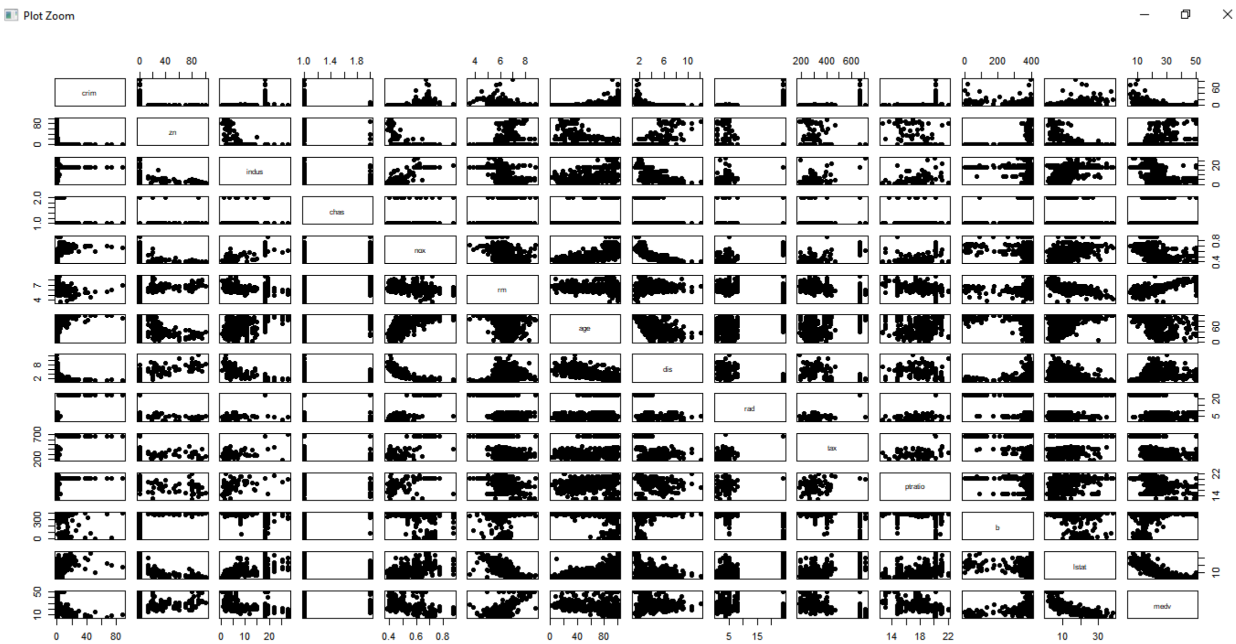
Arinjay Jain (A20447307) CSP571_HW2_Part1

1. Create a scatterplot matrix of all variables in the data set. Save your output.

```
> pairs(BostonHousing[,1:14], pch = 19)
```



2. For each numeric variable in BostonHousing, create a separate boxplot using

"Method 2" listed in the class notes. Do this programmatically; meaning do

not simply hardcode the creation of every boxplot. Instead, loop over the

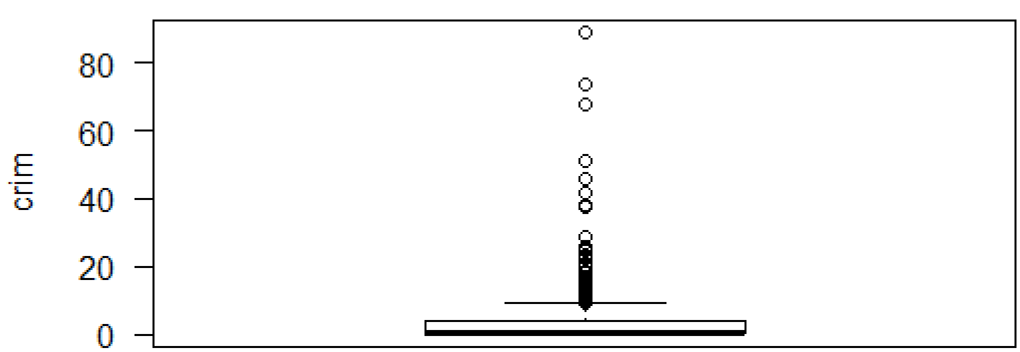
approriate columns and create the boxplots. Save your output. Ensure your boxplots

