Assignment 2: R Basics and Exploratory Data Analysis

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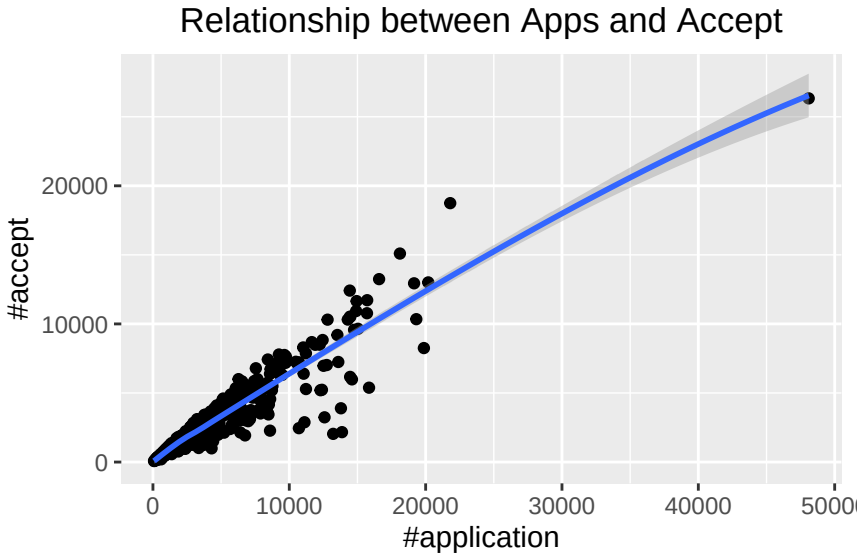
1. College Data Analysis

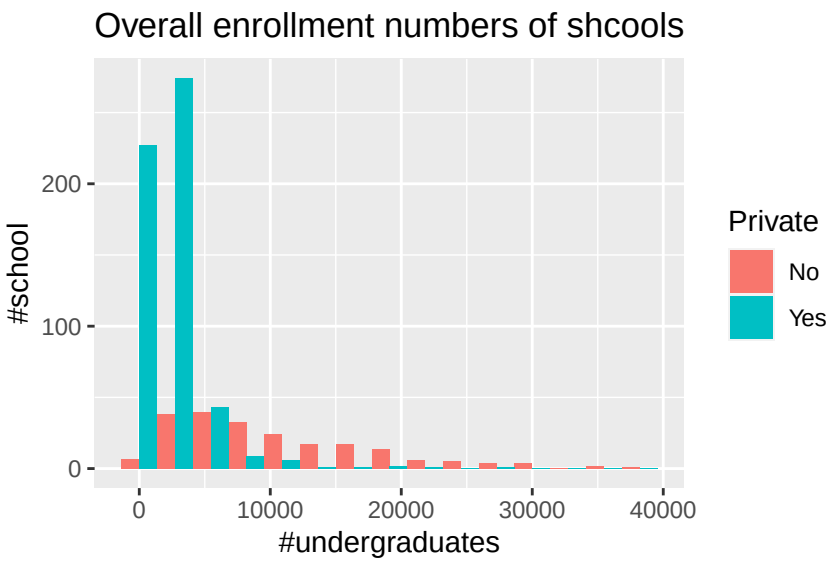
```
library(ggplot2)

##### a. Read the data into R.
College = read.csv("College.csv", header = TRUE)

##### b. Find the median cost of books.
median(College$ Books)
```

```
## [1] 500
```

```
##### c. Produce a scatterplot showing relationship between Apps and Accept.
ggplot(data=College, aes(x=Apps, y=Accept)) + geom_point() + geom_smooth() +
       labs(title="Relationship between Apps and Accept",
            x="#application", y="#accept") +
       theme(plot.title = element_text(hjust = 0.5))
```



