final-r-program.R

Saloni

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```
# Task: Project 1 Name:Saloni Mishra
# Data  Uploaded on RStudio
a <- read.csv(file="C:/Users/Saloni/Desktop/DS510/Final project/auto-mpg
(1).csv", header=TRUE, sep=",")

###read.csv(file.choose())

#####exploring the dataset####
View(a)
summary(a)
```

```
##       mpg           cylinder      displacement     horsepower
##  Min.   : 9.00   Min.   :3.000   Min.   : 68.0   150    : 22
##  1st Qu.:17.50   1st Qu.:4.000   1st Qu.:104.2   90     : 20
##  Median :23.00   Median :4.000   Median :148.5   88     : 19
##  Mean   :23.51   Mean   :5.455   Mean   :193.4   110    : 18
##  3rd Qu.:29.00   3rd Qu.:8.000   3rd Qu.:262.0   100    : 17
##  Max.   :46.60   Max.   :8.000   Max.   :455.0   75     : 14
##                                                  (Other):288
##      weight      acceleration     model.year        origin
##  Min.   :1613   Min.   : 8.00   Min.   :70.00   Min.   :1.000
##  1st Qu.:2224   1st Qu.:13.82   1st Qu.:73.00   1st Qu.:1.000
##  Median :2804   Median :15.50   Median :76.00   Median :1.000
##  Mean   :2970   Mean   :15.57   Mean   :76.01   Mean   :1.573
##  3rd Qu.:3608   3rd Qu.:17.18   3rd Qu.:79.00   3rd Qu.:2.000
##  Max.   :5140   Max.   :24.80   Max.   :82.00   Max.   :3.000
##
##            car.name
##  ford pinto    :  6
##  amc matador   :  5
##  ford maverick :  5
##  toyota corolla:  5
##  amc gremlin   :  4
##  amc hornet    :  4
##  (Other)       :369
```

```
str(a)
```

```
## 'data.frame':    398 obs. of  9 variables:
##  $ mpg         : num  18 15 18 16 17 15 14 14 14 15 ...
##  $ cylinder    : int  8 8 8 8 8 8 8 8 8 8 ...
##  $ displacement: num  307 350 318 304 302 429 454 440 455 390 ...
```

```
##  $ horsepower  : Factor w/ 94 levels "?","100","102",..: 17 35 29 29 24 42
47 46 48 40 ...
##  $ weight      : int  3504 3693 3436 3433 3449 4341 4354 4312 4425 3850
...
##  $ acceleration: num  12 11.5 11 12 10.5 10 9 8.5 10 8.5 ...
##  $ model.year  : int  70 70 70 70 70 70 70 70 70 70 ...
##  $ origin      : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ car.name    : Factor w/ 305 levels "amc ambassador brougham",..: 50 37
232 15 162 142 55 224 242 2 ...
```

```
b <- as.factor(a$horsepower)
x_facttonum <- as.numeric(as.character(b))
```

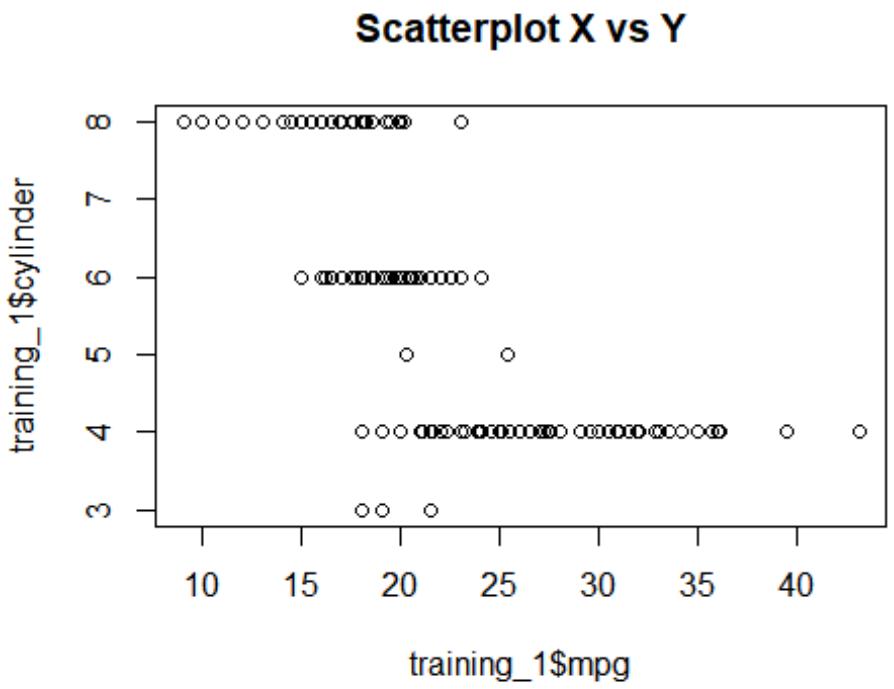
```
## Warning: NAs introduced by coercion
```

```
c<-as.factor(a$car.name)
x_facttochar<-as.character(c)
a$horsepower<-x_facttonum
a$car.name<-x_facttochar
str(a)
```

```
## 'data.frame':    398 obs. of  9 variables:
##  $ mpg         : num  18 15 18 16 17 15 14 14 14 15 ...
##  $ cylinder    : int  8 8 8 8 8 8 8 8 8 8 ...
##  $ displacement: num  307 350 318 304 302 429 454 440 455 390 ...
##  $ horsepower  : num  130 165 150 150 140 198 220 215 225 190 ...
##  $ weight      : int  3504 3693 3436 3433 3449 4341 4354 4312 4425 3850
...
##  $ acceleration: num  12 11.5 11 12 10.5 10 9 8.5 10 8.5 ...
##  $ model.year  : int  70 70 70 70 70 70 70 70 70 70 ...
##  $ origin      : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ car.name    : chr  "chevrolet chevelle malibu" "buick skylark 320"
"plymouth satellite" "amc rebel sst" ...
```

```
##### Splitting the dataset into training & test set

training_1<-a[1:300,]

View (training_1)

##### test set

test_1<-a[301:398,]

View(test_1)

###### Rearranging the sequences

rownames(test_1)<- seq(length=nrow(test_1))
```

```r
#####Scatterplot just to explore data variables###
plot(training_1$mpg, training_1$cylinder, main = "Scatterplot X vs Y")
```




```r
#####Correlation#####
cor(training_1$cylinder, training_1$mpg)     ####-0.8195658

## [1] -0.8195658

###### Regression######
model1 <- lm(training_1$mpg ~ training_1$cylinder, data=training_1)
summary(model1)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder, data = training_1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.0593  -2.2405  -0.3613   1.7595  16.9803
##
## Coefficients:
##                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)           37.8781     0.7224   52.44   <2e-16 ***
## training_1$cylinder  -2.9396     0.1191  -24.69   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 3.607 on 298 degrees of freedom
## Multiple R-squared:  0.6717, Adjusted R-squared:  0.6706
## F-statistic: 609.7 on 1 and 298 DF,  p-value: < 2.2e-16

B0 <- model1$coefficients[1]
B1 <- model1$coefficients[2]

####Correlation
cor(training_1$displacement, training_1$mpg)    ####-0.8448778

## [1] -0.8448778

###### Regression#######
model2 <- lm(training_1$mpg ~ training_1$displacement, data=training_1)
summary(model2)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$displacement, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.8432 -1.9571 -0.4975  1.9047 16.2304
##
## Coefficients:
##                           Estimate Std. Error t value Pr(>|t|)
## (Intercept)              31.250836   0.429861   72.70   <2e-16 ***
## training_1$displacement -0.048680   0.001786  -27.26   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.368 on 298 degrees of freedom
## Multiple R-squared:  0.7138, Adjusted R-squared:  0.7129
## F-statistic: 743.3 on 1 and 298 DF,  p-value: < 2.2e-16

