Loan_prediction_problem_v1.R

jas

Thu Sep 08 21:32:07 2016

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.2.5
```

```
getwd()
```

```
## [1] "C:/Users/jas/Dropbox/Personal/New folder/Analytics Vidhya"
```

```
dir("C:/Users/ghumanja/Desktop/New folder/Analytics vidhya")
```

```
## character(0)
```

```
train <- read.csv('train_home loan.csv',na.strings=c("","NA"))
head(train)
```

```
##    Loan_ID Gender Married Dependents    Education Self_Employed
## 1 LP001002   Male      No          0     Graduate            No
## 2 LP001003   Male     Yes          1     Graduate            No
## 3 LP001005   Male     Yes          0     Graduate           Yes
## 4 LP001006   Male     Yes          0 Not Graduate            No
## 5 LP001008   Male      No          0     Graduate            No
## 6 LP001011   Male     Yes          2     Graduate           Yes
##   ApplicantIncome CoapplicantIncome LoanAmount Loan_Amount_Term
## 1            5849                  0         NA               360
## 2            4583               1508        128               360
## 3            3000                  0         66               360
## 4            2583               2358        120               360
## 5            6000                  0        141               360
## 6            5417               4196        267               360
##   Credit_History Property_Area Loan_Status
## 1              1         Urban           Y
## 2              1         Rural           N
## 3              1         Urban           Y
## 4              1         Urban           Y
## 5              1         Urban           Y
## 6              1         Urban           Y
```

```
dim(train)
```

```
## [1] 614  13
```

```
typeof(train)
```

```
## [1] "list"
```

```r
str(train)
```

```
## 'data.frame':    614 obs. of  13 variables:
##  $ Loan_ID          : Factor w/ 614 levels "LP001002","LP001003",..: 1 2 3
4 5 6 7 8 9 10 ...
##  $ Gender           : Factor w/ 2 levels "Female","Male": 2 2 2 2 2 2 2 2
2 2 ...
##  $ Married          : Factor w/ 2 levels "No","Yes": 1 2 2 2 1 2 2 2 2 2
...
##  $ Dependents       : Factor w/ 4 levels "0","1","2","3+": 1 2 1 1 1 3 1 4
3 2 ...
##  $ Education        : Factor w/ 2 levels "Graduate","Not Graduate": 1 1 1
2 1 1 2 1 1 1 ...
##  $ Self_Employed    : Factor w/ 2 levels "No","Yes": 1 1 2 1 1 2 1 1 1 1
...
##  $ ApplicantIncome  : int  5849 4583 3000 2583 6000 5417 2333 3036 4006
12841 ...
##  $ CoapplicantIncome: num  0 1508 0 2358 0 ...
##  $ LoanAmount       : int  NA 128 66 120 141 267 95 158 168 349 ...
##  $ Loan_Amount_Term : int  360 360 360 360 360 360 360 360 360 360 ...
##  $ Credit_History   : int  1 1 1 1 1 1 1 0 1 1 ...
##  $ Property_Area    : Factor w/ 3 levels "Rural","Semiurban",..: 3 1 3 3 3
3 3 2 3 2 ...
##  $ Loan_Status      : Factor w/ 2 levels "N","Y": 2 1 2 2 2 2 2 1 2 1 ...
```

```r
table(is.na(train))
```

```
##
## FALSE  TRUE
##  7833   149
```

```r
colSums(is.na(train))
```

```
##           Loan_ID            Gender           Married        Dependents
##                 0                13                 3                15
##         Education     Self_Employed   ApplicantIncome CoapplicantIncome
##                 0                32                 0                 0
##        LoanAmount  Loan_Amount_Term    Credit_History     Property_Area
##                22                14                50                 0
##       Loan_Status
##                 0
```

```r
summary(train)
```

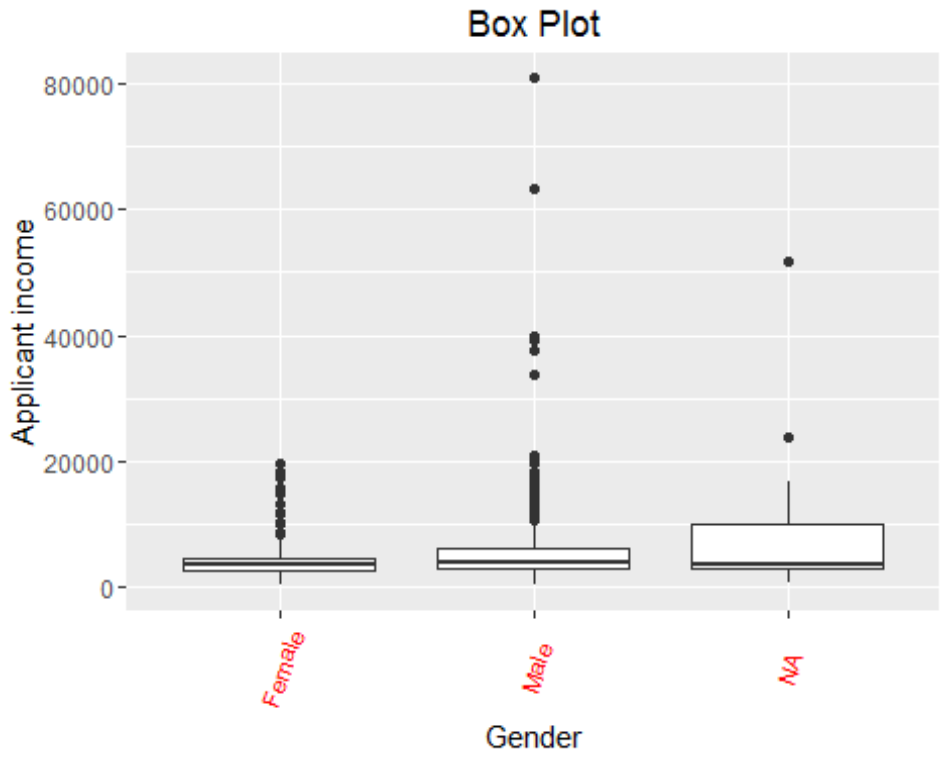
```
##      Loan_ID       Gender    Married    Dependents        Education
##  LP001002:  1   Female:112   No  :213   0   :345   Graduate    :480
##  LP001003:  1   Male  :489   Yes :398   1   :102   Not Graduate:134
##  LP001005:  1   NA's  : 13   NA's:  3   2   :101
##  LP001006:  1                           3+  : 51
##  LP001008:  1                           NA's: 15
##  LP001011:  1
```

