THE SPARKS FOUNDATION

TASK 1 - Prediction using Supervised Machine Learning

Predict the percentage of a student based on the no. of study hours.

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Importing the Packages

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 4.0.5
```

```
library(corrplot)
```

```
## Warning: package 'corrplot' was built under R version 4.0.3

## corrplot 0.84 loaded
```

Importing the Dataset

```
# loading the dataset from the url provided

data = read.csv(url("http://bit.ly/w-data"))
head(data)
```

```
##   Hours Scores
## 1   2.5     21
## 2   5.1     47
## 3   3.2     27
## 4   8.5     75
## 5   3.5     30
## 6   1.5     20
```

```
#taking the dimension of the dataset

dim(data)
```

```
## [1] 25  2
```

The dataset contains 25 observations with 2 variables.

```
#finding the Column names

colnames(data)
```

```
## [1] "Hours"  "Scores"
```

Hours and Scores are the two variables present in the dataset.

DATA PREPROCESSING

```
#checking for NAN values

colSums(is.na(data))
```

```
##  Hours Scores
##      0      0
```

The given dataset contains no NaN values.

```
#checking NULL values

is.null(data)
```

```
## [1] FALSE
```

The given dataset contain no NULL values.

EXPLORATORY DATA ANALYSIS

```
#structure of the dataset

str(data)
```

```
## 'data.frame':    25 obs. of  2 variables:
##  $ Hours : num  2.5 5.1 3.2 8.5 3.5 1.5 9.2 5.5 8.3 2.7 ...
##  $ Scores: int  21 47 27 75 30 20 88 60 81 25 ...
```

The variable Hours is of type Numeric and Scores is of datatype Integer.

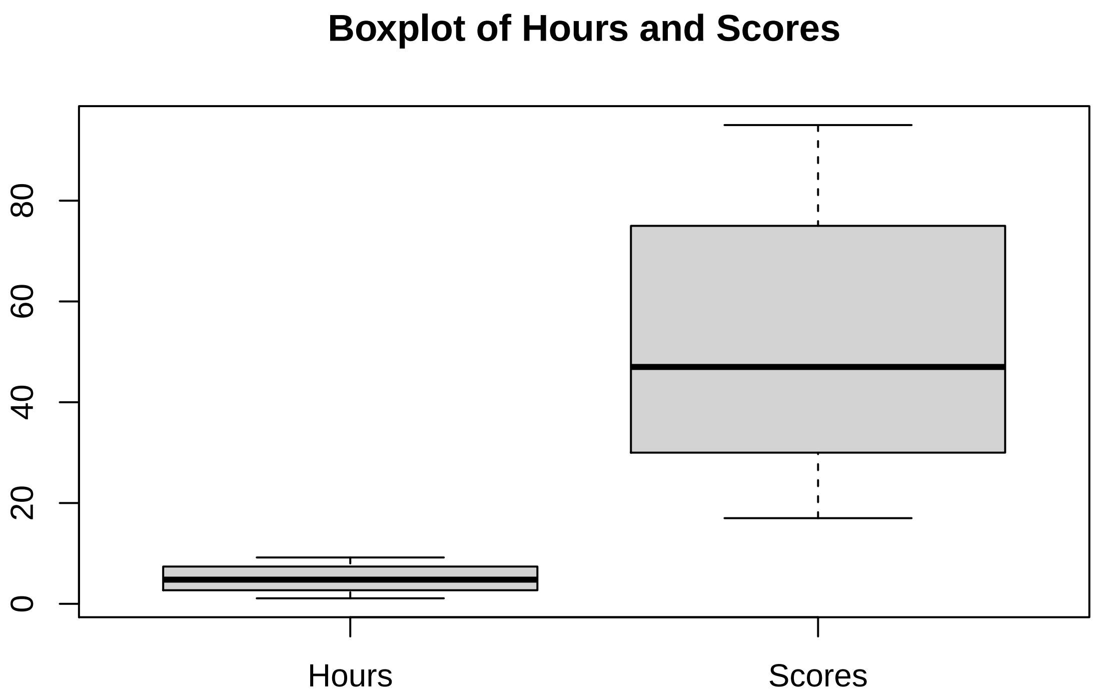
```
#SUMMARY OF THE DATASET