B0 <- model2$coefficients[1]
B1 <- model2$coefficients[2]

####Correlation
cor(training_1$horsepower, training_1$mpg, use ="complete.obs")    ###-
0.8005151

## [1] -0.8005151

###### Regression#######
model3 <- lm(training_1$mpg ~ training_1$horsepower, data=training_1)
summary(model3)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$horsepower, data = training_1)
```

```
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.7872  -2.7817  -0.3246   2.4726  14.3103
##
## Coefficients:
##                         Estimate Std. Error t value Pr(>|t|)
## (Intercept)           34.794687   0.647855   53.71   <2e-16 ***
## training_1$horsepower -0.125105   0.005444  -22.98   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.783 on 296 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.6408, Adjusted R-squared:  0.6396
## F-statistic: 528.1 on 1 and 296 DF,  p-value: < 2.2e-16

B0 <- model3$coefficients[1]
B1 <- model3$coefficients[2]



####Correlation
cor(training_1$weight, training_1$mpg)      ####-0.87983

## [1] -0.87983

###### Regression#######
model4 <- lm(training_1$mpg ~ training_1$weight, data=training_1)
summary(model4)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$weight, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.1077 -1.8842 -0.0333  1.7275 15.1232
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)       40.3879027  0.6368804   63.41   <2e-16 ***
## training_1$weight -0.0062524  0.0001957  -31.96   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.992 on 298 degrees of freedom
## Multiple R-squared:  0.7741, Adjusted R-squared:  0.7733
## F-statistic:  1021 on 1 and 298 DF,  p-value: < 2.2e-16

B0 <- model4$coefficients[1]
B1 <- model4$coefficients[2]
```

```r
####Correlation
cor(training_1$acceleration, training_1$mpg)      #### 0.4640
```

```
## [1] 0.4640842
```

```r
###### Regression#######
model5 <- lm(training_1$mpg ~ training_1$acceleration, data=training_1)
summary(model5)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$acceleration, data = training_1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -15.2441  -4.1160  -0.9237   3.0894  16.2186
##
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)                4.5588     1.8243   2.499    0.013 *
## training_1$acceleration    1.0641     0.1177   9.044   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.577 on 298 degrees of freedom
## Multiple R-squared:  0.2154, Adjusted R-squared:  0.2127
## F-statistic:  81.8 on 1 and 298 DF,  p-value: < 2.2e-16
```

```r
B0 <- model5$coefficients[1]
B1 <- model5$coefficients[2]

####Correlation
cor(training_1$model.year, training_1$mpg)      #### 0.2822
```

```
## [1] 0.2822391
```

```r
###### Regression#######
model6 <- lm(training_1$mpg ~ training_1$model.year, data=training_1)
summary(model6)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$model.year, data = training_1)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -8.967 -4.978 -1.447  4.249 20.023
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
```

```
## (Intercept)           -26.7513     9.3692  -2.855   0.0046 **
## training_1$model.year   0.6388     0.1258   5.079 6.71e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.04 on 298 degrees of freedom
## Multiple R-squared:  0.07966,    Adjusted R-squared:  0.07657
## F-statistic: 25.79 on 1 and 298 DF,  p-value: 6.712e-07
```

```
B0 <- model6$coefficients[1]
B1 <- model6$coefficients[2]
```

```
#####Multiple linear Regression
```

```
model_C1 <- lm(training_1$mpg ~ training_1$cylinder+training_1$displacement,
data=training_1)
summary(model_C1)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder +
training_1$displacement,
##     data = training_1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.1812  -1.9166  -0.4248   1.9986  16.2863
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              32.683612   1.016379  32.157  < 2e-16 ***
## training_1$cylinder     -0.567677   0.365097  -1.555    0.121
## training_1$displacement -0.039992   0.005865  -6.819 5.13e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.36 on 297 degrees of freedom
## Multiple R-squared:  0.7161, Adjusted R-squared:  0.7142
## F-statistic: 374.6 on 2 and 297 DF,  p-value: < 2.2e-16
```

```
B0 <- model_C1$coefficients[1]
B1 <- model_C1$coefficients[2]
```

```
model_C2 <- lm(training_1$mpg ~ training_1$cylinder+training_1$horsepower,
data=training_1)
summary(model_C2)
```

```
##
## Call:
```

```
## lm(formula = training_1$mpg ~ training_1$cylinder + training_1$horsepower,
##     data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.1396 -2.1678 -0.2413  2.0481 15.2501
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)           37.87765    0.67891  55.792  < 2e-16 ***
## training_1$cylinder   -1.79201    0.20608  -8.696 2.45e-16 ***
## training_1$horsepower -0.05958    0.00897  -6.642 1.49e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.381 on 295 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.7141, Adjusted R-squared:  0.7122
## F-statistic: 368.4 on 2 and 295 DF,  p-value: < 2.2e-16

B0 <- model_C2$coefficients[1]
B1 <- model_C2$coefficients[2]

model_C3 <- lm(training_1$mpg ~ training_1$cylinder+training_1$weight,
data=training_1)
summary(model_C3)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder + training_1$weight,
##     data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.6142 -1.8867 -0.0952  1.7118 15.2444
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)         40.4948320  0.6345826  63.813   <2e-16 ***
## training_1$cylinder -0.5028137  0.2269523  -2.216   0.0275 *
## training_1$weight   -0.0053541  0.0004497 -11.907   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.973 on 297 degrees of freedom
## Multiple R-squared:  0.7778, Adjusted R-squared:  0.7763
## F-statistic: 519.7 on 2 and 297 DF,  p-value: < 2.2e-16

B0 <- model_C3$coefficients[1]
B1 <- model_C3$coefficients[2]
```

```r
model_C4 <- lm(training_1$mpg ~ training_1$cylinder+training_1$acceleration,
data=training_1)
summary(model_C4)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder +
training_1$acceleration,
##     data = training_1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.0157  -2.2266  -0.3346   1.7657  16.9325
##
## Coefficients:
##                           Estimate Std. Error t value Pr(>|t|)
## (Intercept)               37.6682     2.0131  18.711   <2e-16 ***
## training_1$cylinder       -2.9305     0.1442 -20.318   <2e-16 ***
## training_1$acceleration    0.0103     0.0922   0.112    0.911
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.613 on 297 degrees of freedom
## Multiple R-squared:  0.6717, Adjusted R-squared:  0.6695
## F-statistic: 303.8 on 2 and 297 DF,  p-value: < 2.2e-16
```

```r
B0 <- model_C4$coefficients[1]
B1 <- model_C4$coefficients[2]

model_C5 <- lm(training_1$mpg ~ training_1$cylinder+training_1$model.year,
data=training_1)
summary(model_C5)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder + training_1$model.year,
##     data = training_1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.2348  -1.9901  -0.1183   1.9110  15.6466
##
## Coefficients:
##                         Estimate Std. Error t value Pr(>|t|)
## (Intercept)              6.48947    5.47753   1.185    0.237
## training_1$cylinder     -2.85805    0.11395 -25.082  < 2e-16 ***
## training_1$model.year    0.41534    0.07191   5.776 1.93e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 3.426 on 297 degrees of freedom
## Multiple R-squared:  0.7048, Adjusted R-squared:  0.7029
## F-statistic: 354.6 on 2 and 297 DF,  p-value: < 2.2e-16