```
##  (Other) :608
##  Self_Employed ApplicantIncome CoapplicantIncome   LoanAmount
##  No  :500      Min.   :  150   Min.   :    0     Min.   :  9.0
##  Yes : 82      1st Qu.: 2878   1st Qu.:    0     1st Qu.:100.0
##  NA's: 32      Median : 3812   Median : 1188     Median :128.0
##                Mean   : 5403   Mean   : 1621     Mean   :146.4
##                3rd Qu.: 5795   3rd Qu.: 2297     3rd Qu.:168.0
##                Max.   :81000   Max.   :41667     Max.   :700.0
##                                                  NA's   :22
##  Loan_Amount_Term Credit_History     Property_Area Loan_Status
##  Min.   : 12      Min.   :0.0000   Rural    :179   N:192
##  1st Qu.:360      1st Qu.:1.0000   Semiurban:233   Y:422
##  Median :360      Median :1.0000   Urban    :202
##  Mean   :342      Mean   :0.8422
##  3rd Qu.:360      3rd Qu.:1.0000
##  Max.   :480      Max.   :1.0000
##  NA's   :14       NA's   :50
```

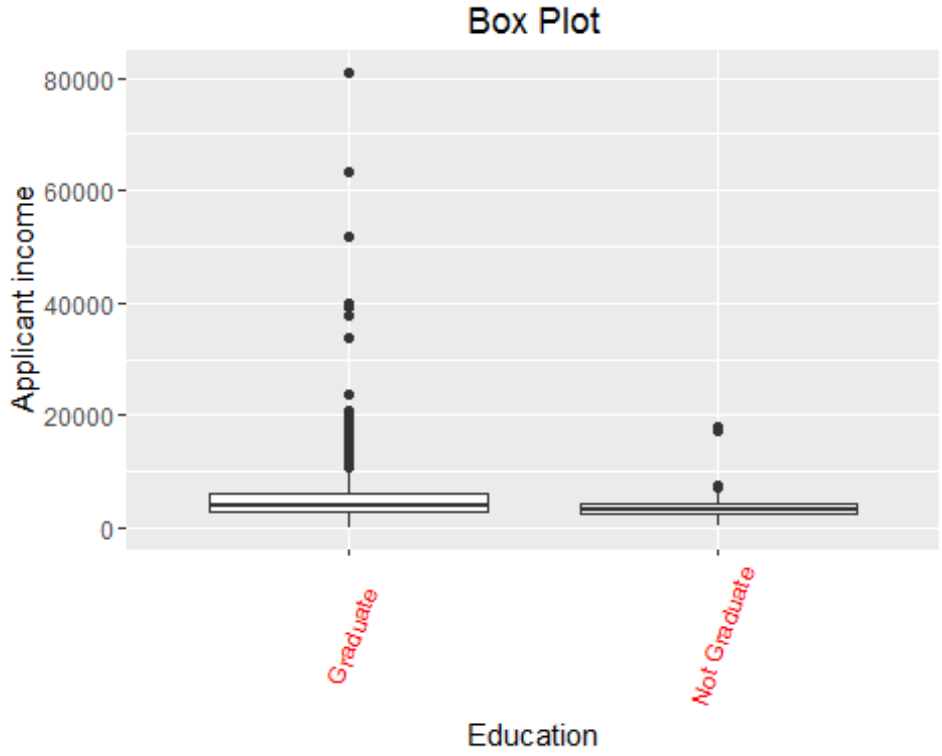
```
ggplot(data=train, aes(ApplicantIncome,LoanAmount))+geom_bar( stat =
"identity") +theme(axis.text.x = element_text(angle = 70, vjust = 0.5, color
= "navy")) + xlab("Applicant income")
```

```
## Warning: Removed 22 rows containing missing values (position_stack).
```


```
ggplot(data=train, aes(Gender,ApplicantIncome))+geom_boxplot() +ggtitle("Box
Plot") + theme(axis.text.x = element_text(angle = 70, vjust = 0.5, color =
"red")) + ylab("Applicant income")+xlab("Gender")
```




```
ggplot(data=train, aes(Education,ApplicantIncome))+geom_boxplot()
+ggtitle("Box Plot") + theme(axis.text.x = element_text(angle = 70, vjust =
0.5, color = "red")) + ylab("Applicant income")+xlab("Education")
```