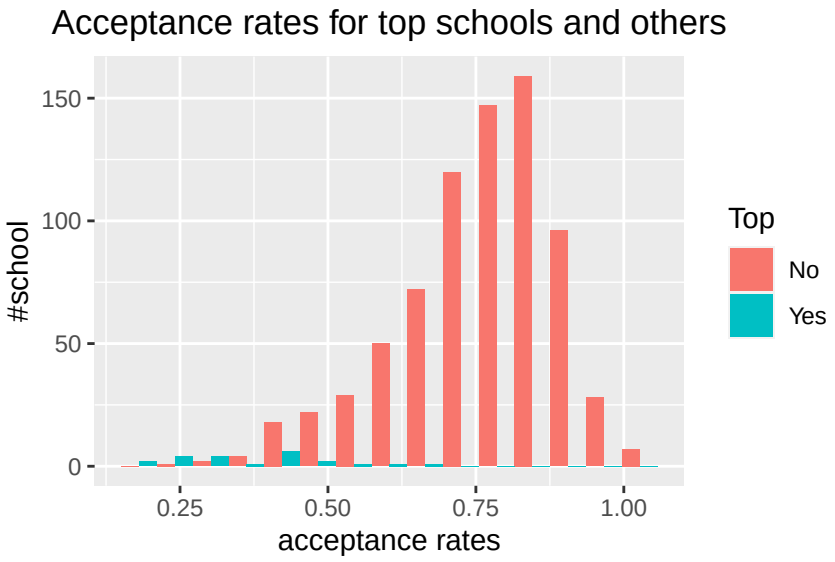

```
##### d. Showing the overall enrollment numbers (P.Undergrad plus F.Undergrad)
ggplot(College, aes(x = P.Undergrad+F.Undergrad, fill = Private)) +
      geom_histogram(bins = 15, position = "dodge") +
      labs(title="Overall enrollment numbers of shcools",
           x="#undergraduates", y="#school") +
      theme(plot.title = element_text(hjust = 0.5))
```




```
##### e. Schools'acceptance rates for each of the two Top categories
Top <- as.factor(ifelse(College$Top10perc > 75, "Yes", "No"))
summary(Top)
```

```
##  No Yes
## 755  22
```

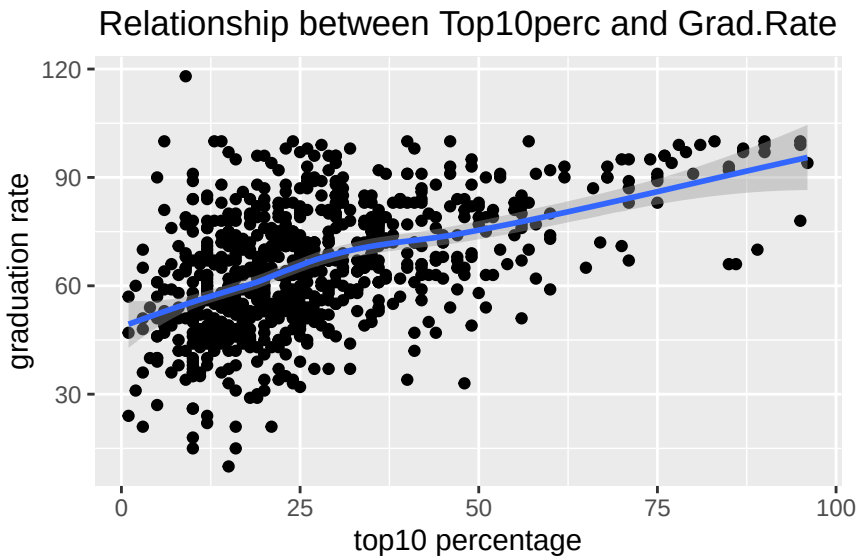
```
AccRate = College$Accept / College$Apps
ggplot(College, aes(x = AccRate, fill = Top)) +
      geom_histogram(bins = 15, position = "dodge") +
      labs(title="Acceptance rates for top schools and others",
           x="acceptance rates", y="#school") +
      theme(plot.title = element_text(hjust = 0.5))
```



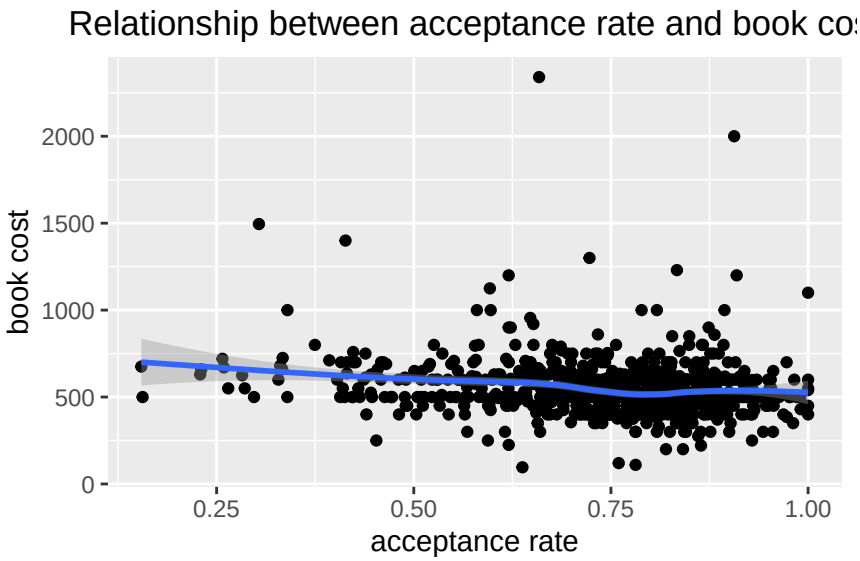

```
cat ("The number of top universities is ", sum(College$Top10perc > 75))
```

```
## The number of top universities is  22
```

```
##### f. Two new plots of any type,

# Colleges that have the most students from top 10% of high school class
# usually have better graduation rate but do not obtain the highest graduation rate.
ggplot(data=College, aes(x=Top10perc, y=Grad.Rate)) + geom_point() + geom_smooth() +
       labs(title="Relationship between Top10perc and Grad.Rate",
            x="top10 percentage", y="graduation rate") +
       theme(plot.title = element_text(hjust = 0.5))
```




```
#Universities with various acceptance rates seem to have very close book cost.
ggplot(data=College, aes(x=AccRate, y=Books)) + geom_point() + geom_smooth() +
       labs(title="Relationship between acceptance rate and book cost",
            x="acceptance rate", y="book cost") +
       theme(plot.title = element_text(hjust = 0.5))
```



