MVA.R

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```
#ggplot2 is used to plot the bar plot
#install.packages("ggplot2")
library("ggplot2")
#corrplot is used to plot the correlation matrix
#install.packages("corrplot")
library("corrplot")
```

```
## corrplot 0.84 loaded
```

```
#It is used to reshape a one-dimensional array into a two-dimensional array with one column and multiple arr
ays.
#install.packages("reshape")
library("reshape")
```

```
## Warning: package 'reshape' was built under R version 3.5.2
```

```
#Reading the dataset
breast_cancer <- read.csv("C:\\Users\\APEKSHA\\Downloads\\wisc_bc_data.csv")

#Displaying the dataset using head function
head(breast_cancer)
```

```
##         id diagnosis radius_mean texture_mean perimeter_mean area_mean
## 1 87139402         B       12.32        12.39          78.85     464.1
## 2  8910251         B       10.60        18.95          69.28     346.4
## 3   905520         B       11.04        16.83          70.92     373.2
## 4   868871         B       11.28        13.39          73.00     384.8
## 5  9012568         B       15.19        13.21          97.65     711.8
## 6   906539         B       11.57        19.04          74.20     409.7
##   smoothness_mean compactness_mean concavity_mean points_mean
## 1         0.10280          0.06981        0.03987     0.03700
## 2         0.09688          0.11470        0.06387     0.02642
## 3         0.10770          0.07804        0.03046     0.02480
## 4         0.11640          0.11360        0.04635     0.04796
## 5         0.07963          0.06934        0.03393     0.02657
## 6         0.08546          0.07722        0.05485     0.01428
##   symmetry_mean dimension_mean radius_se texture_se perimeter_se area_se
## 1        0.1959        0.05955    0.2360     0.6656        1.670   17.43
## 2        0.1922        0.06491    0.4505     1.1970        3.430   27.10
## 3        0.1714        0.06340    0.1967     1.3870        1.342   13.54
## 4        0.1771        0.06072    0.3384     1.3430        1.851   26.33
## 5        0.1721        0.05544    0.1783     0.4125        1.338   17.72
## 6        0.2031        0.06267    0.2864     1.4400        2.206   20.30
##   smoothness_se compactness_se concavity_se points_se symmetry_se
## 1      0.008045       0.011800      0.01683  0.012410     0.01924
## 2      0.007470       0.035810      0.03354  0.013650     0.03504
## 3      0.005158       0.009355      0.01056  0.007483     0.01718
## 4      0.011270       0.034980      0.02187  0.019650     0.01580
## 5      0.005012       0.014850      0.01551  0.009155     0.01647
## 6      0.007278       0.020470      0.04447  0.008799     0.01868
##   dimension_se radius_worst texture_worst perimeter_worst area_worst
## 1     0.002248        13.50         15.64           86.97      549.1
## 2     0.003318        11.88         22.94           78.28      424.8
## 3     0.002198        12.41         26.44           79.93      471.4
## 4     0.003442        11.92         15.77           76.53      434.0
## 5     0.001767        16.20         15.73          104.50      819.1
## 6     0.003339        13.07         26.98           86.43      520.5
##   smoothness_worst compactness_worst concavity_worst points_worst
## 1           0.1385            0.1266         0.12420      0.09391
## 2           0.1213            0.2515         0.19160      0.07926
## 3           0.1369            0.1482         0.10670      0.07431
## 4           0.1367            0.1822         0.08669      0.08611
## 5           0.1126            0.1737         0.13620      0.08178
## 6           0.1249            0.1937         0.25600      0.06664
##   symmetry_worst dimension_worst
## 1         0.2827         0.06771
## 2         0.2940         0.07587
## 3         0.2998         0.07881
## 4         0.2102         0.06784
## 5         0.2487         0.06766
## 6         0.3035         0.08284
```

