

# Assignment on predictive analysis

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## PROBLEM SET 1

**Download “Boston” housing data from MASS library in R. Complete the task given below and submit the report using R markdown. You need to copy each question as well.**

```
library(MASS)

## Warning: package 'MASS' was built under R version 4.5.2

x=Boston
head(x)

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

**1. Report the “class” of the data set. How many rows and columns are in this data set? What do the rows and columns represent?**

```
class(Boston)

## [1] "data.frame"
```

The Boston dataset is of datatype data.frame

```

dim(Boston)
## [1] 506 14

```

The Boston dataset has 506 rows and 14 columns

```

str(x)

## 'data.frame': 506 obs. of 14 variables:
## $ crim : num 0.00632 0.02731 0.02729 0.03237 0.06905 ...
## $ zn   : num 18 0 0 0 0 12.5 12.5 12.5 12.5 ...
## $ indus: num 2.31 7.07 7.07 2.18 2.18 2.18 7.87 7.87 7.87 ...
## $ chas : int 0 0 0 0 0 0 0 0 ...
## $ nox  : num 0.538 0.469 0.469 0.458 0.458 0.458 0.524 0.524 0.524 ...
## $ rm   : num 6.58 6.42 7.18 7 7.15 ...
## $ age  : num 65.2 78.9 61.1 45.8 54.2 58.7 66.6 96.1 100 85.9 ...
## $ dis  : num 4.09 4.97 4.97 6.06 6.06 ...
## $ rad  : int 1 2 2 3 3 3 5 5 5 ...
## $ tax  : num 296 242 242 222 222 222 311 311 311 311 ...
## $ ptratio: num 15.3 17.8 17.8 18.7 18.7 18.7 15.2 15.2 15.2 15.2 ...
## $ black : num 397 397 393 395 397 ...
## $ lstat : num 4.98 9.14 4.03 2.94 5.33 ...
## $ medv  : num 24 21.6 34.7 33.4 36.2 28.7 22.9 27.1 16.5 18.9 ...

```

Each row represents a suburb of Boston . The columns represent the variables

**2. Create a smaller data set with the variables median value of owner-occupied homes, per capita crime rate, nitrogen oxides concentration, proportion of blacks and percentage of lower status of the population. Choosing median value of owner occupied homes as the response and the rest as the pre- dictors, make scatter plots of the response versus each predictor. Present the scatter plots in different panels of the same graph. Comment on your findings.**

```

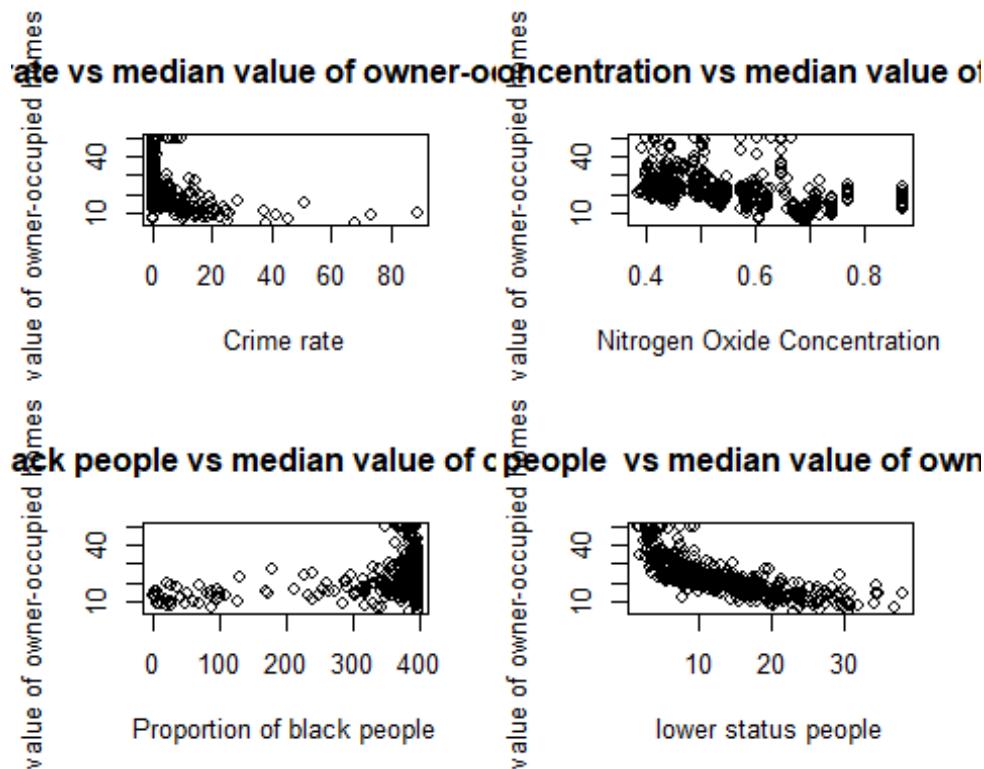
x=data.frame(Boston$medv,Boston$crim,Boston$nox,Boston$black,Boston$lstat)
head(x)