```r
summary(train$Loan_Status)
```

```
##   N   Y
## 192 422
```

```r
table(train$Credit_History)
```

```
##
##   0   1
##  89 475
```

```r
ggplot(train, aes(Credit_History))+geom_bar(width = 0.5) +theme(axis.text.x =
element_text(angle = 70, vjust = 0.5, color = "red"))
```

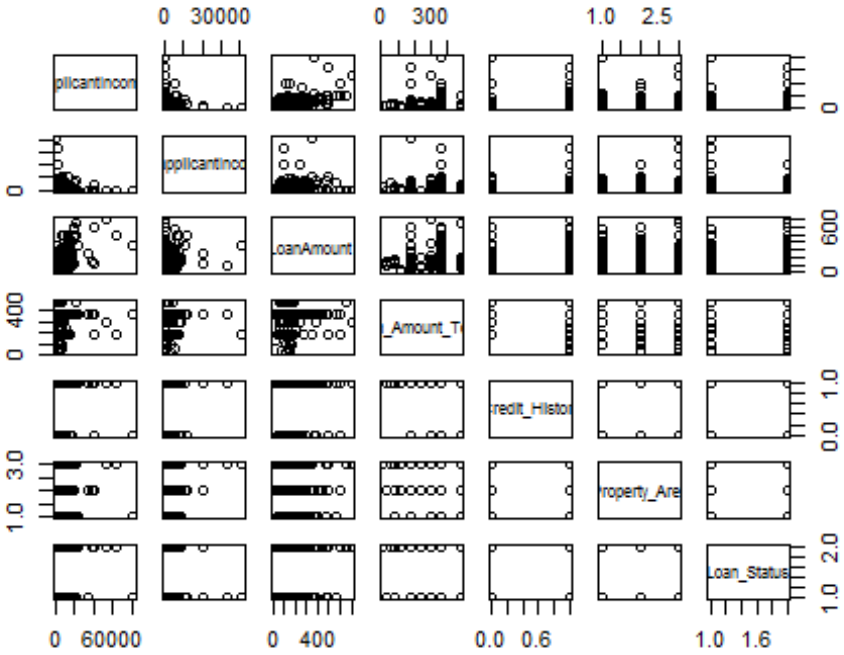
```
## Warning: Removed 50 rows containing non-finite values (stat_count).
```


```r
head(train)
```

```
##    Loan_ID Gender Married Dependents     Education Self_Employed
## 1 LP001002   Male      No          0      Graduate            No
## 2 LP001003   Male     Yes          1      Graduate            No
## 3 LP001005   Male     Yes          0      Graduate           Yes
## 4 LP001006   Male     Yes          0 Not Graduate            No
## 5 LP001008   Male      No          0      Graduate            No
## 6 LP001011   Male     Yes          2      Graduate           Yes
##   ApplicantIncome CoapplicantIncome LoanAmount Loan_Amount_Term
## 1            5849                0         NA               360
## 2            4583             1508        128               360
```

```
## 3             3000                 0         66                360
## 4             2583              2358        120                360
## 5             6000                 0        141                360
## 6             5417              4196        267                360
##   Credit_History Property_Area Loan_Status
## 1              1         Urban           Y
## 2              1         Rural           N
## 3              1         Urban           Y
## 4              1         Urban           Y
## 5              1         Urban           Y
## 6              1         Urban           Y
```

```
pairs(train[,7:13])
```




```
ggplot(train, aes(Credit_History,Loan_Status))+geom_bar(stat = "identity")
+theme(axis.text.x = element_text(angle = 70, vjust = 0.5, color = "red"))

## Warning: Removed 50 rows containing missing values (position_stack).
```


```
ggplot(train, aes(Credit_History,Loan_Status,fill=Gender))+geom_bar(position
= "dodge", stat = "identity") +theme(axis.text.x = element_text(angle = 70,
vjust = 0.2, color = "red"))

## Warning: Removed 50 rows containing missing values (geom_bar).
```


```
table(is.na(train))
```

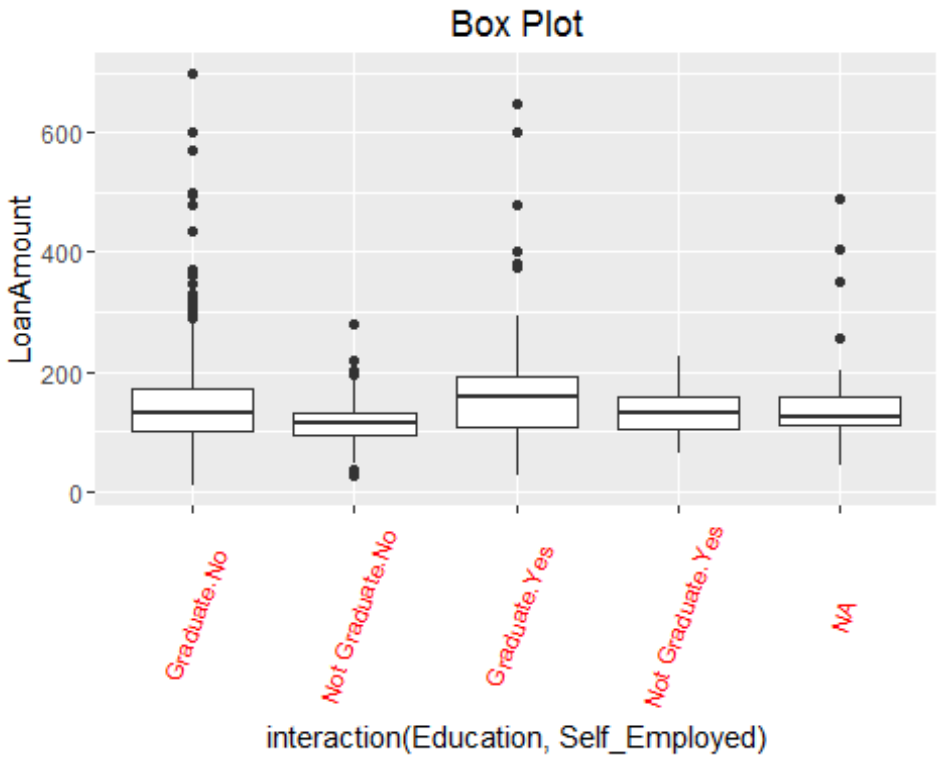
```
##
## FALSE  TRUE
##  7833   149
```