B0 <- model_C5$coefficients[1]
B1 <- model_C5$coefficients[2]


model_C1.1 <- lm(training_1$mpg ~
training_1$displacement+training_1$horsepower, data=training_1)
summary(model_C1.1)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$displacement +
training_1$horsepower,
##     data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.9554 -2.1023 -0.3641  1.7959 15.4326
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              32.686162   0.612295  53.383  < 2e-16 ***
## training_1$displacement -0.037261   0.003972  -9.381  < 2e-16 ***
## training_1$horsepower   -0.034695   0.010761  -3.224  0.00141 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.326 on 295 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.7233, Adjusted R-squared:  0.7215
## F-statistic: 385.7 on 2 and 295 DF,  p-value: < 2.2e-16

B0 <- model_C1.1$coefficients[1]
B1 <- model_C1.1$coefficients[2]

model_C1.2 <- lm(training_1$mpg ~ training_1$displacement+training_1$weight,
data=training_1)
summary(model_C1.2)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$displacement + training_1$weight,
##     data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
```

```
## -9.4362 -1.8464 -0.1621  1.6470 15.2024
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              38.7466846  0.8832868  43.866   <2e-16 ***
## training_1$displacement -0.0113429  0.0042751  -2.653   0.0084 **
## training_1$weight       -0.0049513  0.0005273  -9.390   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.963 on 297 degrees of freedom
## Multiple R-squared:  0.7793, Adjusted R-squared:  0.7778
## F-statistic: 524.5 on 2 and 297 DF,  p-value: < 2.2e-16

B0 <- model_C1.2$coefficients[1]
B1 <- model_C1.2$coefficients[2]

model_C1.3 <- lm(training_1$mpg ~
training_1$displacement+training_1$acceleration, data=training_1)
summary(model_C1.3)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$displacement +
training_1$acceleration,
##     data = training_1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.4758  -1.9013  -0.2714   1.7309  16.9269
##
## Coefficients:
##                             Estimate Std. Error t value Pr(>|t|)
## (Intercept)              34.214017   1.695848  20.175   <2e-16 ***
## training_1$displacement -0.051102   0.002228 -22.940   <2e-16 ***
## training_1$acceleration -0.160083   0.088647  -1.806    0.072 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.355 on 297 degrees of freedom
## Multiple R-squared:  0.7169, Adjusted R-squared:  0.715
## F-statistic: 376.1 on 2 and 297 DF,  p-value: < 2.2e-16

B0 <- model_C1.3$coefficients[1]
B1 <- model_C1.3$coefficients[2]

model_C1.4 <- lm(training_1$mpg ~
training_1$displacement+training_1$model.year, data=training_1)
summary(model_C1.4)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$displacement +
training_1$model.year,
##     data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.1921 -1.9473 -0.3388  1.7717 15.2878
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)                7.642256   5.219726   1.464    0.144
## training_1$displacement -0.047282   0.001757 -26.914  < 2e-16 ***
## training_1$model.year    0.313146   0.069014   4.537 8.28e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.263 on 297 degrees of freedom
## Multiple R-squared:  0.7324, Adjusted R-squared:  0.7306
## F-statistic: 406.4 on 2 and 297 DF,  p-value: < 2.2e-16
```

```
B0 <- model_C1.4$coefficients[1]
B1 <- model_C1.4$coefficients[2]
```

```
model_C2.1 <- lm(training_1$mpg ~ training_1$horsepower+training_1$weight,
data=training_1)
summary(model_C2.1)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$horsepower + training_1$weight,
##     data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.6676 -1.8747  0.0104  1.6777 14.5954
##
## Coefficients:
##                           Estimate Std. Error t value Pr(>|t|)
## (Intercept)           40.1577216  0.6373491   63.01  < 2e-16 ***
## training_1$horsepower -0.0264219  0.0083087   -3.18  0.00163 **
## training_1$weight     -0.0052317  0.0003785  -13.82  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.952 on 295 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.782,  Adjusted R-squared:  0.7805
## F-statistic: 529.1 on 2 and 295 DF,  p-value: < 2.2e-16
```

```r
B0 <- model_C2.1$coefficients[1]
B1 <- model_C2.1$coefficients[2]

model_C2.2 <- lm(training_1$mpg ~
training_1$horsepower+training_1$acceleration, data=training_1)
summary(model_C2.2)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$horsepower +
training_1$acceleration,
##     data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.4634 -2.2539 -0.5183  2.1782 16.1068
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              46.856115   2.406429  19.471  < 2e-16 ***
## training_1$horsepower    -0.153786   0.007603 -20.226  < 2e-16 ***
## training_1$acceleration -0.580520   0.111896  -5.188 3.96e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.628 on 295 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.6709, Adjusted R-squared:  0.6686
## F-statistic: 300.6 on 2 and 295 DF,  p-value: < 2.2e-16

B0 <- model_C2.2$coefficients[1]
B1 <- model_C2.2$coefficients[2]

model_C2.3 <- lm(training_1$mpg ~
training_1$horsepower+training_1$model.year, data=training_1)
summary(model_C2.3)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$horsepower +
training_1$model.year,
##     data = training_1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.7556  -2.5555  -0.2875   2.3896  13.8724
##
## Coefficients:
##                         Estimate Std. Error t value Pr(>|t|)
## (Intercept)           20.794125   6.253059   3.325 0.000994 ***
```

```
## training_1$horsepower -0.121781   0.005605 -21.728  < 2e-16 ***
## training_1$model.year  0.183063   0.081327   2.251 0.025125 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.757 on 295 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.6469, Adjusted R-squared:  0.6445
## F-statistic: 270.2 on 2 and 295 DF,  p-value: < 2.2e-16

B0 <- model_C2.3$coefficients[1]
B1 <- model_C2.3$coefficients[2]

model_C3.1 <- lm(training_1$mpg ~ training_1$weight+training_1$acceleration,
data=training_1)
summary(model_C3.1)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$weight + training_1$acceleration,
##     data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.6363 -1.8981 -0.0538  1.7302 14.4589
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              37.4981447  1.5480242  24.223   <2e-16 ***
## training_1$weight        -0.0060397  0.0002207 -27.370   <2e-16 ***
## training_1$acceleration   0.1456614  0.0711967   2.046   0.0416 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.977 on 297 degrees of freedom
## Multiple R-squared:  0.7772, Adjusted R-squared:  0.7757
## F-statistic: 518.1 on 2 and 297 DF,  p-value: < 2.2e-16

B0 <- model_C3.1$coefficients[1]
B1 <- model_C3.1$coefficients[2]

model_C3.2 <- lm(training_1$mpg ~ training_1$weight+training_1$model.year,
data=training_1)
summary(model_C3.2)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$weight + training_1$model.year,
##     data = training_1)
##
## Residuals:
```

```
##     Min      1Q  Median      3Q     Max
## -8.3185 -1.6059  0.0787  1.5353 13.6506
##
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)             6.0189063  4.3221375   1.393    0.165
## training_1$weight      -0.0061182  0.0001785 -34.283  < 2e-16 ***
## training_1$model.year   0.4560897  0.0568406   8.024 2.39e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.717 on 297 degrees of freedom
## Multiple R-squared:  0.8143, Adjusted R-squared:  0.8131
## F-statistic: 651.4 on 2 and 297 DF,  p-value: < 2.2e-16