summary(data)
```

```
##      Hours           Scores
##  Min.   :1.100   Min.   :17.00
##  1st Qu.:2.700   1st Qu.:30.00
##  Median :4.800   Median :47.00
##  Mean   :5.012   Mean   :51.48
##  3rd Qu.:7.400   3rd Qu.:75.00
##  Max.   :9.200   Max.   :95.00
```

- The Minimum value of Hours is 1.100 and maximum value is 9.200. Mean value is greater than median value. Hence it is right skewed.
- The Minimum value of Scores is 17.00 and maximum value is 95.00. Mean value is greater than median value. Hence it is right skewed.

BOXPLOT

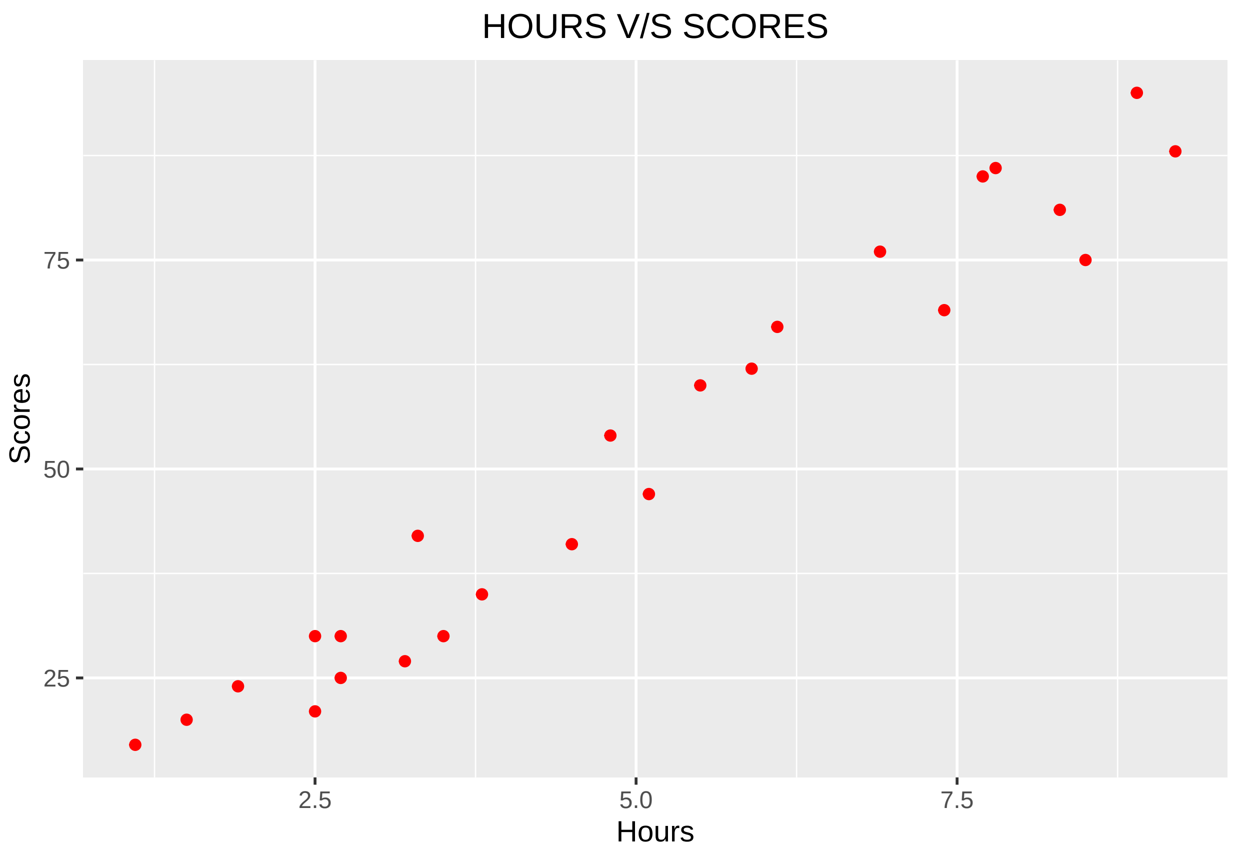
```r
# Checking the outliers