```
colSums(is.na(train))
```

```
##           Loan_ID            Gender           Married        Dependents
##                 0                13                 3                15
##         Education     Self_Employed   ApplicantIncome CoapplicantIncome
##                 0                32                 0                 0
##        LoanAmount  Loan_Amount_Term    Credit_History     Property_Area
##                22                14                50                 0
##       Loan_Status
##                 0
```

```
ggplot(data=train,
aes(interaction(Education,Self_Employed),LoanAmount))+geom_boxplot()
+ggtitle("Box Plot") + theme(axis.text.x = element_text(angle = 70, vjust =
0.5, color = "red"))
```

```
## Warning: Removed 22 rows containing non-finite values (stat_boxplot).
```




```
table(train$Self_Employed)

##
##  No Yes
## 500  82

#Data imputation by mean, median etc#
#train$Self_Employed[which(is.na(train$Self_Employed))] <- "No"#
library(mice)

## Warning: package 'mice' was built under R version 3.2.5

## Loading required package: Rcpp

## Warning: package 'Rcpp' was built under R version 3.2.5

## mice 2.25 2015-11-09

md.pattern(train)

##     Loan_ID Education ApplicantIncome CoapplicantIncome Property_Area
## 480       1         1                1                 1             1
##  12       1         1                1                 1             1
##  10       1         1                1                 1             1
##  25       1         1                1                 1             1
##  19       1         1                1                 1             1
##  12       1         1                1                 1             1
##  43       1         1                1                 1             1
```

```
##   2       1         1               1                 1             1
##   1       1         1               1                 1             1
##   1       1         1               1                 1             1
##   1       1         1               1                 1             1
##   1       1         1               1                 1             1
##   5       1         1               1                 1             1
##   1       1         1               1                 1             1
##   1       1         1               1                 1             1
##           0         0               0                 0             0
##     Loan_Status Married Gender Loan_Amount_Term Dependents LoanAmount
## 480           1       1      1                1          1          1
##  12           1       1      0                1          1          1
##  10           1       1      1                1          0          1
##  25           1       1      1                1          1          1
##  19           1       1      1                1          1          0
##  12           1       1      1                0          1          1
##  43           1       1      1                1          1          1
##   2           1       0      1                1          0          1
##   1           1       1      1                1          0          0
##   1           1       1      1                0          0          1
##   1           1       1      1                0          1          1
##   1           1       1      0                1          1          1
##   5           1       1      1                1          1          1
##   1           1       0      1                1          0          0
##   1           1       1      1                1          1          0
##               0       3     13               14         15         22
##     Self_Employed Credit_History
## 480             1              1   0
##  12             1              1   1
##  10             1              1   1
##  25             0              1   1
##  19             1              1   1
##  12             1              1   1
##  43             1              0   1
##   2             1              1   2
##   1             1              1   2
##   1             1              1   2
##   1             0              1   2
##   1             1              0   2
##   5             0              0   2
##   1             1              1   3
##   1             0              0   3
##                32             50 149
```

```
library(VIM)
```

```
## Warning: package 'VIM' was built under R version 3.2.5
```

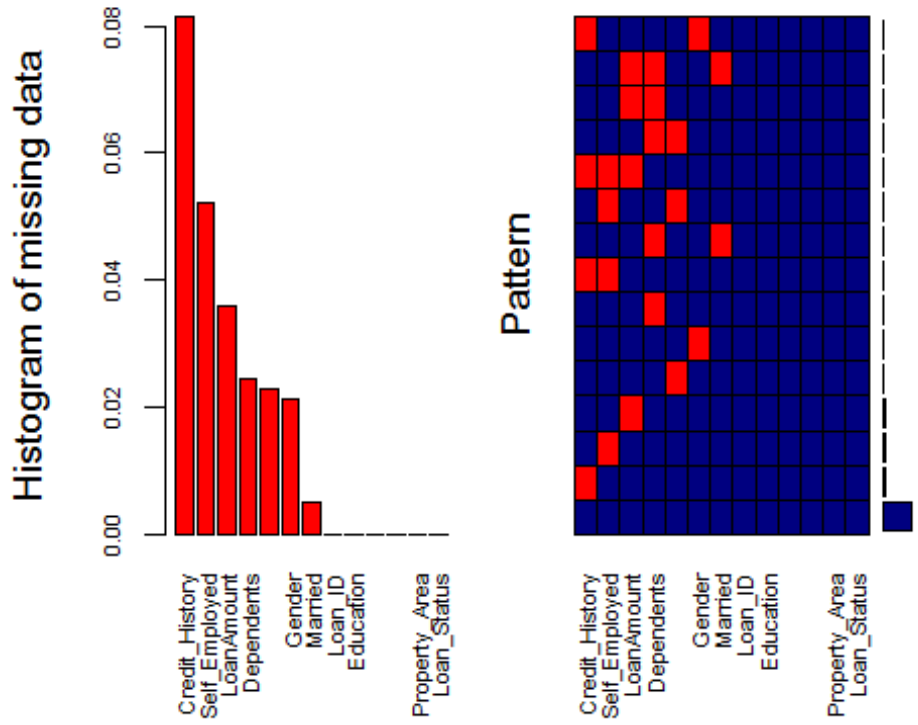
```
## Loading required package: colorspace
```