all have proper titles

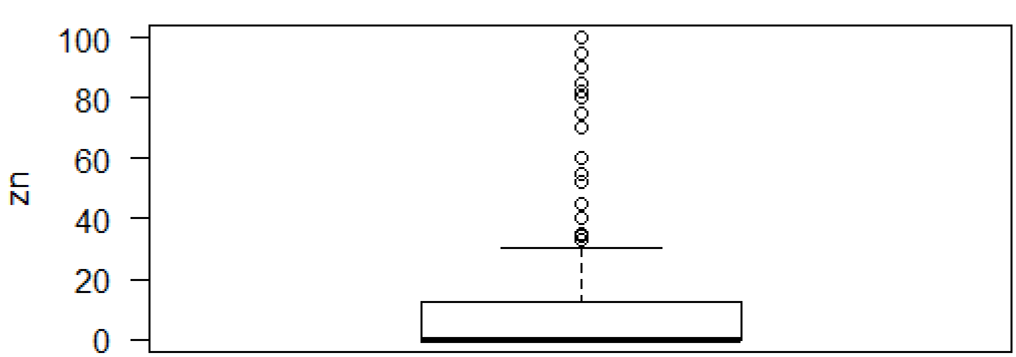
```
coltype<-sapply(BostonHousing, class)
> coltype
     crim        zn     indus      chas       nox        rm       age       dis       rad 
"numeric" "numeric" "numeric"  "factor" "numeric" "numeric" "numeric" "numeric" "numeric" 
      tax   ptratio         b     lstat      medv 
"numeric" "numeric" "numeric" "numeric" "numeric" 


> for ( i in (1:ncol(BostonHousing))){
+   if ("numeric" == coltype[i]){
+     #box plot of each columns
+     boxplot(BostonHousing[i], main =paste("Box Plot",names(BostonHousing[i])), ylab = n
ames(BostonHousing[i]), las=1)
+   }
+ }
```