2. Auto Data Analysis

```
library(ggplot2)
library (PerformanceAnalytics)

##### Read the data into R.
Auto = read.csv("Auto.csv", header = TRUE, na.strings = "?")
Auto = na.omit(Auto)
dim(Auto)
```

```
## [1] 392   9
```

```
##### a. Specify which of the predictors are quantitative, and which are qualitative?
# Quantitative: mpg cylinders   displacement    horsepower  weight  acceleration    year.
QuantitativePredictors = c("mpg", "cylinders", "displacement", "horsepower",
                           "weight", "acceleration", "year")
# Translate origin into factor
Auto$originFactor = factor(Auto$origin, labels = c("USA", "Germany", "Japan"))
table(Auto$originFactor, Auto$origin)
```

```
##
##             1   2   3
##   USA     245   0   0
##   Germany   0  68   0
##   Japan     0   0  79
```

```
# Qualitative:  name origin originFactor
QualitativePredictors = c("name", "origin", "originFactor")

##### b. What is the range, mean and standard deviation of each quantitative predictor?
Quantitatives = which(names(Auto) %in% QuantitativePredictors)
sapply(Auto[, Quantitatives], range)
```

```
##       mpg cylinders displacement horsepower weight acceleration year
## [1,]  9.0         3           68         46   1613          8.0   70
## [2,] 46.6         8          455        230   5140         24.8   82
```

```
sapply(Auto[, Quantitatives], mean)
```

```
##          mpg    cylinders displacement   horsepower       weight acceleration
##    23.445918     5.471939   194.411990   104.469388  2977.584184    15.541327
##         year
##    75.979592
```

```
sapply(Auto[, Quantitatives], sd)
```

```
##          mpg    cylinders displacement   horsepower       weight acceleration
##     7.805007     1.705783   104.644004    38.491160   849.402560     2.758864
##         year
##     3.683737
```

```
##### c. Now remove the 40th through 80th (inclusive) observations from the dataset.
#####    What is the range, mean, and standard deviation of each predictor in the
#####    subset of the data that remains?
sapply(Auto[-seq(40, 80), Quantitatives], range)
```

```
##       mpg cylinders displacement horsepower weight acceleration year
## [1,]  9.0         3           68         46   1649          8.0   70
```

```
## [2,] 46.6         8          455         230    4997         24.8    82
```