```
## Warning: package 'colorspace' was built under R version 3.2.5
```

```
## Loading required package: grid

## Loading required package: data.table

## Warning: package 'data.table' was built under R version 3.2.5

## VIM is ready to use.
##  Since version 4.0.0 the GUI is in its own package VIMGUI.
##
##           Please use the package to use the new (and old) GUI.

## Suggestions and bug-reports can be submitted at:
https://github.com/alexkowa/VIM/issues

##
## Attaching package: 'VIM'

## The following object is masked from 'package:datasets':
##
##     sleep
```

```r
#Plot missing values and check#
aggr_plot <- aggr(train, col=c('navyblue','red'), numbers=TRUE,
sortVars=TRUE, labels=names(train), cex.axis=.7, gap=3, ylab=c("Histogram of
missing data","Pattern"))
```

```
## Warning in plot.aggr(res, ...): not enough horizontal space to display
## frequencies
```



```
##
##  Variables sorted by number of missings:
##           Variable       Count
##     Credit_History 0.081433225
##      Self_Employed 0.052117264
##         LoanAmount 0.035830619
##         Dependents 0.024429967
##   Loan_Amount_Term 0.022801303
##             Gender 0.021172638
##            Married 0.004885993
##            Loan_ID 0.000000000
##          Education 0.000000000
##    ApplicantIncome 0.000000000
##  CoapplicantIncome 0.000000000
##      Property_Area 0.000000000
##        Loan_Status 0.000000000
```

```
labels(train)
```

```
## [[1]]
##   [1] "1"   "2"   "3"   "4"   "5"   "6"   "7"   "8"   "9"   "10"  "11"
##  [12] "12"  "13"  "14"  "15"  "16"  "17"  "18"  "19"  "20"  "21"  "22"
##  [23] "23"  "24"  "25"  "26"  "27"  "28"  "29"  "30"  "31"  "32"  "33"
##  [34] "34"  "35"  "36"  "37"  "38"  "39"  "40"  "41"  "42"  "43"  "44"
##  [45] "45"  "46"  "47"  "48"  "49"  "50"  "51"  "52"  "53"  "54"  "55"
##  [56] "56"  "57"  "58"  "59"  "60"  "61"  "62"  "63"  "64"  "65"  "66"
##  [67] "67"  "68"  "69"  "70"  "71"  "72"  "73"  "74"  "75"  "76"  "77"
##  [78] "78"  "79"  "80"  "81"  "82"  "83"  "84"  "85"  "86"  "87"  "88"
##  [89] "89"  "90"  "91"  "92"  "93"  "94"  "95"  "96"  "97"  "98"  "99"
## [100] "100" "101" "102" "103" "104" "105" "106" "107" "108" "109" "110"
## [111] "111" "112" "113" "114" "115" "116" "117" "118" "119" "120" "121"
## [122] "122" "123" "124" "125" "126" "127" "128" "129" "130" "131" "132"
## [133] "133" "134" "135" "136" "137" "138" "139" "140" "141" "142" "143"
## [144] "144" "145" "146" "147" "148" "149" "150" "151" "152" "153" "154"
## [155] "155" "156" "157" "158" "159" "160" "161" "162" "163" "164" "165"
## [166] "166" "167" "168" "169" "170" "171" "172" "173" "174" "175" "176"
## [177] "177" "178" "179" "180" "181" "182" "183" "184" "185" "186" "187"
## [188] "188" "189" "190" "191" "192" "193" "194" "195" "196" "197" "198"
## [199] "199" "200" "201" "202" "203" "204" "205" "206" "207" "208" "209"
## [210] "210" "211" "212" "213" "214" "215" "216" "217" "218" "219" "220"
## [221] "221" "222" "223" "224" "225" "226" "227" "228" "229" "230" "231"
## [232] "232" "233" "234" "235" "236" "237" "238" "239" "240" "241" "242"
## [243] "243" "244" "245" "246" "247" "248" "249" "250" "251" "252" "253"
## [254] "254" "255" "256" "257" "258" "259" "260" "261" "262" "263" "264"
## [265] "265" "266" "267" "268" "269" "270" "271" "272" "273" "274" "275"
## [276] "276" "277" "278" "279" "280" "281" "282" "283" "284" "285" "286"
## [287] "287" "288" "289" "290" "291" "292" "293" "294" "295" "296" "297"
## [298] "298" "299" "300" "301" "302" "303" "304" "305" "306" "307" "308"
## [309] "309" "310" "311" "312" "313" "314" "315" "316" "317" "318" "319"
## [320] "320" "321" "322" "323" "324" "325" "326" "327" "328" "329" "330"
```

