ACADGILD ASSIGNMENT 11.1

SESSION 11: Linear Models

1. Use the link given below and locate the bank marketing dataset. https://archive.ics.uci.edu/ml/machine-learningdatabases/00222

```
Answer:
library(readr)
bank full <- read csv("C:/Users/Rajesh
Chowdary/Downloads/bank/bank-full.csv")
View(bank full)
bank full <- read delim("C:/Users/Rajesh
Chowdary/Downloads/bank/bank-full.csv",
                                 ";", escape double = FALSE, trim ws =
TRUE)
Parsed with column specification:
cols(
    "age;""job""` = col_character(),
""marital""` = col_character(),
   ""education"" = col_character(),
   ""default"" = col_character(),
""balance"" = col_double(),
""housing"" = col_character(),
   ""loan"" = col_character(),
""contact"" = col_character(),
    ""day"" = col_double(),
""month"" = col_character(),
""duration"" = col_double(),
""campaign"" = col_double(),
   campaign = col_double(),
""pdays"" = col_double(),
""previous"" = col_double(),
""poutcome"" = col_character(),
              ` = col_character()
)
```

a. Create a visual for representing missing values in the dataset. Answer:

head(bank_full) ## Displays first 6 rows for each variable summary(bank_full) ## Provides basic statistical information of each variable

is.na(bank_full) ## Displays True for a missing value

Output from R console:

```
> summary(bank_full)
 "age;""job""
                    ""marital""
                                       ""education""
                                                           ""default""
 Length: 45211
                    Length:45211
                                       Length: 45211
                                                           Length: 45211
 Class :character
                    Class :character
                                       Class :character
                                                           Class:character
                    Mode :character
 Mode :character
                                       Mode :character
                                                           Mode :character
  ""balance""
                  ""housing""
                                       ""loan""
                                                         ""contact""
       : -8019
                  Lenath: 45211
                                     Length:45211
                                                         Length: 45211
                  Class :character
                                     Class:character
                                                         Class:character
 1st Qu.:
                                                         Mode :character
                  Mode :character
                                     Mode :character
 Median:
           1362
 Mean
 3rd Ou.:
          1428
 Max. :102127
    ""day""
                  ""month""
                                     ""duration""
                                                       ""campaign""
       : 1.00
                 Length: 45211
                                    Min. : 0.0
                                                      Min. : 1.000
                                    1st Qu.: 103.0
 1st Qu.: 8.00
                 Class :character
                                                      1st Qu.: 1.000
                 Mode :character
                                                      Median : 2.000
                                    Median : 180.0
 Median :16.00
                                    Mean : 258.2
                                                      Mean : 2.764
 Mean :15.81
                                     3rd Qu.: 319.0
 3rd Qu.:21.00
                                                      3rd Qu.: 3.000
 Max. :31.00
                                    Max. :4918.0
                                                            :63.000
                                     ""poutcome""
   ""pdays""
                  ""previous""
                                                           ""v"""
                      : 0.0000
                                    Length:45211
                                                        Length: 45211
        : -1.0
                 Min.
 1st Qu.: -1.0
                 1st Qu.: 0.0000
                                    Class :character
                                                        Class :character
                 Median :
 Median : -1.0
                           0.0000
                                    Mode :character
                                                        Mode :character
        : 40.2
                           0.5803
 Mean
                 Mean :
 3rd Qu.: -1.0
                 3rd Qu.: 0.0000
                 Max. :275.0000
       :871.0
> is.na(bank_full)
       "age:""job"" ""marital"" ""education"" ""default"" ""balance"" ""housing""
   [1,]
             FALSE
                      FALSE
                                  FALSE
                                            FALSE
                                                      FALSE
                                                               FALSE
   [2,]
             FALSE
                      FALSE
                                  FALSE
                                            FALSE
                                                      FALSE
                                                               FALSE
   [3,]
             FALSE
                      FALSE
                                  FALSE
                                            FALSE
                                                      FALSE
                                                               FALSE
   [4,]
             FALSE
                      FALSE
                                  FALSE
                                            FALSE
                                                      FALSE
                                                               FALSE
```

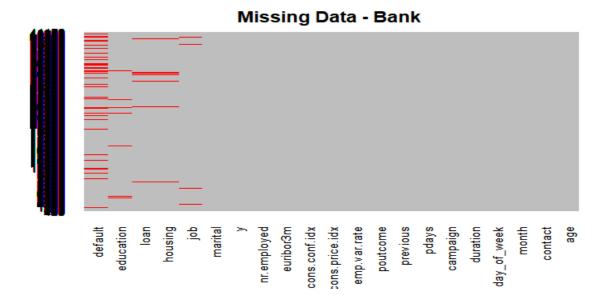
[5,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[6,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[7,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[8,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[9,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[10,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[11,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[12,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[13,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[14,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[15,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[16,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[17,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[18,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[19,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[20,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[21,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[22,]	FALSE	FALSE				FALSE
			FALSE	FALSE	FALSE	
[23,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[24,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[25,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[26,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[27,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[28,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[29,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[30,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[31,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[32,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[33,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
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[36,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[37,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[38,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[39,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[40,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[41,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[42,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[43,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[44,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[45,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[46,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[47,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[48,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[49,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[50,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[51,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
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[53,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[54,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[55,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[56,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[57,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[58,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[59,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[60,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
[61,]	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
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[60,]	FALSE	FALSE	FALSE
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[62,]	FALSE	FALSE	FALSE

[reached getOption("max.print") -- omitted 45149 rows] hence no missing values.ALL the columns shows FALSE