```
#Displays structure of the dataset
str(breast_cancer)
```

```
## 'data.frame':    569 obs. of  32 variables:
##  $ id               : int  87139402 8910251 905520 868871 9012568 906539 925291 87880 862989 89827 ...
##  $ diagnosis        : Factor w/ 2 levels "B","M": 1 1 1 1 1 1 1 2 1 1 ...
##  $ radius_mean      : num  12.3 10.6 11 11.3 15.2 ...
##  $ texture_mean     : num  12.4 18.9 16.8 13.4 13.2 ...
##  $ perimeter_mean   : num  78.8 69.3 70.9 73 97.7 ...
##  $ area_mean        : num  464 346 373 385 712 ...
##  $ smoothness_mean  : num  0.1028 0.0969 0.1077 0.1164 0.0796 ...
##  $ compactness_mean : num  0.0698 0.1147 0.078 0.1136 0.0693 ...
##  $ concavity_mean   : num  0.0399 0.0639 0.0305 0.0464 0.0339 ...
##  $ points_mean      : num  0.037 0.0264 0.0248 0.048 0.0266 ...
##  $ symmetry_mean    : num  0.196 0.192 0.171 0.177 0.172 ...
##  $ dimension_mean   : num  0.0595 0.0649 0.0634 0.0607 0.0554 ...
##  $ radius_se        : num  0.236 0.451 0.197 0.338 0.178 ...
##  $ texture_se       : num  0.666 1.197 1.387 1.343 0.412 ...
##  $ perimeter_se     : num  1.67 3.43 1.34 1.85 1.34 ...
##  $ area_se          : num  17.4 27.1 13.5 26.3 17.7 ...
##  $ smoothness_se    : num  0.00805 0.00747 0.00516 0.01127 0.00501 ...
##  $ compactness_se   : num  0.0118 0.03581 0.00936 0.03498 0.01485 ...
##  $ concavity_se     : num  0.0168 0.0335 0.0106 0.0219 0.0155 ...
##  $ points_se        : num  0.01241 0.01365 0.00748 0.01965 0.00915 ...
##  $ symmetry_se      : num  0.0192 0.035 0.0172 0.0158 0.0165 ...
##  $ dimension_se     : num  0.00225 0.00332 0.0022 0.00344 0.00177 ...
##  $ radius_worst     : num  13.5 11.9 12.4 11.9 16.2 ...
##  $ texture_worst    : num  15.6 22.9 26.4 15.8 15.7 ...
##  $ perimeter_worst  : num  87 78.3 79.9 76.5 104.5 ...
##  $ area_worst       : num  549 425 471 434 819 ...
##  $ smoothness_worst : num  0.139 0.121 0.137 0.137 0.113 ...
##  $ compactness_worst: num  0.127 0.252 0.148 0.182 0.174 ...
##  $ concavity_worst  : num  0.1242 0.1916 0.1067 0.0867 0.1362 ...
##  $ points_worst     : num  0.0939 0.0793 0.0743 0.0861 0.0818 ...
##  $ symmetry_worst   : num  0.283 0.294 0.3 0.21 0.249 ...
##  $ dimension_worst  : num  0.0677 0.0759 0.0788 0.0678 0.0677 ...
```