```
## [331] "331" "332" "333" "334" "335" "336" "337" "338" "339" "340" "341"
## [342] "342" "343" "344" "345" "346" "347" "348" "349" "350" "351" "352"
## [353] "353" "354" "355" "356" "357" "358" "359" "360" "361" "362" "363"
## [364] "364" "365" "366" "367" "368" "369" "370" "371" "372" "373" "374"
## [375] "375" "376" "377" "378" "379" "380" "381" "382" "383" "384" "385"
## [386] "386" "387" "388" "389" "390" "391" "392" "393" "394" "395" "396"
## [397] "397" "398" "399" "400" "401" "402" "403" "404" "405" "406" "407"
## [408] "408" "409" "410" "411" "412" "413" "414" "415" "416" "417" "418"
## [419] "419" "420" "421" "422" "423" "424" "425" "426" "427" "428" "429"
## [430] "430" "431" "432" "433" "434" "435" "436" "437" "438" "439" "440"
## [441] "441" "442" "443" "444" "445" "446" "447" "448" "449" "450" "451"
## [452] "452" "453" "454" "455" "456" "457" "458" "459" "460" "461" "462"
## [463] "463" "464" "465" "466" "467" "468" "469" "470" "471" "472" "473"
## [474] "474" "475" "476" "477" "478" "479" "480" "481" "482" "483" "484"
## [485] "485" "486" "487" "488" "489" "490" "491" "492" "493" "494" "495"
## [496] "496" "497" "498" "499" "500" "501" "502" "503" "504" "505" "506"
## [507] "507" "508" "509" "510" "511" "512" "513" "514" "515" "516" "517"
## [518] "518" "519" "520" "521" "522" "523" "524" "525" "526" "527" "528"
## [529] "529" "530" "531" "532" "533" "534" "535" "536" "537" "538" "539"
## [540] "540" "541" "542" "543" "544" "545" "546" "547" "548" "549" "550"
## [551] "551" "552" "553" "554" "555" "556" "557" "558" "559" "560" "561"
## [562] "562" "563" "564" "565" "566" "567" "568" "569" "570" "571" "572"
## [573] "573" "574" "575" "576" "577" "578" "579" "580" "581" "582" "583"
## [584] "584" "585" "586" "587" "588" "589" "590" "591" "592" "593" "594"
## [595] "595" "596" "597" "598" "599" "600" "601" "602" "603" "604" "605"
## [606] "606" "607" "608" "609" "610" "611" "612" "613" "614"
##
## [[2]]
##  [1] "Loan_ID"           "Gender"            "Married"
##  [4] "Dependents"        "Education"         "Self_Employed"
##  [7] "ApplicantIncome"   "CoapplicantIncome" "LoanAmount"
## [10] "Loan_Amount_Term"  "Credit_History"    "Property_Area"
## [13] "Loan_Status"
```

```
#https://rpubs.com/corey_sparks/63681 . follow this link. Good#
train1 <- mice(data = train[,c("Gender", "Married",
"Dependents","Education","Self_Employed","ApplicantIncome","CoapplicantIncome
","LoanAmount","Loan_Amount_Term","Credit_History","Property_Area","Loan_Stat
us")], m=5,maxit=50,seed = 500)
```

```
##
##  iter imp variable
##   1   1  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   1   2  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   1   3  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   1   4  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
```

```
##   1   5  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   2   1  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   2   2  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   2   3  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   2   4  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   2   5  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   3   1  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   3   2  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   3   3  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   3   4  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   3   5  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   4   1  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
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Loan_Amount_Term  Credit_History
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Loan_Amount_Term  Credit_History
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Loan_Amount_Term  Credit_History
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Loan_Amount_Term  Credit_History
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Loan_Amount_Term  Credit_History
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Loan_Amount_Term  Credit_History
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##   49   1  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   49   2  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   49   3  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   49   4  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   49   5  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   50   1  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   50   2  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   50   3  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   50   4  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
##   50   5  Gender  Married  Dependents  Self_Employed  LoanAmount
Loan_Amount_Term  Credit_History
```

```r
summary(train1)
```

```
## Multiply imputed data set
## Call:
## mice(data = train[, c("Gender", "Married", "Dependents", "Education",
##     "Self_Employed", "ApplicantIncome", "CoapplicantIncome",
##     "LoanAmount", "Loan_Amount_Term", "Credit_History", "Property_Area",
```

