
## 113          0.171873108    1
## 114          0.683375711    1
## 115          0.140573919    1
## 116          0.651410582    0
## 117          0.643782540    1
## 118          0.846167817    0
## 119          0.207228478    0
## 120          0.783690519    1
## 121          0.114178472    1
## 122          0.710316019    0
## 123          0.619929774    0
## 124          0.302639545    1
## 125          0.435585422    0
## 126          0.415607216    0
## 127          0.585785204    0
## 128          0.035052670    1
## 129          0.279755418    0
## 130          0.750877830    0
## 131          0.774912217    0
## 132          0.127557816    1
## 133          0.484925536    1
## 134          0.603099649    1
## 135          0.401319772    0
## 136          0.589538685    0
## 137          0.744278968    1
## 138          0.087904105    0
## 139          0.379222666    0
## 140          0.557270856    1
## 141          0.067381039    0
## 142          0.818258869    0
## 143          0.395084151    0
## 144          0.773459257    0
## 145          0.157767284    0
## 146          0.087904105    0
## 147          0.840477055    0
## 148          0.824857731    1
## 149          0.026879768    0
## 150          0.848105097    1
## 151          0.363542802    0
```

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## 152          0.025971667    0
## 153          0.137910159    1
## 154          0.203232837    0
## 155          0.190095653    1
## 156          0.119021673    1
## 157          0.185857852    1
## 158          0.722968882    1
## 159          0.218973241    1
## 160          0.081668483    1
## 161          0.813899988    0
## 162          0.523005206    1
## 163          0.917907737    0
## 164          0.659401865    1
## 165          0.553275215    1
## 166          0.175747669    1
## 167          0.138455019    0
## 168          0.790471001    1
## 169          0.767707955    0
## 170          0.082394963    1
## 171          0.110788231    0
## 172          0.006538322    1
## 173          0.019009565    0
## 174          0.695846955    0
## 175          0.765831214    1
## 176          0.868022763    0
## 177          0.417544497    0
## 178          0.673507689    1
## 179          0.664426686    0
## 180          0.497638939    0
## 181          0.280542439    1
## 182          0.168785567    1
## 183          0.853614239    1
## 184          0.445392905    0
## 185          0.826976632    1
## 186          0.480203414    0
## 187          0.035718610    0
## 188          0.184828672    0
## 189          0.876377285    0
## 190          0.096682407    1
## 191          0.129131856    1
## 192          0.550369294    0
## 193          0.802518465    0
## 194          0.125136215    1
## 195          0.075977721    1
## 196          0.531057029    0
## 197          0.686463252    1
## 198          0.218246761    0
## 199          0.111817411    1
## 200          0.291984502    0
## 201          0.520220366    1
## 202          0.819166969    1
## 203          0.856701780    1
## 204          0.147596561    1
## 205          0.176292529    1
```

```
## 206          0.296101223    0
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## 821          0.098619688    0
## 822          0.162065625    0
## 823          0.790047221    1
## 824          0.087298704    0
## 825          0.546615813    0
## 826          0.001331880    0
## 827          0.196512895    1
## 828          0.190095653    0
## 829          0.767042015    1
## 830          0.454292287    0
## 831          0.660975905    0
## 832          0.217096501    1
## 833          0.048068773    0
## 834          0.246397869    1
## 835          0.729204504    1
## 836          0.297856883    1
## 837          0.565141058    1
## 838          0.599709408    0
## 839          0.652500303    0
## 840          0.668361787    1
## 841          0.312265407    0
## 842          0.862876862    0
## 843          0.397808451    0
## 844          0.458227388    1
## 845          0.879101586    0
## 846          0.750211890    0
## 847          0.722181862    1
## 848          0.731323405    0
## 849          0.460043589    0
## 850          0.488376317    1
## 851          0.410400775    0
## 852          0.750877830    1
## 853          0.371776244    0
```

```
## 854          0.476147233    0
## 855          0.367175203    1
## 856          0.634822618    1
## 857          0.250696210    1
## 858          0.284174840    0
## 859          0.472575372    1
## 860          0.146506841    1
## 861          0.041469912    1
## 862          0.861302821    1
## 863          0.559208137    0
## 864          0.035597530    0
## 865          0.617568713    0
## 866          0.663518586    1
## 867          0.661702385    0
## 868          0.799673084    0
## 869          0.236166606    1
## 870          0.788412641    0
## 871          0.196270735    1
## 872          0.743128708    1
## 873          0.644085240    0
## 874          0.726722363    0
## 875          0.798946604    1
## 876          0.272551156    1
## 877          0.713464100    0
## 878          0.440004843    0
## 879          0.027303548    1
## 880          0.002239981    0
## 881          0.271764136    0
## 882          0.794042862    0
## 883          0.700447996    1
## 884          0.216006780    0
## 885          0.537898051    1
## 886          0.844896477    1
## 887          0.706804698    1
## 888          0.758021552    1
## 889          0.707167938    0
## 890          0.139544739    0
## 891          0.148020341    0
## 892          0.769826856    0
## 893          0.142813900    1
## 894          0.173386609    1
## 895          0.226601283    1
## 896          0.171933648    0
## 897          0.809117327    0
## 898          0.696270735    0
## 899          0.115510352    1
## 900          0.446361545    0
## 901          0.099891028    0
## 902          0.602009929    1
## 903          0.662610486    0
## 904          0.516951205    1
## 905          0.141542560    0
## 906          0.632461557    1
## 907          0.498304880    1
```