B0 <- model_C3.2$coefficients[1]
B1 <- model_C3.2$coefficients[2]

model_C4.1 <- lm(training_1$mpg ~
training_1$acceleration+training_1$model.year, data=training_1)
summary(model_C4.1)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$acceleration +
training_1$model.year,
##     data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -13.131  -3.919  -1.071   3.569  14.860
##
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)              -23.8694     8.5073  -2.806 0.005352 **
## training_1$acceleration    0.9627     0.1193   8.067 1.79e-14 ***
## training_1$model.year      0.4027     0.1178   3.418 0.000718 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.479 on 297 degrees of freedom
## Multiple R-squared:  0.2451, Adjusted R-squared:   0.24
## F-statistic: 48.21 on 2 and 297 DF,  p-value: < 2.2e-16

B0 <- model_C4.1$coefficients[1]
B1 <- model_C4.1$coefficients[2]

model_d1<- lm(training_1$mpg ~
training_1$cylinder+training_1$displacement+training_1$horsepower,
```

```r
data=training_1)
summary(model_d1)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder +
training_1$displacement +
##     training_1$horsepower, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.3115 -2.0190 -0.3685  1.8406 15.4564
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              34.499553   1.133497  30.436  < 2e-16 ***
## training_1$cylinder     -0.686709   0.361877  -1.898 0.058724 .
## training_1$displacement -0.026093   0.007091  -3.680 0.000277 ***
## training_1$horsepower   -0.036683   0.010765  -3.408 0.000747 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.311 on 294 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.7267, Adjusted R-squared:  0.7239
## F-statistic: 260.6 on 3 and 294 DF,  p-value: < 2.2e-16
```

```r
B0 <- model_d1$coefficients[1]
B1 <- model_d1$coefficients[2]

model_d2<- lm(training_1$mpg ~
training_1$cylinder+training_1$displacement+training_1$weight,
data=training_1)
summary(model_d2)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder +
training_1$displacement +
##     training_1$weight, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.5273 -1.8525 -0.0983  1.6813 15.2241
##
## Coefficients:
##                             Estimate Std. Error t value Pr(>|t|)
## (Intercept)              39.0696085  1.1334468  34.470   <2e-16 ***
## training_1$cylinder     -0.1483014  0.3255202  -0.456    0.649
## training_1$displacement -0.0093291  0.0061535  -1.516    0.131
```

```
## training_1$weight       -0.0049173  0.0005332  -9.222   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.966 on 296 degrees of freedom
## Multiple R-squared:  0.7795, Adjusted R-squared:  0.7773
## F-statistic: 348.8 on 3 and 296 DF,  p-value: < 2.2e-16

B0 <- model_d2$coefficients[1]
B1 <- model_d2$coefficients[2]

model_d3<- lm(training_1$mpg ~
training_1$cylinder+training_1$displacement+training_1$acceleration,
data=training_1)
summary(model_d3)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder +
training_1$displacement +
##     training_1$acceleration, data = training_1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.7730  -1.9175  -0.2425   1.7696  16.9541
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              35.463633   1.891548  18.748  < 2e-16 ***
## training_1$cylinder     -0.538832   0.364234  -1.479   0.1401
## training_1$displacement -0.042765   0.006058  -7.059  1.2e-11 ***
## training_1$acceleration -0.154121   0.088562  -1.740   0.0829 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.349 on 296 degrees of freedom
## Multiple R-squared:  0.719,  Adjusted R-squared:  0.7162
## F-statistic: 252.5 on 3 and 296 DF,  p-value: < 2.2e-16

B0 <- model_d3$coefficients[1]
B1 <- model_d3$coefficients[2]

model_d4<- lm(training_1$mpg ~
training_1$cylinder+training_1$displacement+training_1$model.year,
data=training_1)
summary(model_d4)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder +
training_1$displacement +
```

```
##     training_1$model.year, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.6306 -1.8451 -0.2221  1.8214 15.2993
##
## Coefficients:
##                           Estimate Std. Error t value Pr(>|t|)
## (Intercept)               7.974146   5.184598   1.538   0.1251
## training_1$cylinder      -0.816745   0.355697  -2.296   0.0224 *
## training_1$displacement -0.034680   0.005759  -6.022 5.10e-09 ***
## training_1$model.year     0.336086   0.069248   4.853 1.97e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.239 on 296 degrees of freedom
## Multiple R-squared:  0.7371, Adjusted R-squared:  0.7344
## F-statistic: 276.6 on 3 and 296 DF,  p-value: < 2.2e-16
```

```
model_d2.1<- lm(training_1$mpg ~
training_1$cylinder+training_1$horsepower+training_1$weight, data=training_1)
summary(model_d2.1)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder + training_1$horsepower
+
##     training_1$weight, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.0407 -1.8782  0.0327  1.6703 14.7359
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)           40.2587387  0.6411068  62.796  < 2e-16 ***
## training_1$cylinder   -0.3120080  0.2359008  -1.323  0.18699
## training_1$horsepower -0.0230311  0.0086852  -2.652  0.00844 **
## training_1$weight     -0.0048066  0.0004962  -9.686  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.949 on 294 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.7833, Adjusted R-squared:  0.7811
## F-statistic: 354.2 on 3 and 294 DF,  p-value: < 2.2e-16
```

```
model_d2.2<- lm(training_1$mpg ~
training_1$cylinder+training_1$horsepower+training_1$acceleration,
```

```r
data=training_1)
summary(model_d2.2)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder + training_1$horsepower
+
##     training_1$acceleration, data = training_1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.2158  -2.0828  -0.2493   1.6669  16.6333
##
## Coefficients:
##                           Estimate Std. Error t value Pr(>|t|)
## (Intercept)              47.38636    2.17093  21.828  < 2e-16 ***
## training_1$cylinder      -1.66867    0.20119  -8.294 3.98e-15 ***
## training_1$horsepower    -0.08720    0.01056  -8.260 5.02e-15 ***
## training_1$acceleration -0.46787    0.10181  -4.595 6.42e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.271 on 294 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.7333, Adjusted R-squared:  0.7305
## F-statistic: 269.4 on 3 and 294 DF,  p-value: < 2.2e-16

model_d2.3<- lm(training_1$mpg ~
training_1$cylinder+training_1$horsepower+training_1$model.year,
data=training_1)
summary(model_d2.3)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder + training_1$horsepower
+
##     training_1$model.year, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.8823 -2.2461 -0.1608  1.9618 14.5998
##
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)           14.796946   5.508691   2.686  0.00764 **
## training_1$cylinder   -1.944095   0.203662  -9.546  < 2e-16 ***
## training_1$horsepower -0.048476   0.009112  -5.320 2.06e-07 ***
## training_1$model.year  0.305211   0.072320   4.220 3.25e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 3.288 on 294 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.7304, Adjusted R-squared:  0.7277
## F-statistic: 265.6 on 3 and 294 DF,  p-value: < 2.2e-16
```

```
model_d3.1<- lm(training_1$mpg ~
training_1$cylinder+training_1$weight+training_1$acceleration,
data=training_1)
summary(model_d3.1)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder + training_1$weight +
##     training_1$acceleration, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.1653 -1.9111 -0.0731  1.6997 14.7503
##
## Coefficients:
##                             Estimate Std. Error t value Pr(>|t|)
## (Intercept)              38.4438487  1.6553102  23.225   <2e-16 ***
## training_1$cylinder      -0.3852592  0.2430047  -1.585    0.114
## training_1$weight        -0.0054150  0.0004513 -11.998   <2e-16 ***
## training_1$acceleration   0.1021219  0.0761412   1.341    0.181
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.969 on 296 degrees of freedom
## Multiple R-squared:  0.7791, Adjusted R-squared:  0.7769
## F-statistic:   348 on 3 and 296 DF,  p-value: < 2.2e-16
```