```
##     "Loan_Status")], m = 5, maxit = 50, seed = 500)
## Number of multiple imputations:  5
## Missing cells per column:
##            Gender           Married        Dependents         Education
##                13                 3                15                 0
##     Self_Employed   ApplicantIncome CoapplicantIncome        LoanAmount
##                32                 0                 0                22
##  Loan_Amount_Term    Credit_History     Property_Area       Loan_Status
##                14                50                 0                 0
## Imputation methods:
##            Gender           Married        Dependents         Education
##          "logreg"          "logreg"         "polyreg"                ""
##     Self_Employed   ApplicantIncome CoapplicantIncome        LoanAmount
##          "logreg"                ""                ""             "pmm"
##  Loan_Amount_Term    Credit_History     Property_Area       Loan_Status
##             "pmm"             "pmm"                ""                ""
## VisitSequence:
##           Gender          Married       Dependents    Self_Employed
##                1                2                3                5
##       LoanAmount Loan_Amount_Term   Credit_History
##                8                9               10
## PredictorMatrix:
##                   Gender Married Dependents Education Self_Employed
## Gender                 0       1          1         1             1
## Married                1       0          1         1             1
## Dependents             1       1          0         1             1
## Education              0       0          0         0             0
## Self_Employed          1       1          1         1             0
## ApplicantIncome        0       0          0         0             0
## CoapplicantIncome      0       0          0         0             0
## LoanAmount             1       1          1         1             1
## Loan_Amount_Term       1       1          1         1             1
## Credit_History         1       1          1         1             1
## Property_Area          0       0          0         0             0
## Loan_Status            0       0          0         0             0
##                   ApplicantIncome CoapplicantIncome LoanAmount
## Gender                          1                 1          1
## Married                         1                 1          1
## Dependents                      1                 1          1
## Education                       0                 0          0
## Self_Employed                   1                 1          1
## ApplicantIncome                 0                 0          0
## CoapplicantIncome               0                 0          0
## LoanAmount                      1                 1          0
## Loan_Amount_Term                1                 1          1
## Credit_History                  1                 1          1
## Property_Area                   0                 0          0
## Loan_Status                     0                 0          0
##                   Loan_Amount_Term Credit_History Property_Area
## Gender                           1              1             1
```

```
## Married                           1              1              1
## Dependents                        1              1              1
## Education                         0              0              0
## Self_Employed                     1              1              1
## ApplicantIncome                   0              0              0
## CoapplicantIncome                 0              0              0
## LoanAmount                        1              1              1
## Loan_Amount_Term                  0              1              1
## Credit_History                    1              0              1
## Property_Area                     0              0              0
## Loan_Status                       0              0              0
##                    Loan_Status
## Gender                       1
## Married                      1
## Dependents                   1
## Education                    0
## Self_Employed                1
## ApplicantIncome              0
## CoapplicantIncome            0
## LoanAmount                   1
## Loan_Amount_Term             1
## Credit_History               1
## Property_Area                0
## Loan_Status                  0
## Random generator seed value:  500
```

```
#This is to see the variability in the 5 different imputations for each
outcome#
names(train)
```

```
##  [1] "Loan_ID"           "Gender"            "Married"
##  [4] "Dependents"        "Education"         "Self_Employed"
##  [7] "ApplicantIncome"   "CoapplicantIncome" "LoanAmount"
## [10] "Loan_Amount_Term"  "Credit_History"    "Property_Area"
## [13] "Loan_Status"
```

```
train2 <- with(data=train1
,exp=lm(Loan_Status~Gender+Married+Dependents+Education+Self_Employed+Applica
ntIncome+CoapplicantIncome+LoanAmount+Loan_Amount_Term+Credit_History+Propert
y_Area))
```

```
## Warning in model.response(mf, "numeric"): using type = "numeric" with a
## factor response will be ignored

## Warning in Ops.factor(y, z$residuals): '-' not meaningful for factors

## Warning in model.response(mf, "numeric"): using type = "numeric" with a
## factor response will be ignored

## Warning in Ops.factor(y, z$residuals): '-' not meaningful for factors
```

```
## Warning in model.response(mf, "numeric"): using type = "numeric" with a
## factor response will be ignored

## Warning in Ops.factor(y, z$residuals): '-' not meaningful for factors

## Warning in model.response(mf, "numeric"): using type = "numeric" with a
## factor response will be ignored

## Warning in Ops.factor(y, z$residuals): '-' not meaningful for factors

## Warning in model.response(mf, "numeric"): using type = "numeric" with a
## factor response will be ignored

## Warning in Ops.factor(y, z$residuals): '-' not meaningful for factors

train2

## call :
## with.mids(data = train1, expr = lm(Loan_Status ~ Gender + Married +
##     Dependents + Education + Self_Employed + ApplicantIncome +
##     CoapplicantIncome + LoanAmount + Loan_Amount_Term + Credit_History +
##     Property_Area))
##
## call1 :
## mice(data = train[, c("Gender", "Married", "Dependents", "Education",
##     "Self_Employed", "ApplicantIncome", "CoapplicantIncome",
##     "LoanAmount", "Loan_Amount_Term", "Credit_History", "Property_Area",
##     "Loan_Status")], m = 5, maxit = 50, seed = 500)
##
## nmis :
##            Gender           Married        Dependents         Education
##                13                 3                15                 0
##     Self_Employed   ApplicantIncome CoapplicantIncome        LoanAmount
##                32                 0                 0                22
##  Loan_Amount_Term    Credit_History     Property_Area       Loan_Status
##                14                50                 0                 0
##
## analyses :
## [[1]]
##
## Call:
## lm(formula = Loan_Status ~ Gender + Married + Dependents + Education +
##     Self_Employed + ApplicantIncome + CoapplicantIncome + LoanAmount +
##     Loan_Amount_Term + Credit_History + Property_Area)
##
## Coefficients:
##       (Intercept)            Gender2           Married2
##         1.074e+00          5.169e-04          9.230e-02
##       Dependents2        Dependents3        Dependents4
##        -6.223e-02          2.546e-02         -1.649e-03
##        Education2     Self_Employed2    ApplicantIncome
```