library(ggplot2)
boxplot(data,main='Boxplot of Hours and Scores')
```



From the boxplot, we can understand that No outliers are present in the dataset.

SCATTERPLOT

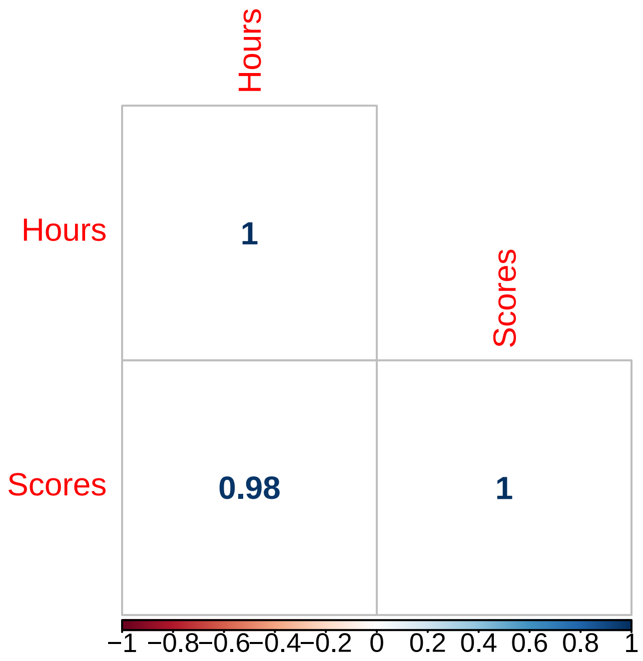
```r
library(ggplot2)
my_graph <- ggplot(data,
                   aes(x =Hours, y =Scores))+
                   ggtitle('HOURS V/S SCORES')+
                   theme(plot.title = element_text(hjust = 0.5))+
                   geom_point(col='red')

my_graph
```



From the graph we can see that there is a linear relationship between the response variable and explanatory variable. Also the direction of association seems to be positive i.e. As Hours increase, the Scores obtained also increase and vice-versa.

CORRELATION

```r
library(corrplot)
corrplot(cor(data),
method ='number',
type = 'lower' # show only lower side
)
```



```
#using pearson correlation

cor.test(data$Hours,data$Scores)
```

```
##
##  Pearson's product-moment correlation
##
## data:  data$Hours and data$Scores
## t = 21.583, df = 23, p-value < 2.2e-16
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.9459248 0.9896072
## sample estimates:
##       cor
## 0.9761907
```

Here, the correlation value is 0.9761907. Hence, we can understand that there exists a high positive correlation between Hours and Scores.

DATA MODELLING

Train Test Splitting

```
set.seed(100)
rows=sample(nrow(data))

#Randomly order data
data=data[rows,]
```

```r
#Identify row to split on: split
split = round(nrow(data) * .80)
```

```r
#Create train
train=data[1:split,]
#Create test
test=data[(split+1):nrow(data),]
```

Linear Regression Model

```r
#fitting linear regression model
linmod = lm(Scores~Hours, data = train)

#taking the summary of the model
summary(linmod)
```

```
##
## Call:
## lm(formula = Scores ~ Hours, data = train)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -8.983 -4.624  1.614  4.579  7.252
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   3.5030     2.9013   1.207    0.243
## Hours         9.4682     0.5367  17.643 8.29e-13 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.508 on 18 degrees of freedom
## Multiple R-squared:  0.9453, Adjusted R-squared:  0.9423
## F-statistic: 311.3 on 1 and 18 DF,  p-value: 8.29e-13
```

The value of intercept of the linear model is 3.5030. The slope of the model is 9.4682. Hence,the model can be interpreted as : $Scores = 9.4682 * Hours + 3.5030$.

- Residual standard error is the measure of the quality of the linear regreesion fit and here it is 5.508 on 18 degrees of freedom.
- R squared statistic provides measure of how well the model is fitting the actual dataset.Here, 94 of fitting to the linear model.
- F statistic value is 311.3, which is relatively larger than 1. Hence, a good relationship is existing between Sales and Spend.

Predicting the Scores