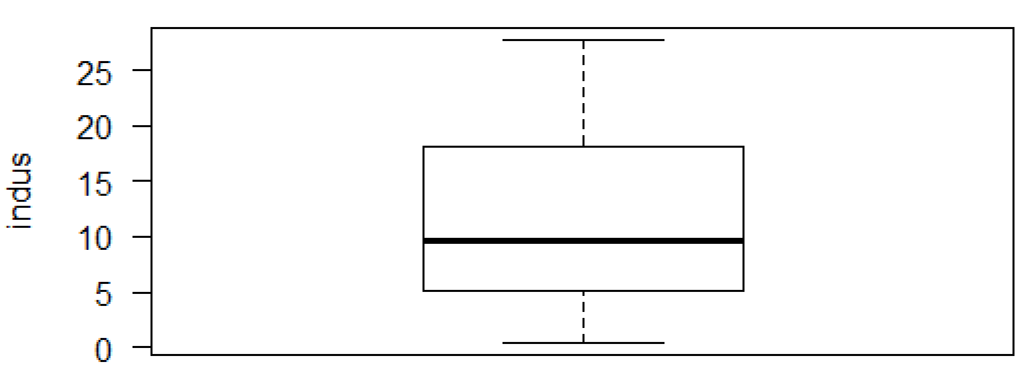
Box Plot crim

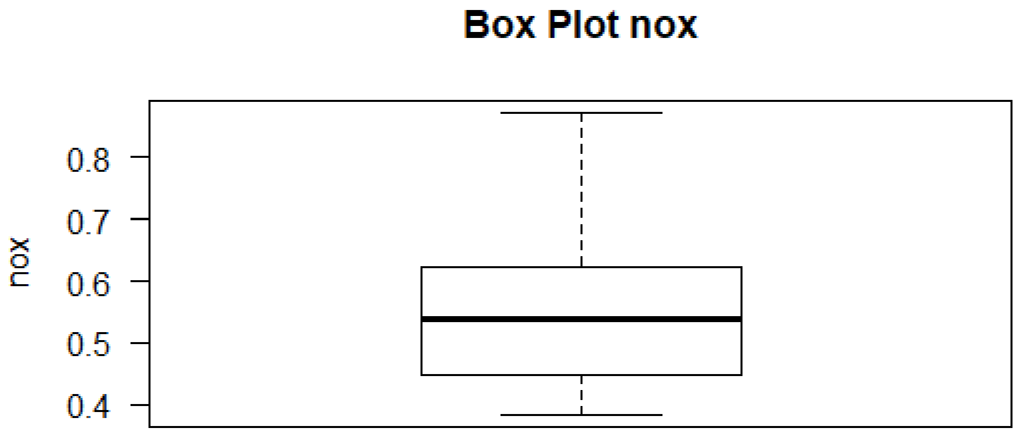


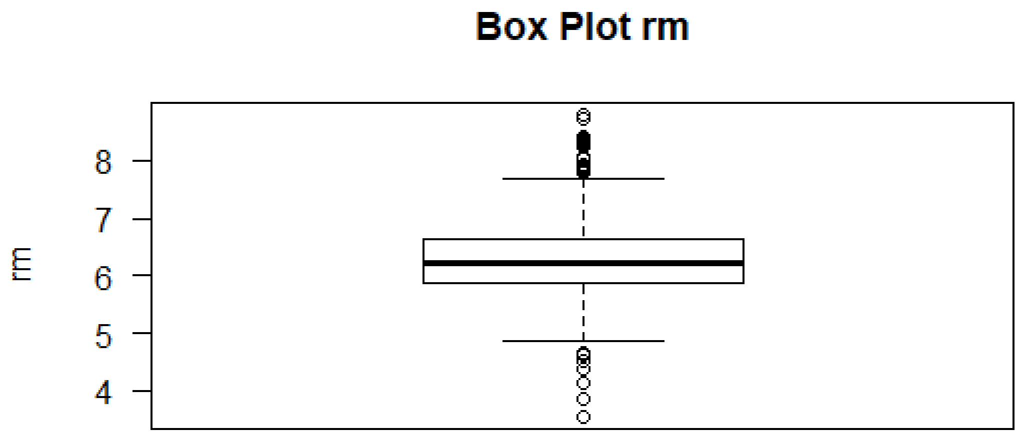
Box Plot zn

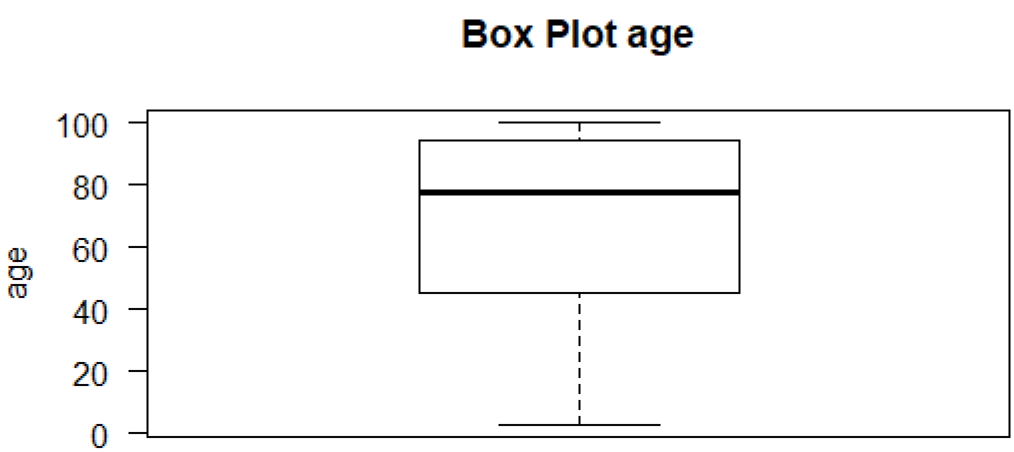


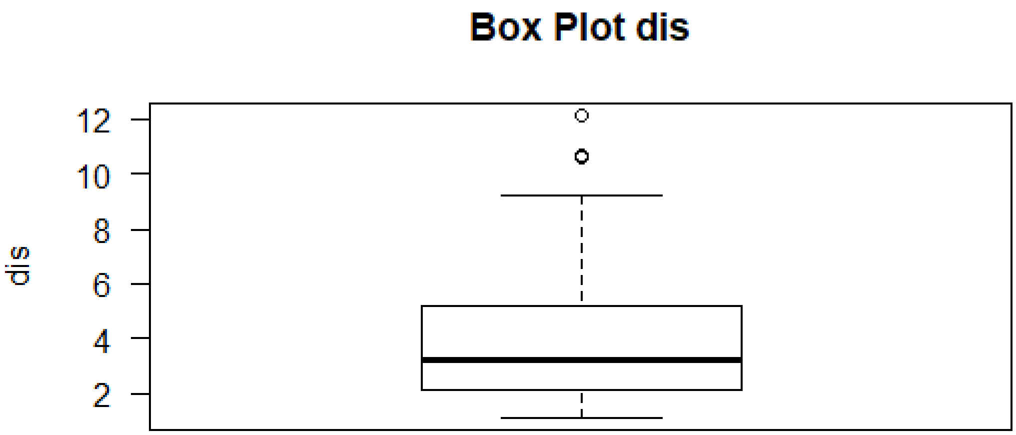
