

Assignment 1

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```
library(caret)
```

```
## Warning: package 'caret' was built under R version 4.2.2
```

```
## Loading required package: ggplot2
```

```
## Warning: package 'ggplot2' was built under R version 4.2.3
```

```
## Loading required package: lattice
```

```
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(ISLR)
```

```
library(glmnet)
```

```
## Loading required package: Matrix
```

```
## Loaded glmnet 4.1-4
```

```
#loading and selecting required columns from ISLR carseats dataset
```

```
carseats <- Carseats %>% select("Sales", "Price",  
                                "Advertising", "Population", "Age", "Income", "Education")
```

```
#Scaling of the the carseats dataset using preProcess function from Caret package
```

```

carseats_scaled <- preProcess(carseats, method = c("scale", "center"))
carseats_predict<- predict(carseats_scaled, carseats)
summary(carseats_predict)

```

```

##      Sales      Price      Advertising      Population
## Min.   :-2.65440  Min.   :-3.87702  Min.   :-0.9977  Min.   :-1.72918
## 1st Qu.: -0.74584  1st Qu.: -0.66711  1st Qu.: -0.9977  1st Qu.: -0.85387
## Median :-0.00224  Median : 0.05089  Median :-0.2459  Median : 0.04858
## Mean   : 0.00000  Mean   : 0.00000  Mean   : 0.0000  Mean   : 0.00000
## 3rd Qu.: 0.64575  3rd Qu.: 0.64219  3rd Qu.: 0.8067  3rd Qu.: 0.90693
## Max.    : 3.10670  Max.    : 3.17633  Max.    : 3.3630  Max.    : 1.65671
##      Age      Income      Education
## Min.   :-1.74827  Min.   :-1.70290  Min.   :-1.48825
## 1st Qu.: -0.83779  1st Qu.: -0.92573  1st Qu.: -0.72504
## Median : 0.07268  Median : 0.01224  Median : 0.03816
## Mean   : 0.00000  Mean   : 0.00000  Mean   : 0.00000
## 3rd Qu.: 0.78255  3rd Qu.: 0.79834  3rd Qu.: 0.80137
## Max.    : 1.64673  Max.    : 1.83458  Max.    : 1.56457

```

#Creating a matrix for glmnet library for current dataset.

```

y <- carseats_predict$Sales
x<- data.matrix(carseats_predict[,c("Price",
"Advertising","Population","Age","Income","Education")])

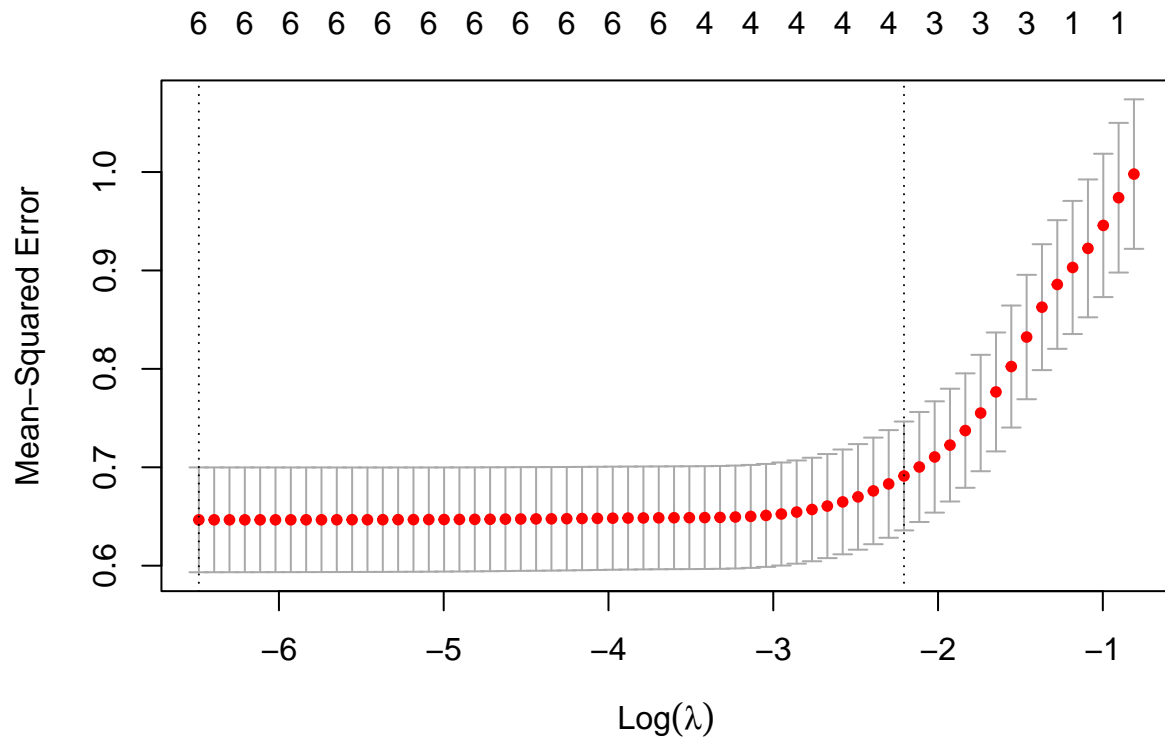
```

#QB1. Build a Lasso regression model to predict Sales based on all other attributes.