```
model_d3.2<- lm(training_1$mpg ~
training_1$cylinder+training_1$weight+training_1$model.year, data=training_1)
summary(model_d3.2)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder + training_1$weight +
##     training_1$model.year, data = training_1)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -8.690 -1.663  0.012  1.581 13.764
##
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)             6.761682   4.330412   1.561   0.1195
## training_1$cylinder    -0.353565   0.207647  -1.703   0.0897 .
## training_1$weight      -0.005489   0.000410 -13.387  < 2e-16 ***
```

```
## training_1$model.year  0.447231   0.056898   7.860 7.18e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.709 on 296 degrees of freedom
## Multiple R-squared:  0.8161, Adjusted R-squared:  0.8143
## F-statistic:   438 on 3 and 296 DF,  p-value: < 2.2e-16
```

```
model_d4.1<- lm(training_1$mpg ~
training_1$cylinder+training_1$acceleration+training_1$model.year,
data=training_1)
summary(model_d4.1)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder +
training_1$acceleration +
##     training_1$model.year, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -10.641  -2.064  -0.205   1.866  16.073
##
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)               7.20461    5.50820   1.308    0.192
## training_1$cylinder      -2.94648    0.13670 -21.554  < 2e-16 ***
## training_1$acceleration -0.10468    0.08952  -1.169    0.243
## training_1$model.year    0.43409    0.07363   5.895 1.02e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.424 on 296 degrees of freedom
## Multiple R-squared:  0.7062, Adjusted R-squared:  0.7032
## F-statistic: 237.2 on 3 and 296 DF,  p-value: < 2.2e-16
```

```
model_d5.1<- lm(training_1$mpg ~
training_1$displacement+training_1$horsepower+training_1$weight,
data=training_1)
summary(model_d5.1)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$displacement +
training_1$horsepower +
##     training_1$weight, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.9396 -1.9036 -0.0611  1.6062 14.7474
##
```

```
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              39.3739544  0.9210731  42.748   <2e-16 ***
## training_1$displacement -0.0058457  0.0049625  -1.178   0.2398
## training_1$horsepower   -0.0205727  0.0096748  -2.126   0.0343 *
## training_1$weight       -0.0047898  0.0005328  -8.991   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.95 on 294 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.783,  Adjusted R-squared:  0.7808
## F-statistic: 353.6 on 3 and 294 DF,  p-value: < 2.2e-16
```

```
model_d5.2<- lm(training_1$mpg ~
training_1$displacement+training_1$horsepower+training_1$acceleration,
data=training_1)
summary(model_d5.2)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$displacement +
training_1$horsepower +
##     training_1$acceleration, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.9217 -2.0405 -0.3065  1.3734 16.6852
##
## Coefficients:
##                             Estimate Std. Error t value Pr(>|t|)
## (Intercept)              41.818200   2.219504  18.841  < 2e-16 ***
## training_1$displacement -0.034469   0.003916  -8.802  < 2e-16 ***
## training_1$horsepower   -0.062808   0.012359  -5.082 6.65e-07 ***
## training_1$acceleration -0.431924   0.101133  -4.271 2.63e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.233 on 294 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.7395, Adjusted R-squared:  0.7368
## F-statistic: 278.2 on 3 and 294 DF,  p-value: < 2.2e-16
```

```
model_d5.3<- lm(training_1$mpg ~
training_1$displacement+training_1$horsepower+training_1$model.year,
data=training_1)
summary(model_d5.3)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$displacement +
```

```
training_1$horsepower +
##     training_1$model.year, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.6278 -2.1093 -0.2433  1.8528 14.8346
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              11.576862   5.485828   2.110 0.035675 *
## training_1$displacement -0.039212   0.003914 -10.019  < 2e-16 ***
## training_1$horsepower   -0.024976   0.010810  -2.310 0.021554 *
## training_1$model.year    0.274570   0.070929   3.871 0.000134 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.25 on 294 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.7368, Adjusted R-squared:  0.7341
## F-statistic: 274.3 on 3 and 294 DF,  p-value: < 2.2e-16

model_d5.4<- lm(training_1$mpg ~
training_1$displacement+training_1$weight+training_1$acceleration,
data=training_1)
summary(model_d5.4)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$displacement + training_1$weight
+
##     training_1$acceleration, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.1558 -1.8340 -0.0885  1.6912 14.8775
##
## Coefficients:
##                             Estimate Std. Error t value Pr(>|t|)
## (Intercept)              37.6963326  1.5451929  24.396   <2e-16 ***
## training_1$displacement -0.0092688  0.0049559  -1.870   0.0624 .
## training_1$weight       -0.0050898  0.0005534  -9.197   <2e-16 ***
## training_1$acceleration  0.0680709  0.0821450   0.829   0.4080
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.964 on 296 degrees of freedom
## Multiple R-squared:  0.7798, Adjusted R-squared:  0.7776
## F-statistic: 349.5 on 3 and 296 DF,  p-value: < 2.2e-16
```

```r
model_d5.5<- lm(training_1$mpg ~
training_1$displacement+training_1$weight+training_1$model.year,
data=training_1)
summary(model_d5.5)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$displacement + training_1$weight
+
##     training_1$model.year, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.4583 -1.6112  0.0344  1.4858 13.7236
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              6.4921096  4.3487380   1.493    0.137
## training_1$displacement -0.0039937  0.0040405  -0.988    0.324
## training_1$weight       -0.0056641  0.0004928 -11.494  < 2e-16 ***
## training_1$model.year    0.4421418  0.0585682   7.549 5.46e-13 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.717 on 296 degrees of freedom
## Multiple R-squared:  0.815,  Adjusted R-squared:  0.8131
## F-statistic: 434.5 on 3 and 296 DF,  p-value: < 2.2e-16
```

```r
model_d5.6<- lm(training_1$mpg ~
training_1$displacement+training_1$acceleration+training_1$model.year,
data=training_1)
summary(model_d5.6)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$displacement +
training_1$acceleration +
##     training_1$model.year, data = training_1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.0645  -1.6396  -0.2691   1.6831  16.2233
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              9.444354   5.203840   1.815  0.07055 .
## training_1$displacement -0.050744   0.002144 -23.673  < 2e-16 ***
## training_1$acceleration -0.239073   0.086697  -2.758  0.00619 **
## training_1$model.year    0.347940   0.069416   5.012 9.27e-07 ***
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.227 on 296 degrees of freedom
## Multiple R-squared:  0.7391, Adjusted R-squared:  0.7364
## F-statistic: 279.5 on 3 and 296 DF,  p-value: < 2.2e-16
```

```
model_d6.1<- lm(training_1$mpg ~
training_1$horsepower+training_1$weight+training_1$acceleration,
data=training_1)
summary(model_d6.1)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$horsepower + training_1$weight +
##     training_1$acceleration, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.7074 -1.8361 -0.0185  1.6741 14.6646
##
## Coefficients:
##                             Estimate Std. Error t value Pr(>|t|)
## (Intercept)              40.5941035  2.0272277  20.024   <2e-16 ***
## training_1$horsepower   -0.0283737  0.0119715  -2.370   0.0184 *
## training_1$weight       -0.0051888  0.0004238 -12.245   <2e-16 ***
## training_1$acceleration -0.0231206  0.1019429  -0.227   0.8207
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.957 on 294 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.782,  Adjusted R-squared:  0.7798
## F-statistic: 351.6 on 3 and 294 DF,  p-value: < 2.2e-16
```