Box Plot indus

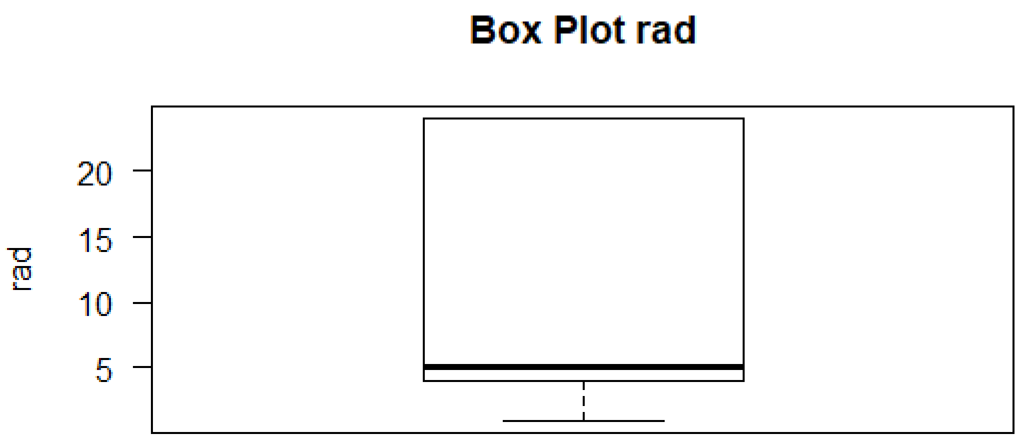


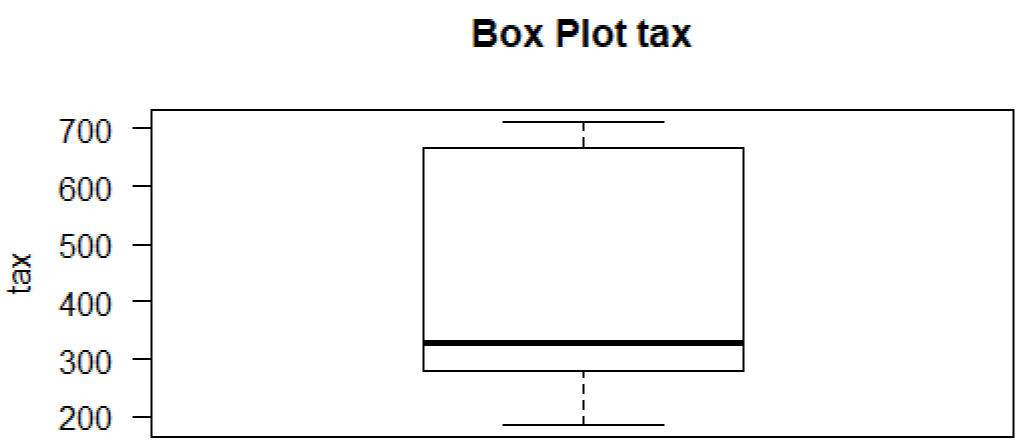

Box Plot nox
nox
0.4
0.5
0.6
0.7
0.8

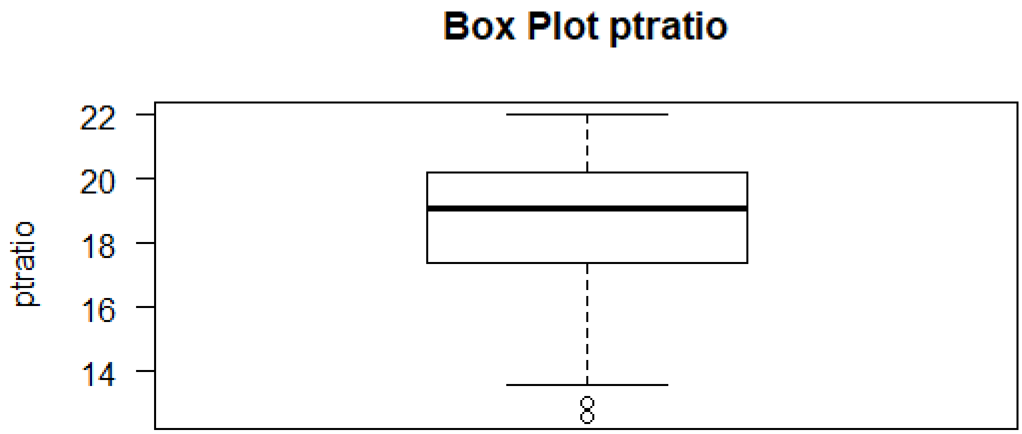

Box Plot rm
rm
4
5
6
7
8