```
#Displays the names of the columns
names(breast_cancer)
```

```
##  [1] "id"                "diagnosis"         "radius_mean"      
##  [4] "texture_mean"      "perimeter_mean"    "area_mean"        
##  [7] "smoothness_mean"   "compactness_mean"  "concavity_mean"   
## [10] "points_mean"       "symmetry_mean"     "dimension_mean"   
## [13] "radius_se"         "texture_se"        "perimeter_se"     
## [16] "area_se"           "smoothness_se"     "compactness_se"   
## [19] "concavity_se"      "points_se"         "symmetry_se"      
## [22] "dimension_se"      "radius_worst"      "texture_worst"    
## [25] "perimeter_worst"   "area_worst"        "smoothness_worst" 
## [28] "compactness_worst" "concavity_worst"   "points_worst"     
## [31] "symmetry_worst"    "dimension_worst"
```

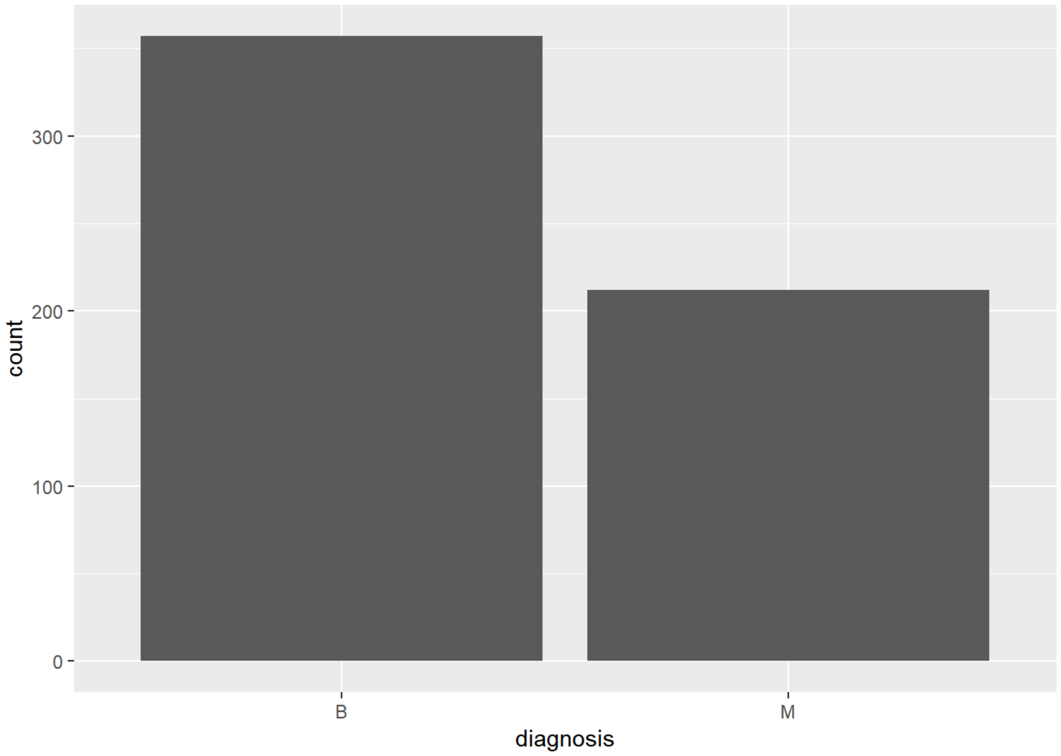
```
#Displays the summary of the dataset
summary(breast_cancer)
```