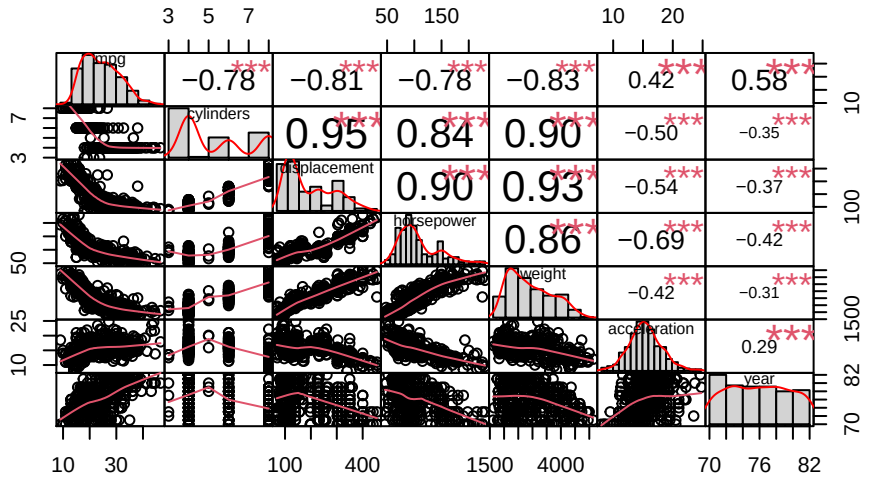
```
sapply(Auto[-seq(40, 80), Quantitatives], mean)
```

```
##          mpg    cylinders displacement   horsepower       weight acceleration
##    23.931054     5.424501   190.943020   103.019943  2948.934473    15.581766
##         year
##    76.492877
```

```
sapply(Auto[-seq(40, 80), Quantitatives], sd)
```

```
##          mpg    cylinders displacement   horsepower       weight acceleration
##     7.826817     1.667975   101.726508    37.711797   815.903085     2.730831
##         year
##     3.550345
```

```
##### d. Using the full data set, investigate the predictors graphically, using
#####    scatterplots,correlation scores or other tools of your choice. Create
#####    a correlation matrix for the relevant variables.
chart.Correlation(Auto[, Quantitatives], histogram=TRUE, pch=19)
```

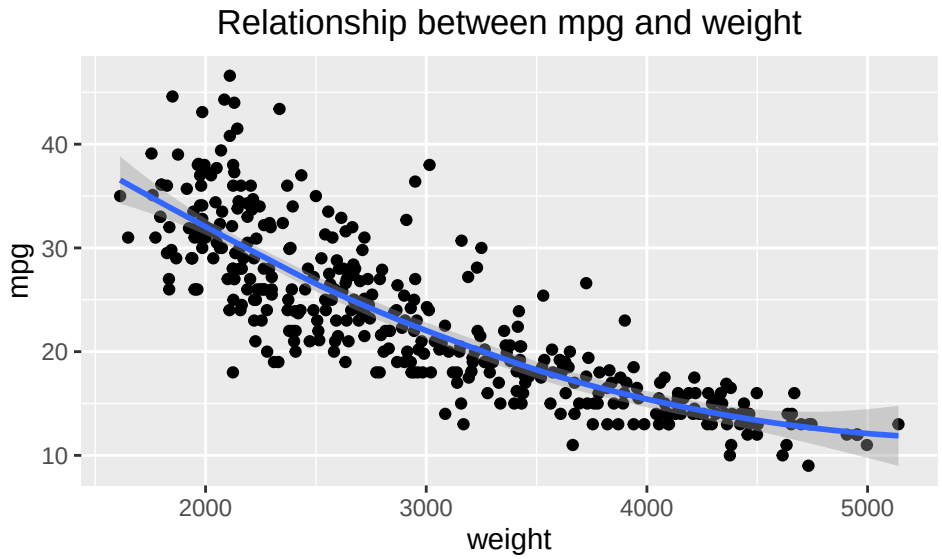



```
Matrix = cor(Auto[, Quantitatives])
round(Matrix, 2)
```

```
##                mpg cylinders displacement horsepower weight acceleration  year
## mpg           1.00     -0.78        -0.81      -0.78  -0.83         0.42  0.58
## cylinders    -0.78      1.00         0.95       0.84   0.90        -0.50 -0.35
## displacement -0.81      0.95         1.00       0.90   0.93        -0.54 -0.37
## horsepower   -0.78      0.84         0.90       1.00   0.86        -0.69 -0.42
## weight       -0.83      0.90         0.93       0.86   1.00        -0.42 -0.31
## acceleration  0.42     -0.50        -0.54      -0.69  -0.42         1.00  0.29
## year          0.58     -0.35        -0.37      -0.42  -0.31         0.29  1.00
```

```
##### e. Suppose that we wish to predict gas mileage (mpg) on the basis of the
#####    other variables. Which, if any, of the other variables might be useful
#####    in predicting mpg? Justify your answer based on the prior correlations.

#From the correlation graph, we can find that all of the quantitative variables show some
```

```
# correlation with mpg. for example, as weight goes up, mpg goes down.
ggplot(data=Auto, aes(x=weight, y=mpg)) + geom_point() + geom_smooth() +
       labs(title="Relationship between mpg and weight",
            x="weight", y="mpg") +
       theme(plot.title = element_text(hjust = 0.5))
```




```
# and better acceleration with higher mpg
ggplot(data=Auto, aes(x=acceleration, y=mpg)) + geom_point() + geom_smooth() +
       labs(title="Relationship between mpg and acceleration",
            x="acceleration", y="mpg") +
       theme(plot.title = element_text(hjust = 0.5))
```