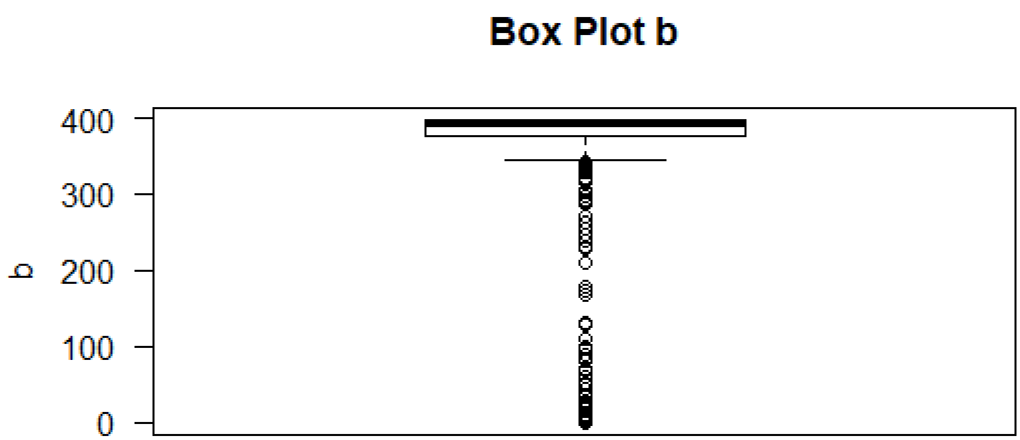

Box Plot age
age
0
20
40
60
80
100

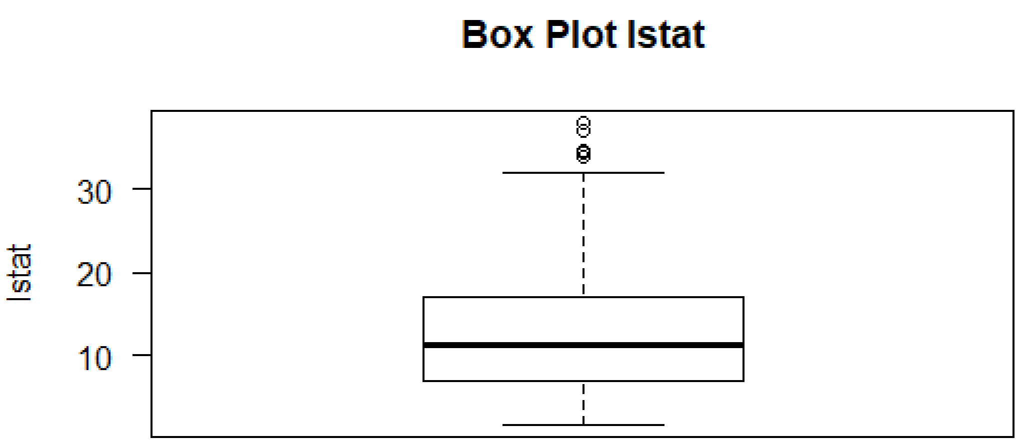

Box Plot dis
dis
12
10
8
6
4
2

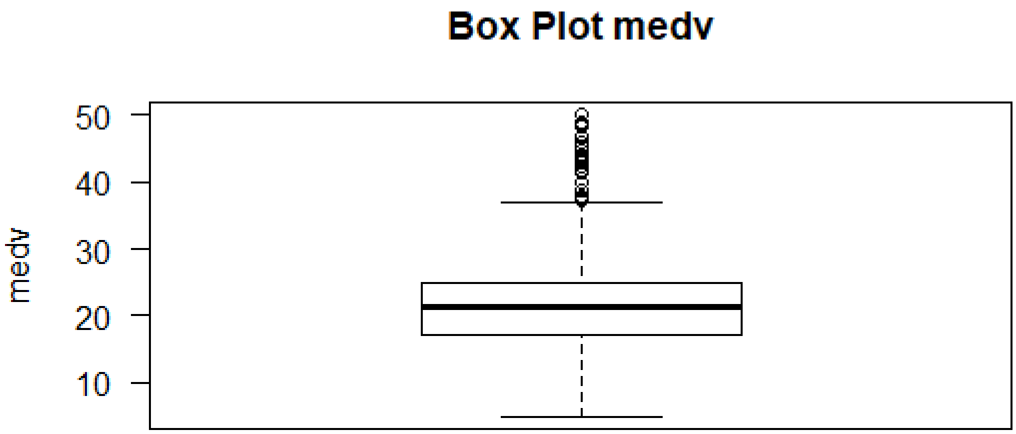

Box Plot rad
rad
20
15
10
5


Box Plot tax
tax