##   Boston.medv Boston.crim Boston.nox Boston.black Boston.lstat
## 1      24.0     0.00632     0.538      396.90      4.98
## 2      21.6     0.02731     0.469      396.90      9.14
## 3      34.7     0.02729     0.469      392.83      4.03
## 4      33.4     0.03237     0.458      394.63      2.94
## 5      36.2     0.06905     0.458      396.90      5.33
## 6      28.7     0.02985     0.458      394.12      5.21

par(mfrow=c(2,2))
plot(x$Boston.crim,x$Boston.medv,xlab="Crime rate",ylab="median value of
owner-occupied homes in $1000s",main="Scatterplot of Crime rate vs median
value of owner-occupied homes in $1000s")
plot(x$Boston.nox,x$Boston.medv,xlab="Nitrogen Oxide
Concentration",ylab="median value of owner-occupied homes in

```

```
$1000s",main="Scatterplot of nitrogen oxides concentration vs median value of owner-occupied homes in $1000s ")
plot(x$Boston.black,x$Boston.medv,xlab="Proportion of black people",ylab="median value of owner-occupied homes in $1000s",main="Scatterplot of proportion of black people vs median value of owner-occupied homes in $1000s ")
plot(x$Boston.lstat,x$Boston.medv,xlab="lower status people",ylab="median value of owner-occupied homes in $1000s",main="Scatterplot of lower status people vs median value of owner-occupied homes in $1000s ")
```



From Scatterplot of crime rate vs median values we thus see that there is a negative strong linear relationship between them indicating higher crime rates are associated with lower house prices

From Scatterplot of Nitrogen Oxide Concentration vs median values we thus see that there is a negative strong linear relationship between them indicating higher pollution is associated with lower house prices

From Scatterplot of proportion of black people vs median values we thus see that there is a positive linear relationship between them indicating higher the proportion of black people,higher are the house prices

From Scatterplot of lower status of population vs median values we thus see that there is a negative strong linear relationship between them indicating more number of lower status people in the popluation are associated with lower house prices

**3. Which suburb of Boston has lowest median value of owner-occupied homes? What are the values of the other predictors mentioned in (2), for that suburb. How do these values compare to the overall ranges for those pre- dictors? Comment on your findings. Hint: Mention which percentile these values belong to.**

```
min=which.min(Boston$medv)
min

## [1] 399

low_medv_suburb=Boston[min, c("medv", "crim", "nox", "black", "lstat")]
low_medv_suburb

##      medv      crim      nox black lstat
## 399  38.3518 0.693 396.9 30.59
```

The 399 th suburb has the lowest median . The values of the suburb for the predictors in 2 are given above

```
percentile = function(x, value) {
  mean(x <= value) * 100
}

percentiles = sapply(
  c("crim", "nox", "black", "lstat"),
  function(v) percentile(Boston[[v]], low_medv_suburb[[v]])
)

percentiles

##      crim      nox      black      lstat
## 98.81423 85.77075 100.00000 97.82609
```