```
##        id             diagnosis  radius_mean      texture_mean
##  Min.   :     8670   B:357     Min.   : 6.981   Min.   : 9.71
##  1st Qu.:   869218   M:212     1st Qu.:11.700   1st Qu.:16.17
##  Median :   906024             Median :13.370   Median :18.84
##  Mean   : 30371831             Mean   :14.127   Mean   :19.29
##  3rd Qu.:  8813129             3rd Qu.:15.780   3rd Qu.:21.80
##  Max.   :911320502             Max.   :28.110   Max.   :39.28
##  perimeter_mean     area_mean      smoothness_mean   compactness_mean
##  Min.   : 43.79   Min.   : 143.5   Min.   :0.05263   Min.   :0.01938
##  1st Qu.: 75.17   1st Qu.: 420.3   1st Qu.:0.08637   1st Qu.:0.06492
##  Median : 86.24   Median : 551.1   Median :0.09587   Median :0.09263
##  Mean   : 91.97   Mean   : 654.9   Mean   :0.09636   Mean   :0.10434
##  3rd Qu.:104.10   3rd Qu.: 782.7   3rd Qu.:0.10530   3rd Qu.:0.13040
##  Max.   :188.50   Max.   :2501.0   Max.   :0.16340   Max.   :0.34540
##  concavity_mean     points_mean      symmetry_mean    dimension_mean
##  Min.   :0.00000   Min.   :0.00000   Min.   :0.1060   Min.   :0.04996
##  1st Qu.:0.02956   1st Qu.:0.02031   1st Qu.:0.1619   1st Qu.:0.05770
##  Median :0.06154   Median :0.03350   Median :0.1792   Median :0.06154
##  Mean   :0.08880   Mean   :0.04892   Mean   :0.1812   Mean   :0.06280
##  3rd Qu.:0.13070   3rd Qu.:0.07400   3rd Qu.:0.1957   3rd Qu.:0.06612
##  Max.   :0.42680   Max.   :0.20120   Max.   :0.3040   Max.   :0.09744
##    radius_se        texture_se      perimeter_se       area_se
##  Min.   :0.1115   Min.   :0.3602   Min.   : 0.757   Min.   :  6.802
##  1st Qu.:0.2324   1st Qu.:0.8339   1st Qu.: 1.606   1st Qu.: 17.850
##  Median :0.3242   Median :1.1080   Median : 2.287   Median : 24.530
##  Mean   :0.4052   Mean   :1.2169   Mean   : 2.866   Mean   : 40.337
##  3rd Qu.:0.4789   3rd Qu.:1.4740   3rd Qu.: 3.357   3rd Qu.: 45.190
##  Max.   :2.8730   Max.   :4.8850   Max.   :21.980   Max.   :542.200
##  smoothness_se      compactness_se      concavity_se
##  Min.   :0.001713   Min.   :0.002252   Min.   :0.00000
##  1st Qu.:0.005169   1st Qu.:0.013080   1st Qu.:0.01509
##  Median :0.006380   Median :0.020450   Median :0.02589
##  Mean   :0.007041   Mean   :0.025478   Mean   :0.03189
##  3rd Qu.:0.008146   3rd Qu.:0.032450   3rd Qu.:0.04205
##  Max.   :0.031130   Max.   :0.135400   Max.   :0.39600
##    points_se         symmetry_se        dimension_se        radius_worst
##  Min.   :0.000000   Min.   :0.007882   Min.   :0.0008948   Min.   : 7.93
##  1st Qu.:0.007638   1st Qu.:0.015160   1st Qu.:0.0022480   1st Qu.:13.01
##  Median :0.010930   Median :0.018730   Median :0.0031870   Median :14.97
##  Mean   :0.011796   Mean   :0.020542   Mean   :0.0037949   Mean   :16.27
##  3rd Qu.:0.014710   3rd Qu.:0.023480   3rd Qu.:0.0045580   3rd Qu.:18.79
##  Max.   :0.052790   Max.   :0.078950   Max.   :0.0298400   Max.   :36.04
##  texture_worst   perimeter_worst    area_worst     smoothness_worst
##  Min.   :12.02   Min.   : 50.41   Min.   : 185.2   Min.   :0.07117
##  1st Qu.:21.08   1st Qu.: 84.11   1st Qu.: 515.3   1st Qu.:0.11660
##  Median :25.41   Median : 97.66   Median : 686.5   Median :0.13130
##  Mean   :25.68   Mean   :107.26   Mean   : 880.6   Mean   :0.13237
##  3rd Qu.:29.72   3rd Qu.:125.40   3rd Qu.:1084.0   3rd Qu.:0.14600
##  Max.   :49.54   Max.   :251.20   Max.   :4254.0   Max.   :0.22260
##  compactness_worst concavity_worst   points_worst     symmetry_worst
##  Min.   :0.02729   Min.   :0.0000   Min.   :0.00000   Min.   :0.1565
##  1st Qu.:0.14720   1st Qu.:0.1145   1st Qu.:0.06493   1st Qu.:0.2504
##  Median :0.21190   Median :0.2267   Median :0.09993   Median :0.2822
##  Mean   :0.25427   Mean   :0.2722   Mean   :0.11461   Mean   :0.2901
##  3rd Qu.:0.33910   3rd Qu.:0.3829   3rd Qu.:0.16140   3rd Qu.:0.3179
##  Max.   :1.05800   Max.   :1.2520   Max.   :0.29100   Max.   :0.6638
##  dimension_worst
##  Min.   :0.05504
##  1st Qu.:0.07146
##  Median :0.08004
##  Mean   :0.08395
##  3rd Qu.:0.09208
##  Max.   :0.20750
```

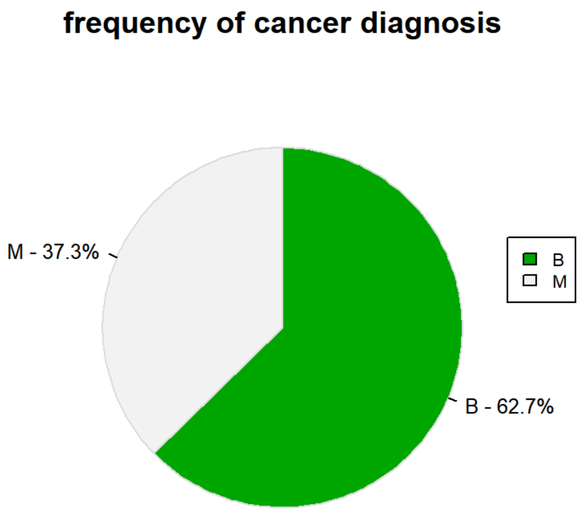
```
#To display the frequency table
diagnosis.table <- table(breast_cancer$diagnosis)