700
600
500
400
300
200


Box Plot ptratio
ptratio
22
20
18
16
14


Box Plot b
b
400
300
200
100
0


Box Plot lstat
lstat
30
20
10



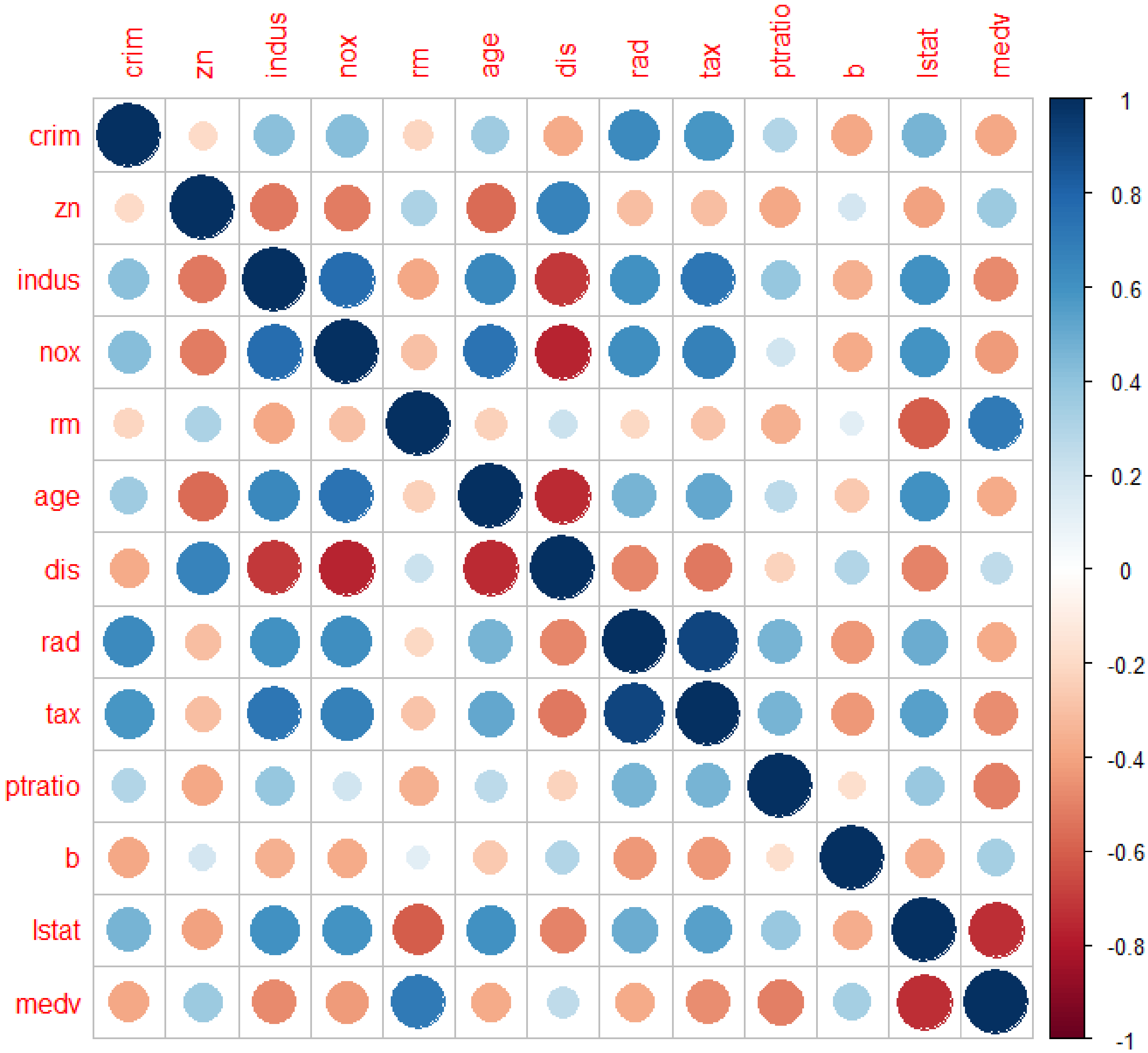
3. Create a correlation matrix and correlation plot