```
## 908          0.471425112    0
## 909          0.621503814    0
## 910          0.400290592    1
## 911          0.697844775    1
## 912          0.516406345    1
## 913          0.668361787    1
## 914          0.654679743    1
## 915          0.111635791    0
## 916          0.254389151    1
## 917          0.285567260    0
## 918          0.166666667    1
## 919          0.480990435    1
## 920          0.929168180    0
## 921          0.663760746    0
## 922          0.716672721    1
## 923          0.160491585    1
## 924          0.389393389    0
## 925          0.729265044    0
## 926          0.021007386    1
## 927          0.709528999    1
## 928          0.120050854    1
## 929          0.592807846    1
## 930          0.352161279    0
## 931          0.402348953    1
## 932          0.278786778    1
## 933          0.834301974    0
## 934          0.194151834    0
## 935          0.639363119    0
## 936          0.766376075    1
## 937          0.597287807    0
## 938          0.367962223    0
## 939          0.750696210    1
## 940          0.157888364    0
## 941          0.648323042    0
## 942          0.807119506    0
## 943          0.349194818    1
## 944          0.331032813    1
## 945          0.372502724    0
## 946          0.184404892    1
## 947          0.767405255    0
## 948          0.388303669    0
## 949          0.639786899    0
## 950          0.845259717    1
## 951          0.503511321    0
## 952          0.476086693    1
## 953          0.427351980    0
## 954          0.669027727    1
## 955          0.220062962    0
## 956          0.384368568    0
## 957          0.542378012    0
## 958          0.610606611    1
## 959          0.323949631    1
## 960          0.721334302    0
## 961          0.355369900    1
```

```
## 962           0.146688461    0
## 963           0.490797917    1
## 964           0.661581305    1
## 965           0.054001695    0
## 966           0.322375590    1
## 967           0.694454534    1
## 968           0.214130040    1
## 969           0.609759051    1
## 970           0.798764984    0
## 971           0.447814505    1
## 972           0.020099286    0
## 973           0.287322920    0
## 974           0.434314082    0
## 975           0.676353069    0
## 976           0.572829640    1
## 977           0.584090084    1
## 978           0.352463979    1
## 979           0.744339508    1
## 980           0.001574040    1
## 981           0.182225451    1
## 982           0.786838600    0
## 983           0.742160068    1
## 984           0.114057392    0
## 985           0.917847197    1
## 986           0.642269040    1
## 987           0.710316019    1
## 988           0.405254873    0
## 989           0.786838600    1
## 990           0.241615208    1
## 991           0.059995157    0
## 992           0.764559874    0
## 993           0.088025185    1
## 994           0.012592324    0
## 995           0.625015135    1
## 996           0.653892723    0
## 997           0.817169149    0
## 998           0.589659765    1
## 999           0.134338298    0
## 1000          0.285627800    0
```

```
# training and test data
#
library(caTools)
train <- target_adv[1:800,]
test <- target_adv[801:1000,]
train_sp <- target_random[1:800, 7]
test_sp <- target_random[801:1000, 7]
dim(train)
```

```
## [1] 800   6
```

```
train_vec = as.vector(train_sp$Clicked.on.Ad)
test_vec = as.vector(test_sp$Clicked.on.Ad)
```

```r
# Fitting the model.
#
library(class)
require(class)

model <- knn(train = train, test=test, cl = train_vec ,k=9)

confusionMatrix(table(model ,test_vec))
```

```
## Confusion Matrix and Statistics
##
##      test_vec
## model   0   1
##     0 105   6
##     1   3  86
##
##                Accuracy : 0.955
##                  95% CI : (0.9163, 0.9792)
##     No Information Rate : 0.54
##     P-Value [Acc > NIR] : <2e-16
##
##                   Kappa : 0.9092
##
##  Mcnemar's Test P-Value : 0.505
##
##             Sensitivity : 0.9722
##             Specificity : 0.9348
##          Pos Pred Value : 0.9459
##          Neg Pred Value : 0.9663
##              Prevalence : 0.5400
##          Detection Rate : 0.5250
##    Detection Prevalence : 0.5550
##       Balanced Accuracy : 0.9535
##
##        'Positive' Class : 0
##
```

k was adjusted to get the desired accuracy. It has to be between 90-95% to avoid overfitting. An accuracy of 95.5% is satisfactory.

6) Challenging the solution.

Implementing another algorithm to compare the accuracy.

7) Conclusion and Recommendation.

Give the results of this analysis the most likely group of people to click on the targeted ads are:

a)Those aged between 35-45

b) Who spend between 50 minutes to an hour per day on the site

c) From Ethiopia, Turkey, Australia. though not limited to this countries only.

d) The above is backed up by the frequency of continents which shows Africa and Europe have some of the highest frequencies.

More data is needed for further analysis. However, what is currently analyzed could still be useful to launch a pilot advertising program and gauge how well it works and reaches the target audience.

8) Follow up Questions.

a) Did we have the right data?

Yes.

b) Do we need other data to answer our question?

Having additional data is highly advised to cross validated our results.

c) Did we have the right question?

Yes.