```
##        -4.773e-02          1.647e-02          9.584e-07
## CoapplicantIncome         LoanAmount   Loan_Amount_Term
##        -9.241e-06         -2.444e-04         -1.381e-04
##    Credit_History     Property_Area2     Property_Area3
##         7.127e-01          1.255e-01          3.108e-02
##
##
## [[2]]
##
## Call:
## lm(formula = Loan_Status ~ Gender + Married + Dependents + Education +
##     Self_Employed + ApplicantIncome + CoapplicantIncome + LoanAmount +
##     Loan_Amount_Term + Credit_History + Property_Area)
##
## Coefficients:
##       (Intercept)            Gender2           Married2
##         1.110e+00         -3.430e-03          8.810e-02
##       Dependents2        Dependents3        Dependents4
##        -6.417e-02          2.507e-02         -5.733e-03
##        Education2     Self_Employed2    ApplicantIncome
##        -6.153e-02         -2.457e-03          1.914e-06
## CoapplicantIncome         LoanAmount   Loan_Amount_Term
##        -9.059e-06         -3.522e-04         -1.549e-04
##    Credit_History     Property_Area2     Property_Area3
##         6.963e-01          1.311e-01          3.609e-02
##
##
## [[3]]
##
## Call:
## lm(formula = Loan_Status ~ Gender + Married + Dependents + Education +
##     Self_Employed + ApplicantIncome + CoapplicantIncome + LoanAmount +
##     Loan_Amount_Term + Credit_History + Property_Area)
##
## Coefficients:
##       (Intercept)            Gender2           Married2
##         1.063e+00          4.929e-03          9.237e-02
##       Dependents2        Dependents3        Dependents4
##        -6.197e-02          2.607e-02          6.639e-03
##        Education2     Self_Employed2    ApplicantIncome
##        -5.172e-02          2.928e-02          6.681e-07
## CoapplicantIncome         LoanAmount   Loan_Amount_Term
##        -1.084e-05         -2.287e-04         -1.527e-04
##    Credit_History     Property_Area2     Property_Area3
##         7.121e-01          1.377e-01          4.836e-02
##
##
## [[4]]
##
## Call:
```

```
## lm(formula = Loan_Status ~ Gender + Married + Dependents + Education +
##     Self_Employed + ApplicantIncome + CoapplicantIncome + LoanAmount +
##     Loan_Amount_Term + Credit_History + Property_Area)
##
## Coefficients:
##       (Intercept)            Gender2           Married2
##         1.090e+00          4.420e-03          9.211e-02
##       Dependents2        Dependents3        Dependents4
##        -6.812e-02          2.989e-02         -2.332e-03
##        Education2     Self_Employed2    ApplicantIncome
##        -6.468e-02          5.659e-03          2.394e-06
## CoapplicantIncome         LoanAmount   Loan_Amount_Term
##        -8.495e-06         -4.119e-04         -1.360e-04
##    Credit_History     Property_Area2     Property_Area3
##         7.117e-01          1.311e-01          2.856e-02
##
##
## [[5]]
##
## Call:
## lm(formula = Loan_Status ~ Gender + Married + Dependents + Education +
##     Self_Employed + ApplicantIncome + CoapplicantIncome + LoanAmount +
##     Loan_Amount_Term + Credit_History + Property_Area)
##
## Coefficients:
##       (Intercept)            Gender2           Married2
##         1.071e+00          5.334e-03          9.830e-02
##       Dependents2        Dependents3        Dependents4
##        -5.843e-02          2.996e-02          7.995e-03
##        Education2     Self_Employed2    ApplicantIncome
##        -6.515e-02         -4.980e-03          2.106e-06
## CoapplicantIncome         LoanAmount   Loan_Amount_Term
##        -9.034e-06         -3.986e-04         -1.062e-04
##    Credit_History     Property_Area2     Property_Area3
##         7.160e-01          1.295e-01          3.210e-02
```

```
#Pooling or combining results from all the 5 iterations#
train3 <- pool(train2)
```

```
## Warning in Ops.factor(r, 2): '^' not meaningful for factors

## Warning in Ops.factor(r, 2): '^' not meaningful for factors

## Warning in Ops.factor(r, 2): '^' not meaningful for factors

## Warning in Ops.factor(r, 2): '^' not meaningful for factors

## Warning in Ops.factor(r, 2): '^' not meaningful for factors

## Warning in Ops.factor(r, 2): '^' not meaningful for factors
```

```r
print(train3)
```

```
## Call: pool(object = train2)
##
## Pooled coefficients:
##       (Intercept)           Gender2          Married2       Dependents2
##      1.081481e+00      2.353873e-03      9.263618e-02     -6.298524e-02
##       Dependents3       Dependents4        Education2    Self_Employed2
##      2.729063e-02      9.838884e-04     -5.816442e-02      8.793945e-03
##   ApplicantIncome CoapplicantIncome        LoanAmount  Loan_Amount_Term
##      1.608077e-06     -9.333187e-06     -3.271587e-04     -1.375821e-04
##    Credit_History    Property_Area2    Property_Area3
##      7.097754e-01      1.309825e-01      3.523838e-02
##
## Fraction of information about the coefficients missing due to nonresponse:
##       (Intercept)           Gender2          Married2       Dependents2
##                NA                NA                NA                NA
##       Dependents3       Dependents4        Education2    Self_Employed2
##                NA                NA                NA                NA
##   ApplicantIncome CoapplicantIncome        LoanAmount  Loan_Amount_Term
##                NA                NA                NA                NA
##    Credit_History    Property_Area2    Property_Area3
##                NA                NA                NA
```