for the BostonHousing data set. Save your output.

```
> library(corrplot)
> cor_Mat<-cor(BostonHousing[,sapply(BostonHousing, is.numeric)], method = c("pearson", "
kendall", "spearman"))
> cor_Mat<- round(cor_Mat,2)

> print(cor_Mat)
```

```
         crim    zn indus   nox    rm   age   dis   rad   tax ptratio     b lstat  medv
crim     1.00 -0.20  0.41  0.42 -0.22  0.35 -0.38  0.63  0.58    0.29 -0.39  0.46 -0.39
zn      -0.20  1.00 -0.53 -0.52  0.31 -0.57  0.66 -0.31 -0.31   -0.39  0.18 -0.41  0.36
indus    0.41 -0.53  1.00  0.76 -0.39  0.64 -0.71  0.60  0.72    0.38 -0.36  0.60 -0.48
nox      0.42 -0.52  0.76  1.00 -0.30  0.73 -0.77  0.61  0.67    0.19 -0.38  0.59 -0.43
rm      -0.22  0.31 -0.39 -0.30  1.00 -0.24  0.21 -0.21 -0.29   -0.36  0.13 -0.61  0.70
age      0.35 -0.57  0.64  0.73 -0.24  1.00 -0.75  0.46  0.51    0.26 -0.27  0.60 -0.38
dis     -0.38  0.66 -0.71 -0.77  0.21 -0.75  1.00 -0.49 -0.53   -0.23  0.29 -0.50  0.25
rad      0.63 -0.31  0.60  0.61 -0.21  0.46 -0.49  1.00  0]\.91    0.46 -0.44  0.49 -0.38
tax      0.58 -0.31  0.72  0.67 -0.29  0.51 -0.53  0.91  1.00    0.46 -0.44  0.54 -0.47
ptratio  0.29 -0.39  0.38  0.19 -0.36  0.26 -0.23  0.46  0.46    1.00 -0.18  0.37 -0.51
b       -0.39  0.18 -0.36 -0.38  0.13 -0.27  0.29 -0.44 -0.44   -0.18  1.00 -0.37  0.33
lstat    0.46 -0.41  0.60  0.59 -0.61  0.60 -0.50  0.49  0.54    0.37 -0.37  1.00 -0.74
medv    -0.39  0.36 -0.48 -0.43  0.70 -0.38  0.25 -0.38 -0.47   -0.51  0.33 -0.74  1.00
> corrplot(cor_Mat)
```




```
> # 4. Identify the top 3 strongest absolute correlations in the data set. Save your outp
ut.
> # because diagonl and half matrix have self correlation cofficient and same correlation
cofficient with others
> cor_Mat[lower.tri(cor_Mat,diag=TRUE)]<-NA
> cor_Cof<-as.data.frame(as.table(cor_Mat))
> #removing NA
> cor_Cof<-cor_Cof[complete.cases(cor_Cof),]
> cor_Cof<-cor_Cof[order(abs(cor_Cof$Freq),decreasing = TRUE),]
> # TOP 3 STRONGEST ABSOLUTE CORRELATION
> cor_Cof[1:3,]
     Var1 Var2  Freq
112   rad  tax  0.91
82    nox  dis -0.77
42  indus  nox  0.76
```

```
> # 5. Create a new variable call ageGroup quartiles. Divide the age variable
> # into four even sections and assign it to one quartile.
> BostonHousing$ageGroup<-NULL
> BostonHousing$ageGroup<-cut(BostonHousing$age, breaks = quantile(BostonHousing$age, pro
bs = seq(0, 1, 0.25)), include.lowest = TRUE)

> head(BostonHousing)

     crim zn indus chas   nox    rm  age    dis rad tax ptratio      b lstat medv
1 0.00632 18  2.31    0 0.538 6.575 65.2 4.0900   1 296    15.3 396.90  4.98 24.0
2 0.02731  0  7.07    0 0.469 6.421 78.9 4.9671   2 242    17.8 396.90  9.14 21.6
3 0.02729  0  7.07    0 0.469 7.185 61.1 4.9671   2 242    17.8 392.83  4.03 34.7
4 0.03237  0  2.18    0 0.458 6.998 45.8 6.0622   3 222    18.7 394.63  2.94 33.4
5 0.06905  0  2.18    0 0.458 7.147 54.2 6.0622   3 222    18.7 396.90  5.33 36.2
6 0.02985  0  2.18    0 0.458 6.430 58.7 6.0622   3 222    18.7 394.12  5.21 28.7
     ageGroup
1   (45,77.5]
2 (77.5,94.1]
3   (45,77.5]
4   (45,77.5]
5   (45,77.5]
6   (45,77.5]
```

```
> # 6. Go to the website listed below. Convert the html table into a
> # dataframe with columns NO, Player, Highlights
> library('rvest')
> library('tidyr')
> url = 'http://www.espn.com/nfl/superbowl/history/mvps'
> my_df <- as.data.frame(read_html(url) %>% html_table(trim = TRUE, fill=TRUE))
> my_df<-my_df[-(1:2),]
> names(my_df)<-c('NO', 'Player', 'Highlights')
> head(my_df)
   NO                       Player                         Highlights
3   I      Bart Starr, QB, Green Bay              Two touchdown passes
4  II      Bart Starr, QB, Green Bay           202 yards passing, 1 TD
5 III Joe Namath, QB, New York Jets                  206 yards passing
6  IV    Len Dawson, QB, Kansas City           142 yards passing, 1 TD
7   V       Chuck Howley, LB, Dallas Two interceptions, fumble recovery
8  VI     Roger Staubach, QB, Dallas          119 yards passing, 2 TDs
```

```
> # 7.Extract the names of the MVPs, Position and Team into columns
> # MVP1, MVP2, Position, Team
> my_df<-separate(my_df, Player, c('MVPs', 'Position', 'Team')
+                 , sep=', ' # We want to split this where the comma is located
+                 , remove=TRUE)
> my_df$MVPs <- ifelse(!grepl('&', my_df$MVPs), paste0(my_df$MVPs,"&"), my_df$MVPs)
> my_df<-separate(my_df, MVPs, c('MVP1', 'MVP2')
+                 , sep='&' # We want to split this where the & is located
+                 , remove=TRUE)
> #my_df <- sapply(my_df, as.character)
> #my_df[is.na(my_df)] <- ""
> head(my_df)
```

```
    NO          MVP1 MVP2 Position         Team                       Highlights
3    I      Bart Starr           QB      Green Bay            Two touchdown passes
4   II      Bart Starr           QB      Green Bay         202 yards passing, 1 TD
5  III      Joe Namath           QB New York Jets                206 yards passing
6   IV      Len Dawson           QB    Kansas City         142 yards passing, 1 TD
7    V    Chuck Howley           LB         Dallas Two interceptions, fumble recovery
8   VI Roger Staubach            QB         Dallas           119 yards passing, 2 TDs
```

```
> print(my_df[10:15,])
      NO             MVP1          MVP2 Position       Team
12     X       Lynn Swann                     WR Pittsburgh
13    XI Fred Biletnikoff                     WR    Oakland
14   XII    Harvey Martin  Randy White        DL     Dallas
15  XIII    Terry Bradshaw                    QB Pittsburgh
16   XIV    Terry Bradshaw                    QB Pittsburgh
17    XV      Jim Plunkett                    QB    Oakland
                                    Highlights
12                     4 catches, 161 yards, 1 TD
13                            4 catches, 79 yards
14 Led Dallas defense that forced eight turnovers
15                       318 yards passing, 4 TDs
16                       309 yards passing, 2 TDs
17                       261 yards passing, 3 TDs
```