#Displays the table
#This shows how many patients are benign and malignant
diagnosis.table
```

```
##
##   B   M
## 357 212
```

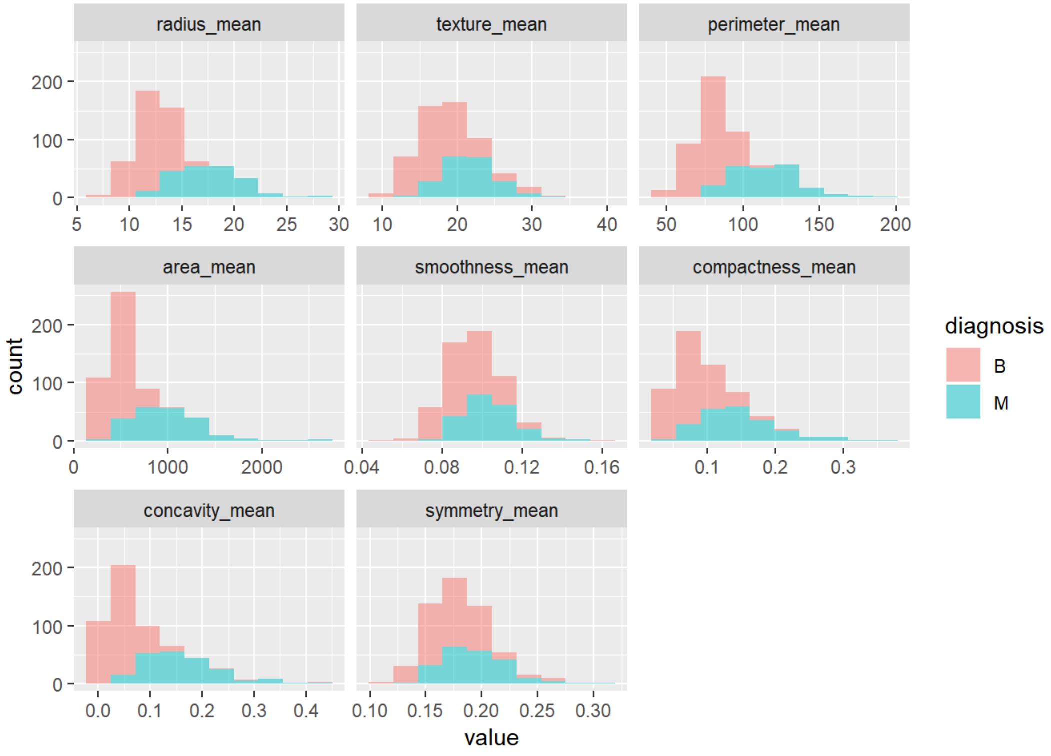
```
#Generate barplot
ggplot(data=breast_cancer, aes(x=diagnosis)) + geom_bar(stat = "count")
```



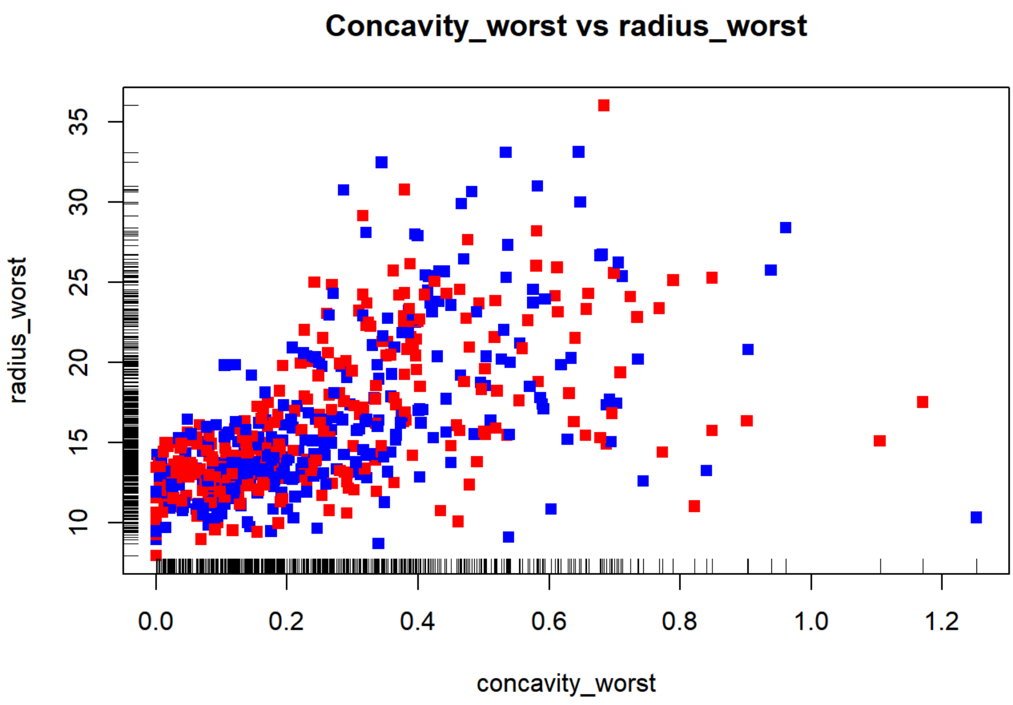
```
#Generate Pie chart represented in frequency
diagnosis.prop.table <- prop.table(diagnosis.table)*100
diagnosis.prop.df <- as.data.frame(diagnosis.prop.table)
pielabels <- sprintf("%s - %3.1f%s", diagnosis.prop.df[,1], diagnosis.prop.table, "%")