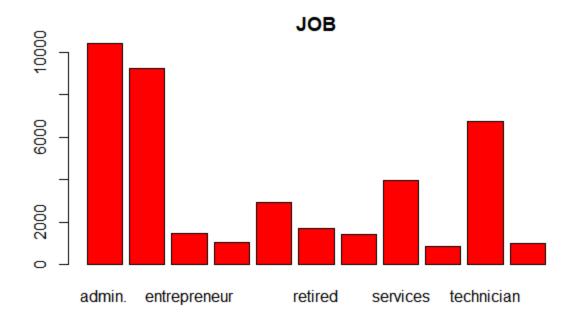


b. Show a distribution of clients based on a job. Answer:

barplot(table(bankdata\$job),col="red",main="JOB")

BARPLOT

Clients based on a job



c. Check whether is there any relation between Job and Marital Status?

Answer:

with(bankdata,chisq.test(job,marital))
with(bankdata,table(job,marital))

Output from R-console

```
>with(bankdata,chisq.test(job,marital))
      Pearson's Chi-squared test
       job and marital
X-squared = 4045.1, df = 20, p-value < 2.2e-16
> with(bankdata,table(job,marital))
               marital
job
                 divorced married single
  admin.
                             5253
                                     3875
                     1280
  blue-collar
                             6687
                                     1825
                      728
  entrepreneur
                      179
                             1071
                                      203
                              777
                      161
                                      119
  housemaid
  management
                      331
                             2089
                                      501
```

```
retired
                      348
                              1274
                                        93
  self-employed
                      133
                                       379
                               904
  services
                      532
                              2294
                                     1137
  student
                        9
                                41
                                      824
                      774
                                     2287
  technician
                              3670
                      124
                                       251
  unemployed
                               634
>
d. Check whether is there any association between Job and
Education?
Answer:
with(bankdata,chisq.test(job,education))
with(bankdata,table(job,education))
(OR)
with(bankdata, prop.table(table(job,education)))
Output from R-console:
> with(bankdata,chisq.test(job,education))
       Pearson's Chi-squared test
       iob and education
X-squared = 35560, df = 60, p-value < 2.2e-16
Warning message:
In chisq.test(job, education): Chi-squared approximation may be
incorrect
> with(bankdata,table(job,education))
                education
                 basic.4y basic.6y basic.9y high.school illiterate
job
                                151
                                          499
  admin.
                                                      3329
  blue-collar
                     2318
                               1426
                                         3623
                                                                     8
2
1
0
3
3
0
                                                       878
                      137
                                 71
                                          210
                                                       234
  entrepreneur
                                 77
                      474
  housemaid
                                           94
                                                       174
                                 85
  management
                      100
                                          166
                                                       298
                                 75
  retired
                      597
                                          145
                                                       276
  self-employed
                       93
                                 25
                                          220
                                                       118
```

services

technician

unemployed

student

education

```
job
                professional.course university.degree
  admin.
                                 363
                                                    5753
                                 453
  blue-collar
                                                     94
                                 135
  entrepreneur
                                                     610
                                   59
  housemaid
                                                    139
                                  89
                                                   2063
  management
  retired
                                 241
                                                     285
  self-employed
                                 168
                                                    765
  services
                                                    173
                                 218
  student
                                  43
                                                    170
  technician
                                3320
                                                   1809
  unemployed
                                                    262
                                 142
> with(bankdata, prop.table(table( job,education)))
               education
job
                                  basic.6v
                                                basic.9y
                                                           high.school
                     basic.4y
illiterate
  admin.
                1.961384e-03 3.846350e-03 1.271079e-02 8.479800e-02
2.547252e-05
  blue-collar
                5.904529e-02 3.632381e-02 9.228692e-02 2.236487e-02
2.037801e-04
                3.489735e-03 1.808549e-03 5.349228e-03 5.960569e-03
  entrepreneur
5.094503e-05
                1.207397e-02 1.961384e-03 2.394416e-03 4.432218e-03
  housemaid
2.547252e-05
                2.547252e-03 2.165164e-03 4.228438e-03 7.590810e-03
  management
0.000000e+00
                1.520709e-02 1.910439e-03 3.693515e-03 7.030414e-03
  retired
7.641755e-05
  self-employed 2.368944e-03 6.368129e-04 5.603953e-03 3.005757e-03
7.641755e-05
  services
                 3.362372e-03 5.756788e-03 9.883336e-03 6.831729e-02
0.000000e+00
  student
                6.622854e-04 3.311427e-04 2.521779e-03 9.093688e-03
0.00000e+00
                1.477406e-03 2.216109e-03 9.781446e-03 2.223751e-02
  technician
0.000000e+00
                2.852922e-03 8.660655e-04 4.737888e-03 6.597381e-03
  unemployed
0.000000e+00
               education
                professional.course university.degree
iob
  admin.
                        9.246523e-03
                                           1.465434e-01
  blue-collar
                        1.153905e-02
                                           2.394416e-03
                        3.438790e-03
                                           1.553823e-02
  entrepreneur
                        1.502878e-03
                                           3.540680e-03
  housemaid
                                           5.254980e-02
  management
                        2.267054e-03
                        6.138876e-03
                                           7.259667e-03
  retired
  self-employed
                        4.279383e-03
                                           1.948647e-02
  services
                        5.553008e-03
                                           4.406745e-03
  student
                        1.095318e-03
                                           4.330328e-03
                        8.456875e-02
                                           4.607978e-02
  technician
                        3.617097e-03
                                           6.673799e-03
  unemploved
```