8. Determine the 90th%, 92.5th%, 95th%, 97.5th% and 99th% confidence intervals# for the mean of passing yards

(as listed in "Highlights" column) for quarterbacks.

```
> #quarterbacks = QB in positions.
> df_QB <- subset(my_df, Position == 'QB')
> split_Higlights<-unlist(strsplit(df_QB$Highlights, " "))
> yards_values<-NULL
> for (i in 1:length(split_Higlights)){
+   if (grepl("yards",split_Higlights[i])){
+     yards_values<-append(yards_values,split_Higlights[i-1])
+   }
+ }
> print(yards_values)
 [1] "202" "206" "142" "119" "318" "309" "261" "157" "331" "268" "340" "297" "292" "273"
[15] "325" "336" "414" "145" "354" "247" "255" "288" "304" "296" "287" "328" "466" "373"
[29] "286"
> # confidence intervals
> t.test(as.numeric(yards_values), conf.level = 0.9)

        One Sample t-test

data:  as.numeric(yards_values)
t = 19.259, df = 28, p-value < 2.2e-16
alternative hypothesis: true mean is not equal to 0
90 percent confidence interval:
 258.3797 308.4479
sample estimates:
mean of x
 283.4138

> t.test(as.numeric(yards_values), conf.level = 0.925)

        One Sample t-test

data:  as.numeric(yards_values)
t = 19.259, df = 28, p-value < 2.2e-16
alternative hypothesis: true mean is not equal to 0
92.5 percent confidence interval:
```

```
 256.1994 310.6282
sample estimates:
mean of x
 283.4138


> t.test(as.numeric(yards_values), conf.level = 0.95)

        One Sample t-test

data:  as.numeric(yards_values)
t = 19.259, df = 28, p-value < 2.2e-16
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
 253.2691 313.5585
sample estimates:
mean of x
 283.4138

> t.test(as.numeric(yards_values), conf.level = 0.975)

        One Sample t-test

data:  as.numeric(yards_values)
t = 19.259, df = 28, p-value < 2.2e-16
alternative hypothesis: true mean is not equal to 0
97.5 percent confidence interval:
 248.5593 318.2683
sample estimates:
mean of x
 283.4138

> t.test(as.numeric(yards_values), conf.level = 0.99)

        One Sample t-test

data:  as.numeric(yards_values)
t = 19.259, df = 28, p-value < 2.2e-16
alternative hypothesis: true mean is not equal to 0
99 percent confidence interval:
 242.7492 324.0784
sample estimates:
mean of x
 283.4138



> # 9. The following contains data on the calorie counts of four types
> # of foods. Perform an ANOVA and determine the Pr(>F)
> food1 <- c(164,   172,   168,   177,       156,    195)
> food2 <- c(178,   191,       197,    182,    185,    177)
> food3 <- c(175,      193,    178,    171,    163,    176)
> food4 <- c(155,      166,    149,    164,    170,    168)
> food_df <- data.frame(food1,food2,food3,food4)
> food_df <- stack(food_df)
> anova<-aov(food_df$values ~ food_df$ind, food_df)
> print(anova)
Call:
   aov(formula = food_df$values ~ food_df$ind, data = food_df)

Terms:
                food_df$ind Residuals
Sum of Squares       1636.5    2018.0
Deg. of Freedom           3        20

Residual standard error: 10.0449
Estimated effects may be unbalanced
> summary(anova)
            Df Sum Sq Mean Sq F value  Pr(>F)
```

```
food_df$ind  3   1636   545.5   5.406 0.00688 **
Residuals   20   2018   100.9
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

```
# 10. Determine how many
# Tuesdays fell on the first of the month
# during the 19th century (1 Jan 1801 to 31 Dec 1901).

install.packages("lubridate")

> library(lubridate)
> beginDate<-as.Date("1801-01-01")
> endDate<-as.Date("1901-12-31")
> sum(wday(seq(beginDate,endDate,"months"), label = TRUE) == "Tue")
[1] 173
```