colors <- terrain.colors(2)
pie(diagnosis.prop.table,
    labels=pielabels,
    clockwise=TRUE,
    col=colors,
    border="gainsboro",
    radius=0.8,
    cex=0.8,
    main="frequency of cancer diagnosis")
legend(1, .4, legend=diagnosis.prop.df[,1], cex = 0.7, fill = colors)
```



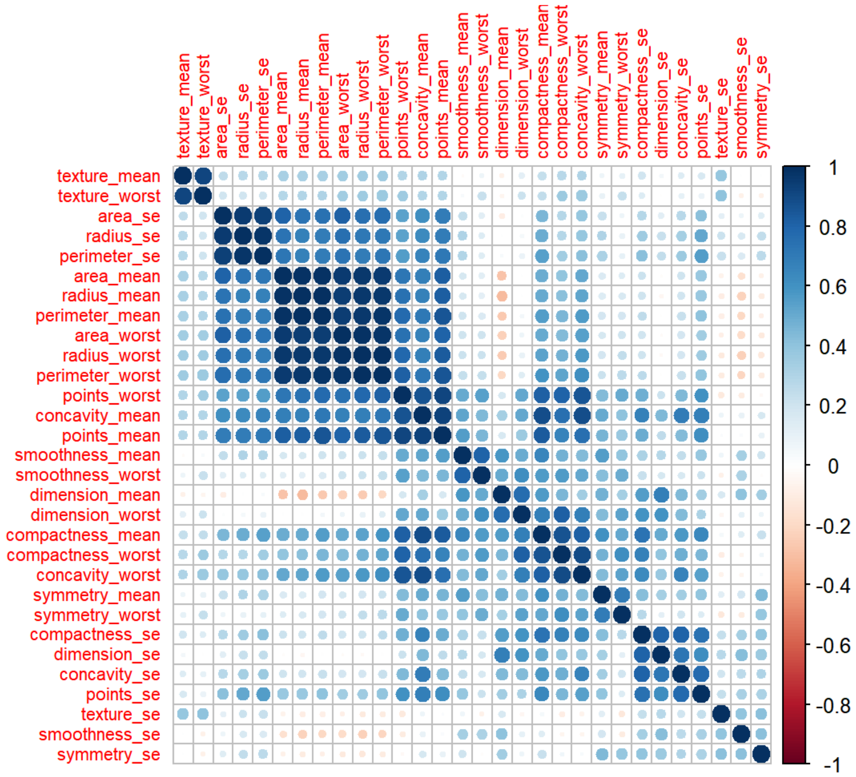
```r
#To Plot histograms of "mean" variables group by diagnosis
data_mean <- breast_cancer[ ,c("diagnosis", "radius_mean", "texture_mean","perimeter_mean", "area_mean", "smoothness_mean", "compactness_mean", "concavity_mean", "symmetry_mean" )]