```
model_d6.2<- lm(training_1$mpg ~
training_1$horsepower+training_1$weight+training_1$model.year,
data=training_1)
summary(model_d6.2)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$horsepower + training_1$weight +
##     training_1$model.year, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.2576 -1.6773  0.0745  1.4955 13.5815
##
## Coefficients:
##                           Estimate Std. Error t value Pr(>|t|)
## (Intercept)            7.2588879  4.6142695   1.573    0.117
```

```
## training_1$horsepower -0.0058361  0.0081924  -0.712    0.477
## training_1$weight     -0.0059004  0.0003619 -16.306  < 2e-16 ***
## training_1$model.year  0.4391299  0.0610873   7.189 5.43e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.727 on 294 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.8146, Adjusted R-squared:  0.8127
## F-statistic: 430.5 on 3 and 294 DF,  p-value: < 2.2e-16
```

```
model_d6.3<- lm(training_1$mpg ~
training_1$horsepower+training_1$acceleration+training_1$model.year,
data=training_1)
summary(model_d6.3)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$horsepower +
training_1$acceleration +
##     training_1$model.year, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.3534 -2.3491 -0.5507  2.0369 15.6655
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              30.303947   6.208372   4.881 1.73e-06 ***
## training_1$horsepower   -0.151247   0.007562 -20.001  < 2e-16 ***
## training_1$acceleration -0.611769   0.111061  -5.508 7.91e-08 ***
## training_1$model.year    0.224916   0.077933   2.886  0.00419 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.583 on 294 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.6799, Adjusted R-squared:  0.6767
## F-statistic: 208.2 on 3 and 294 DF,  p-value: < 2.2e-16
```

```
model_d7.1<- lm(training_1$mpg ~
training_1$weight+training_1$acceleration+training_1$model.year,
data=training_1)
summary(model_d7.1)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$weight + training_1$acceleration
+
##     training_1$model.year, data = training_1)
##
```

```
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.244 -1.622  0.105  1.545 13.550
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              5.9028284  4.3388617   1.360    0.175
## training_1$weight       -0.0060821  0.0002018 -30.137  < 2e-16 ***
## training_1$acceleration  0.0257388  0.0669261   0.385    0.701
## training_1$model.year    0.4508539  0.0585278   7.703 2.01e-13 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.721 on 296 degrees of freedom
## Multiple R-squared:  0.8144, Adjusted R-squared:  0.8126
## F-statistic: 433.1 on 3 and 296 DF,  p-value: < 2.2e-16

model_d8.1<- lm(training_1$mpg ~
training_1$cylinder+training_1$displacement+training_1$horsepower+training_1$
weight, data=training_1)
summary(model_d8.1)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder +
training_1$displacement +
##     training_1$horsepower + training_1$weight, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.0588 -1.8630 -0.0045  1.6507 14.7640
##
## Coefficients:
##                             Estimate Std. Error t value Pr(>|t|)
## (Intercept)              39.8952537  1.1839062  33.698   <2e-16 ***
## training_1$cylinder      -0.2294291  0.3269255  -0.702    0.483
## training_1$displacement -0.0025116  0.0068731  -0.365    0.715
## training_1$horsepower   -0.0214154  0.0097573  -2.195    0.029 *
## training_1$weight       -0.0047293  0.0005401  -8.755   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.953 on 293 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.7834, Adjusted R-squared:  0.7804
## F-statistic: 264.9 on 4 and 293 DF,  p-value: < 2.2e-16

model_d8.2<- lm(training_1$mpg ~
training_1$cylinder+training_1$displacement+training_1$horsepower+training_1$
```

```
acceleration, data=training_1)
summary(model_d8.2)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder +
training_1$displacement +
##     training_1$horsepower + training_1$acceleration, data = training_1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.2893  -1.9761  -0.2516   1.4772  16.7148
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              43.708654   2.403310  18.187  < 2e-16 ***
## training_1$cylinder      -0.700876   0.351534  -1.994 0.047104 *
## training_1$displacement -0.023059   0.006923  -3.330 0.000978 ***
## training_1$horsepower   -0.064959   0.012344  -5.263 2.75e-07 ***
## training_1$acceleration -0.433800   0.100629  -4.311 2.22e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.216 on 293 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.743,  Adjusted R-squared:  0.7395
## F-statistic: 211.8 on 4 and 293 DF,  p-value: < 2.2e-16

model_d8.3<- lm(training_1$mpg ~
training_1$cylinder+training_1$displacement+training_1$horsepower+training_1$
model.year, data=training_1)
summary(model_d8.3)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder +
training_1$displacement +
##     training_1$horsepower + training_1$model.year, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.0550 -2.0831 -0.2544  1.7968 14.8167
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              12.185632   5.444697   2.238  0.02597 *
## training_1$cylinder      -0.874885   0.354982  -2.465  0.01429 *
## training_1$displacement -0.025140   0.006903  -3.642  0.00032 ***
## training_1$horsepower   -0.026726   0.010741  -2.488  0.01340 *
## training_1$model.year    0.296702   0.070896   4.185 3.77e-05 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.222 on 293 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.7421, Adjusted R-squared:  0.7386
## F-statistic: 210.8 on 4 and 293 DF,  p-value: < 2.2e-16
```

```
model_d8.4<- lm(training_1$mpg ~
training_1$cylinder+training_1$displacement+training_1$weight+training_1$acce
leration, data=training_1)
summary(model_d8.4)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder +
training_1$displacement +
##     training_1$weight + training_1$acceleration, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.2469 -1.8740 -0.0975  1.6958 14.8987
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              38.0192791  1.7001936  22.362   <2e-16 ***
## training_1$cylinder      -0.1492507  0.3256942  -0.458    0.647
## training_1$displacement -0.0072381  0.0066532  -1.088    0.278
## training_1$weight        -0.0050559  0.0005591  -9.044   <2e-16 ***
## training_1$acceleration  0.0682034  0.0822553   0.829    0.408
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.968 on 295 degrees of freedom
## Multiple R-squared:   0.78,  Adjusted R-squared:  0.777
## F-statistic: 261.5 on 4 and 295 DF,  p-value: < 2.2e-16
```

```
model_d8.6<- lm(training_1$mpg ~
training_1$cylinder+training_1$displacement+training_1$acceleration+training_
1$model.year, data=training_1)
summary(model_d8.6)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder +
training_1$displacement +
##     training_1$acceleration + training_1$model.year, data = training_1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.4786  -1.6355  -0.2446   1.6982  16.2194
```

```
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)                9.739351   5.169489   1.884  0.06055 .
## training_1$cylinder       -0.797697   0.351947  -2.267  0.02414 *
## training_1$displacement   -0.038379   0.005856  -6.554 2.50e-10 ***
## training_1$acceleration   -0.235206   0.086114  -2.731  0.00669 **
## training_1$model.year      0.369783   0.069606   5.313 2.13e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.205 on 295 degrees of freedom
## Multiple R-squared:  0.7435, Adjusted R-squared:  0.7401
## F-statistic: 213.8 on 4 and 295 DF,  p-value: < 2.2e-16
```

```
model_d8.7<- lm(training_1$mpg ~
training_1$cylinder+training_1$horsepower+training_1$weight+training_1$accele
ration, data=training_1)
summary(model_d8.7)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder + training_1$horsepower
+
##     training_1$weight + training_1$acceleration, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.1744 -1.8449  0.0243  1.6557 14.9195
##
## Coefficients:
##                              Estimate Std. Error t value Pr(>|t|)
## (Intercept)                41.3408671  2.0919503  19.762  < 2e-16 ***
## training_1$cylinder        -0.3421445  0.2426056  -1.410   0.1595
## training_1$horsepower      -0.0275000  0.0119675  -2.298   0.0223 *
## training_1$weight          -0.0046601  0.0005652  -8.244 5.64e-15 ***
## training_1$acceleration    -0.0568168  0.1045390  -0.543   0.5872
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.952 on 293 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.7835, Adjusted R-squared:  0.7805
## F-statistic: 265.1 on 4 and 293 DF,  p-value: < 2.2e-16
```