```

lasso_model<- cv.glmnet(x, y, alpha = 1)
plot(lasso_model)

```



```
best_lambda <- lasso_model$lambda.min
best_lambda
```

```
## [1] 0.001524481
```

```
#The best value of lambda is 0.001524481
```

```
#QB2.The coefficient for the price (normalized) attribute in the best model
```

```
price_coef<- coef(lasso_model, s= "lambda.min")
price_coef
```

```
## 7 x 1 sparse Matrix of class "dgCMatrix"
##           s1
## (Intercept) 9.866665e-17
## Price      -4.793834e-01
## Advertising 2.932098e-01
## Population  -4.624934e-02
## Age         -2.792202e-01
## Income      1.024459e-01
## Education   -3.223128e-02
```

```
#The coefficient for the price is -4.793834e-01.
```

```
#QB3.Changing Lambda value to 0.01 and 0.1
```

```
lasso_model1<- cv.glmnet(x, y, alpha = 0.01)
best_lambda1 <- lasso_model1$lambda.min
best_lambda1
```

```
## [1] 0.01794027
```

```
coef<- coef(lasso_model1, s = "lambda.min")
coef
```

```
## 7 x 1 sparse Matrix of class "dgCMatrix"
##              s1
## (Intercept)  9.874475e-17
## Price       -4.716757e-01
## Advertising  2.888487e-01
## Population  -4.544767e-02
## Age         -2.748702e-01
## Income       1.026357e-01
## Education   -3.315759e-02
```

#Changing Lambda value to 0.1

```
lasso_model2<- cv.glmnet(x, y, alpha = 0.1)
best_lambda2 <- lasso_model2$lambda.min
best_lambda2
```

```
## [1] 0.004991987
```

```
coef1<- coef(lasso_model2, s = "lambda.min")
coef1
```

```
## 7 x 1 sparse Matrix of class "dgCMatrix"
##              s1
## (Intercept)  9.874037e-17
## Price       -4.781850e-01
## Advertising  2.930271e-01
## Population  -4.708307e-02
## Age         -2.788973e-01
## Income       1.030291e-01
## Education   -3.318640e-02
```

#The comparison between changing the lambda value shows that all the attributes remain in the model, even after changing the lambda.

#QB4. Build an elastic-net model with alpha set to 0.6.

```
elastic_model<- cv.glmnet(x, y, alpha = 0.6)
best_lambda3<- elastic_model$lambda.min
best_lambda3
```

```
## [1] 0.003358789
```

```
coef2<- coef(lasso_model2, s = "lambda.min")
coef2
```

```
## 7 x 1 sparse Matrix of class "dgCMatrix"
##              s1
## (Intercept)  9.874037e-17
## Price       -4.781850e-01
## Advertising  2.930271e-01
## Population  -4.708307e-02
## Age         -2.788973e-01
## Income       1.030291e-01
## Education   -3.318640e-02
```

```
#The best value of lambda for current model is 0.002315083
```