#Plot histograms
ggplot(data = melt(data_mean, id.var = "diagnosis"), mapping = aes(x = value)) +
  geom_histogram(bins = 10, aes(fill=diagnosis), alpha=0.5) + facet_wrap(~variable, scales ='free_x')
```



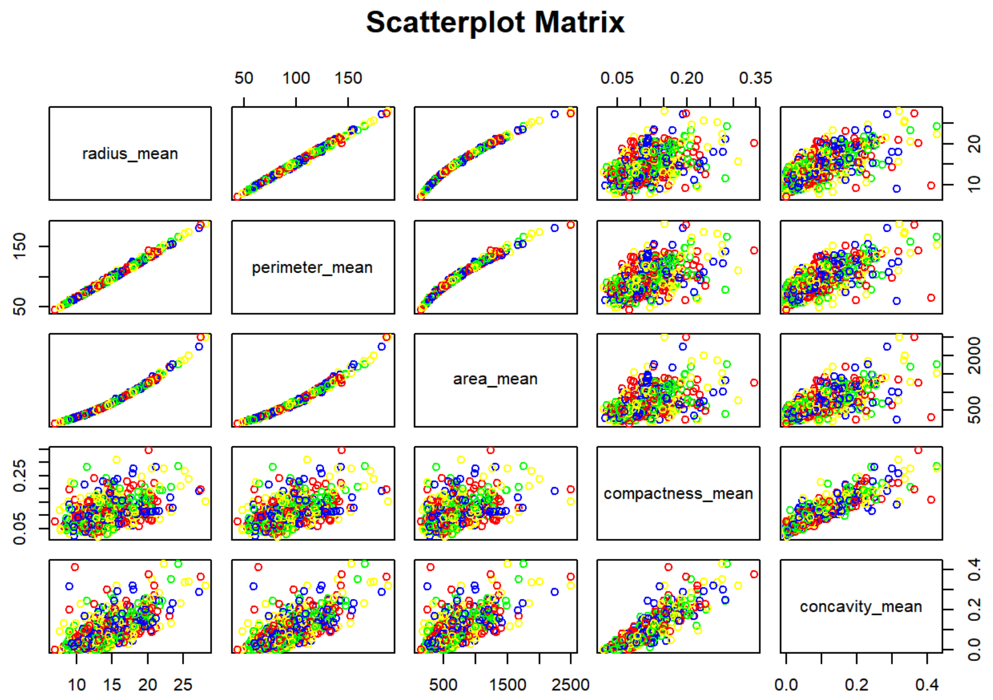
```
#Generate a Scatter plot of two varaible ie. concavity against radius
data <- breast_cancer[,c('concavity_worst','radius_worst')]
plot(x = breast_cancer$concavity_worst,y = breast_cancer$radius_worst,
     xlab = "concavity_worst",
     ylab = "radius_worst",
     main = "Concavity_worst vs radius_worst",
     pch=15,
     col = c("red","blue")
     )
rug(breast_cancer$concavity_worst, side = 1)
rug(breast_cancer$radius_worst, side = 2)
```



```
#Generate Corelation Matrix of columns
corMatMy <- cor(breast_cancer[,3:32])
corrplot(corMatMy, order = "hclust", tl.cex = 0.7)
```



```
#Generate Scatterplot Matrix
pairs(~radius_mean+perimeter_mean+area_mean+compactness_mean+concavity_mean,data = breast_cancer,main = "Scatterplot Matrix",col=c("red","blue","green","yellow"))
```


Scatterplot Matrix
radius_mean
perimeter_mean
area_mean
compactness_mean
concavity_mean