```
model_d8.8<- lm(training_1$mpg ~
training_1$cylinder+training_1$horsepower+training_1$weight+training_1$model.
year, data=training_1)
summary(model_d8.8)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder + training_1$horsepower
+
##     training_1$weight + training_1$model.year, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.6561 -1.6861  0.0464  1.5638 13.7289
##
## Coefficients:
##                           Estimate Std. Error t value Pr(>|t|)
## (Intercept)             7.2677930  4.6036567   1.579    0.115
## training_1$cylinder    -0.3342958  0.2177210  -1.535    0.126
## training_1$horsepower  -0.0021410  0.0085205  -0.251    0.802
## training_1$weight      -0.0054470  0.0004664 -11.678  < 2e-16 ***
## training_1$model.year   0.4404557  0.0609529   7.226 4.32e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.721 on 293 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.8161, Adjusted R-squared:  0.8135
## F-statistic:   325 on 4 and 293 DF,  p-value: < 2.2e-16
```

```
model_d8.9<- lm(training_1$mpg ~
training_1$cylinder+training_1$horsepower+training_1$acceleration+training_1$
model.year, data=training_1)
summary(model_d8.9)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder + training_1$horsepower
+
##     training_1$acceleration + training_1$model.year, data = training_1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.0176  -2.0926  -0.1274   1.8083  16.0308
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              22.99146    5.52529   4.161 4.17e-05 ***
## training_1$cylinder      -1.82479    0.19687  -9.269  < 2e-16 ***
## training_1$horsepower    -0.07722    0.01040  -7.426 1.23e-12 ***
## training_1$acceleration  -0.50348    0.09852  -5.110 5.81e-07 ***
## training_1$model.year     0.33216    0.06962   4.771 2.89e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 3.156 on 293 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.7525, Adjusted R-squared:  0.7491
## F-statistic: 222.7 on 4 and 293 DF,  p-value: < 2.2e-16
```

```
model_d8.10<- lm(training_1$mpg ~
training_1$cylinder+training_1$weight+training_1$acceleration+training_1$mode
l.year, data=training_1)
summary(model_d8.10)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder + training_1$weight +
##     training_1$acceleration + training_1$model.year, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.7544 -1.6706  0.0164  1.5732 13.8324
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              6.8703899  4.3643837   1.574   0.1165
## training_1$cylinder     -0.3710162  0.2220646  -1.671   0.0958 .
## training_1$weight       -0.0054804  0.0004125 -13.285  < 2e-16 ***
## training_1$acceleration -0.0159754  0.0712427  -0.224   0.8227
## training_1$model.year    0.4500431  0.0583535   7.712 1.91e-13 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.713 on 295 degrees of freedom
## Multiple R-squared:  0.8162, Adjusted R-squared:  0.8137
## F-statistic: 327.5 on 4 and 295 DF,  p-value: < 2.2e-16
```

```
model_d8.11<- lm(training_1$mpg ~
training_1$displacement+training_1$horsepower+training_1$weight+training_1$ac
celeration, data=training_1)
summary(model_d8.11)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$displacement +
training_1$horsepower +
##     training_1$weight + training_1$acceleration, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.0606 -1.8120 -0.0489  1.5561 14.9244
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)             40.3082911  2.0377625  19.781  < 2e-16 ***
```

```
## training_1$displacement -0.0064554  0.0051083  -1.264    0.207
## training_1$horsepower   -0.0245072  0.0123446  -1.985    0.048 *
## training_1$weight       -0.0046438  0.0006043  -7.685 2.33e-13 ***
## training_1$acceleration -0.0538346  0.1046996  -0.514    0.608
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.954 on 293 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.7832, Adjusted R-squared:  0.7802
## F-statistic: 264.6 on 4 and 293 DF,  p-value: < 2.2e-16

model_d8.12<- lm(training_1$mpg ~
training_1$displacement+training_1$horsepower+training_1$weight+training_1$mo
del.year, data=training_1)
summary(model_d8.12)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$displacement +
training_1$horsepower +
##     training_1$weight + training_1$model.year, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.4169 -1.6565  0.0354  1.4477 13.6765
##
## Coefficients:
##                           Estimate Std. Error t value Pr(>|t|)
## (Intercept)              7.0639025  4.6257044   1.527    0.128
## training_1$displacement -0.0033546  0.0046044  -0.729    0.467
## training_1$horsepower   -0.0026389  0.0092995  -0.284    0.777
## training_1$weight       -0.0056417  0.0005072 -11.122  < 2e-16 ***
## training_1$model.year    0.4357290  0.0613140   7.107 9.09e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.73 on 293 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.8149, Adjusted R-squared:  0.8124
## F-statistic: 322.5 on 4 and 293 DF,  p-value: < 2.2e-16

model_d8.13<- lm(training_1$mpg ~
training_1$displacement+training_1$horsepower+training_1$acceleration+trainin
g_1$model.year, data=training_1)
summary(model_d8.13)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$displacement +
training_1$horsepower +
```

```
##     training_1$acceleration + training_1$model.year, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.6386 -1.8170 -0.4546  1.6254 16.1290
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              19.475050   5.554400   3.506 0.000526 ***
## training_1$displacement -0.036383   0.003826  -9.509  < 2e-16 ***
## training_1$horsepower   -0.054371   0.012151  -4.475 1.10e-05 ***
## training_1$acceleration -0.465325   0.098463  -4.726 3.56e-06 ***
## training_1$model.year    0.299804   0.068695   4.364 1.77e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.138 on 293 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.7554, Adjusted R-squared:  0.7521
## F-statistic: 226.2 on 4 and 293 DF,  p-value: < 2.2e-16
```

```
model_d8.14<- lm(training_1$mpg ~
training_1$displacement+training_1$weight+training_1$acceleration+training_1$
model.year, data=training_1)
summary(model_d8.14)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$displacement + training_1$weight
+
##     training_1$acceleration + training_1$model.year, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.4869 -1.6079  0.0396  1.4816 13.7561
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              6.5502601  4.3975101   1.490    0.137
## training_1$displacement -0.0042049  0.0046011  -0.914    0.362
## training_1$weight       -0.0056504  0.0005137 -11.000  < 2e-16 ***
## training_1$acceleration -0.0073448  0.0761059  -0.097    0.923
## training_1$model.year    0.4428983  0.0591878   7.483 8.41e-13 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.722 on 295 degrees of freedom
## Multiple R-squared:  0.815,  Adjusted R-squared:  0.8125
## F-statistic: 324.8 on 4 and 295 DF,  p-value: < 2.2e-16
```

```r
model_d8.15<- lm(training_1$mpg ~
training_1$horsepower+training_1$weight+training_1$acceleration+training_1$mo
del.year, data=training_1)
summary(model_d8.15)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$horsepower + training_1$weight +
##     training_1$acceleration + training_1$model.year, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.2742 -1.6672  0.0874  1.4958 13.6105
##
## Coefficients:
##                             Estimate Std. Error t value Pr(>|t|)
## (Intercept)               7.4494440  4.9858989   1.494    0.136
## training_1$horsepower    -0.0066524  0.0114672  -0.580    0.562
## training_1$weight        -0.0058824  0.0004033 -14.587  < 2e-16 ***
## training_1$acceleration  -0.0096007  0.0942006  -0.102    0.919
## training_1$model.year     0.4390051  0.0612026   7.173 6.02e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.732 on 293 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.8146, Adjusted R-squared:  0.812
## F-statistic: 321.8 on 4 and 293 DF,  p-value: < 2.2e-16
```