```r
Pred = predict(linmod, test)
```

Comparing The Actual and Predicted Scores

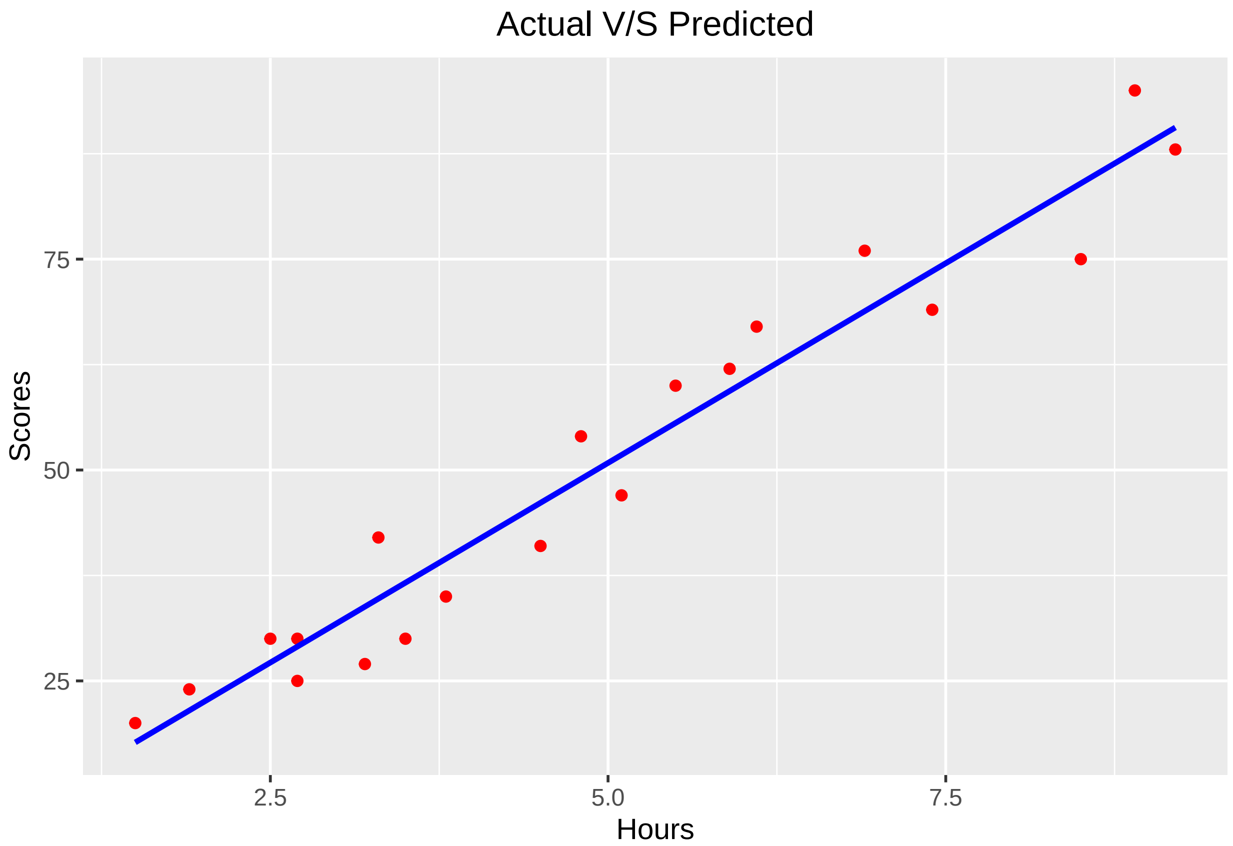
```r
data.frame(Actual=test$Scores,Predicted=Pred)
```

```
##    Actual Predicted
## 15     17  13.91803
## 11     85  76.40841
## 9      81  82.08936
## 1      21  27.17356
## 25     86  77.35524
```

Comparing The Actual and Predicted Values using Data Visualisation

```
library(ggplot2)
my_graph <- ggplot(train,
                    aes(x =Hours, y =Scores))+
                    ggtitle('Actual V/S Predicted')+
                    theme(plot.title = element_text(hjust = 0.5))+
                    geom_point(col='red')+
                    stat_smooth(method = 'lm',
                    col = 'blue',
                    se = FALSE,
                    size = 1)

my_graph
```

```
## `geom_smooth()` using formula 'y ~ x'
```



```
test2 = data.frame(Hours = 9.25)
predict(linmod, test2)
```

What will be the predicted score if the student studies for 9.25 hr/day?

```
##        1
## 91.08419
```

Therefore, according to the regression model, if a student studies for 9.25 hours per day he/she is likely to score 91.08419.