```r
model_d8.16<- lm(training_1$mpg ~
training_1$cylinder+training_1$displacement+training_1$horsepower+training_1$
weight+training_1$acceleration, data=training_1)
summary(model_d8.16)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder +
training_1$displacement +
##     training_1$horsepower + training_1$weight + training_1$acceleration,
##     data = training_1)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -9.207 -1.842  0.016  1.604 14.968
##
## Coefficients:
##                              Estimate Std. Error t value Pr(>|t|)
## (Intercept)                41.0054213  2.2389099  18.315  < 2e-16 ***
## training_1$cylinder        -0.2480496  0.3288403  -0.754   0.4513
## training_1$displacement -0.0029379  0.0069194  -0.425   0.6715
```

```
## training_1$horsepower   -0.0259806  0.0125071  -2.077   0.0387 *
## training_1$weight       -0.0045575  0.0006155  -7.405 1.41e-12 ***
## training_1$acceleration -0.0615279  0.1052719  -0.584   0.5594
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.956 on 292 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.7836, Adjusted R-squared:  0.7799
## F-statistic: 211.5 on 5 and 292 DF,  p-value: < 2.2e-16
```

```
model_d8.17<- lm(training_1$mpg ~
training_1$cylinder+training_1$displacement+training_1$horsepower+training_1$
weight+training_1$model.year, data=training_1)
summary(model_d8.17)
```

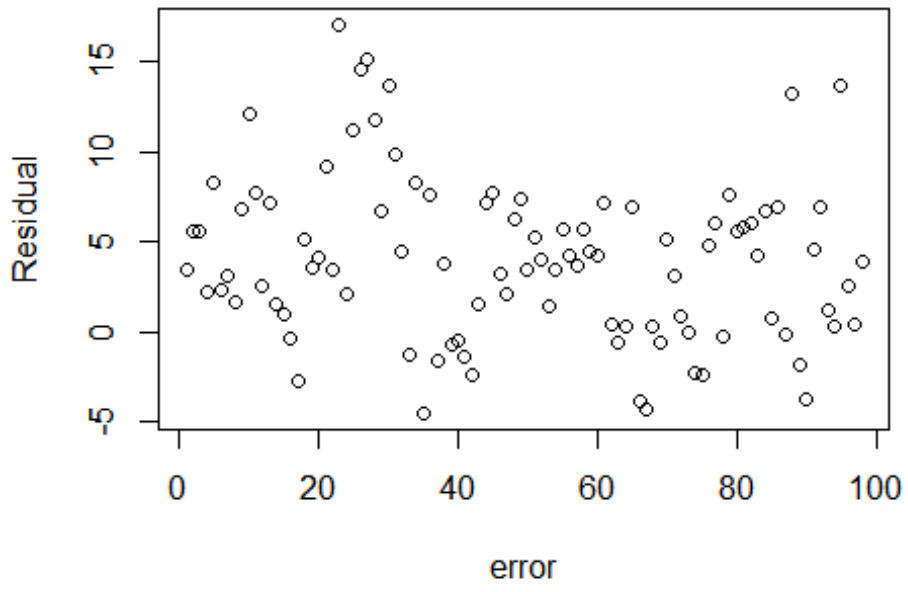
```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder +
training_1$displacement +
##     training_1$horsepower + training_1$weight + training_1$model.year,
##     data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.6316 -1.6768  0.0905  1.5807 13.6878
##
## Coefficients:
##                           Estimate Std. Error t value Pr(>|t|)
## (Intercept)               7.443187   4.625202   1.609    0.109
## training_1$cylinder      -0.432206   0.302963  -1.427    0.155
## training_1$displacement   0.002973   0.006387   0.465    0.642
## training_1$horsepower    -0.003892   0.009325  -0.417    0.677
## training_1$weight        -0.005543   0.000511 -10.848  < 2e-16 ***
## training_1$model.year     0.443858   0.061471   7.221 4.51e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.725 on 292 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.8162, Adjusted R-squared:  0.813
## F-statistic: 259.3 on 5 and 292 DF,  p-value: < 2.2e-16
```

```
model_d8.18<- lm(training_1$mpg ~
training_1$cylinder+training_1$displacement+training_1$horsepower+training_1$
weight+training_1$model.year+training_1$acceleration, data=training_1)
summary(model_d8.18)
```

```
##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder +
```

```
training_1$displacement +
##     training_1$horsepower + training_1$weight + training_1$model.year +
##     training_1$acceleration, data = training_1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8.7296 -1.6923  0.0644  1.5593 13.8236
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              8.2294532  5.0024180   1.645    0.101
## training_1$cylinder     -0.4440934  0.3047356  -1.457    0.146
## training_1$displacement  0.0026829  0.0064341   0.417    0.677
## training_1$horsepower   -0.0069234  0.0118439  -0.585    0.559
## training_1$weight       -0.0054291  0.0005809  -9.347  < 2e-16 ***
## training_1$model.year    0.4430853  0.0615859   7.195 5.33e-12 ***
## training_1$acceleration -0.0404467  0.0972087  -0.416    0.678
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.729 on 291 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.8163, Adjusted R-squared:  0.8125
## F-statistic: 215.5 on 6 and 291 DF,  p-value: < 2.2e-16

#### As based on adjusted R square the best model:- model_d3.2:-
##mpg=6.761682+(-0.353565 )cylinder+(-0.005489)weight+(0.447231)model.year

model_d3.2<- lm(training_1$mpg ~
training_1$cylinder+training_1$weight+training_1$model.year, data=training_1)
summary(model_d3.2)

##
## Call:
## lm(formula = training_1$mpg ~ training_1$cylinder + training_1$weight +
##     training_1$model.year, data = training_1)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -8.690 -1.663  0.012  1.581 13.764
##
## Coefficients:
##                         Estimate Std. Error t value Pr(>|t|)
## (Intercept)            6.761682   4.330412   1.561   0.1195
## training_1$cylinder   -0.353565   0.207647  -1.703   0.0897 .
## training_1$weight     -0.005489   0.000410 -13.387  < 2e-16 ***
## training_1$model.year  0.447231   0.056898   7.860 7.18e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 2.709 on 296 degrees of freedom
## Multiple R-squared:  0.8161, Adjusted R-squared:  0.8143
## F-statistic:   438 on 3 and 296 DF,  p-value: < 2.2e-16

B0<-coefficients(model_d3.2)[1]
B1<-coefficients(model_d3.2)[2]
B2<-coefficients(model_d3.2)[3]
B3<-coefficients(model_d3.2)[4]

mpg_predicted<-B0+B1*test_1$cylinder+B2*test_1$weight+B3*test_1$model.year
View (mpg_predicted)

mpg_actual<-test_1[,1]

### Residuals
error<-mpg_actual-mpg_predicted
View (error)

#### Residual plot

plot(error, xlab = "error", ylab = "Residual")
```




```
###Plot Histogram

hist(error, prob=T, breaks=10, xlab="Error Residual", ylab="Density")
```

```r
lines(density(error), col="red")

mu_e<-mean(error)     ####Mean
v_e<-var(error)     ###variance
sd_e<-sqrt(v_e)      ####std deviation
View(sd_e)
x_e<-seq(-15,15 , length=20)
y_e<-dnorm(x_e,mu_e,sd_e)
lines(x_e,y_e,col="blue")
```