HW 1 Piyaporn (pp712) separate work of the group

Class: 33:136:487:01 LG SCALE DATA ANALY

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Piyaporn Puangprasert(pp712) This homework we separate work from Steven

Due date: Feb 15, 2024

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read the data file

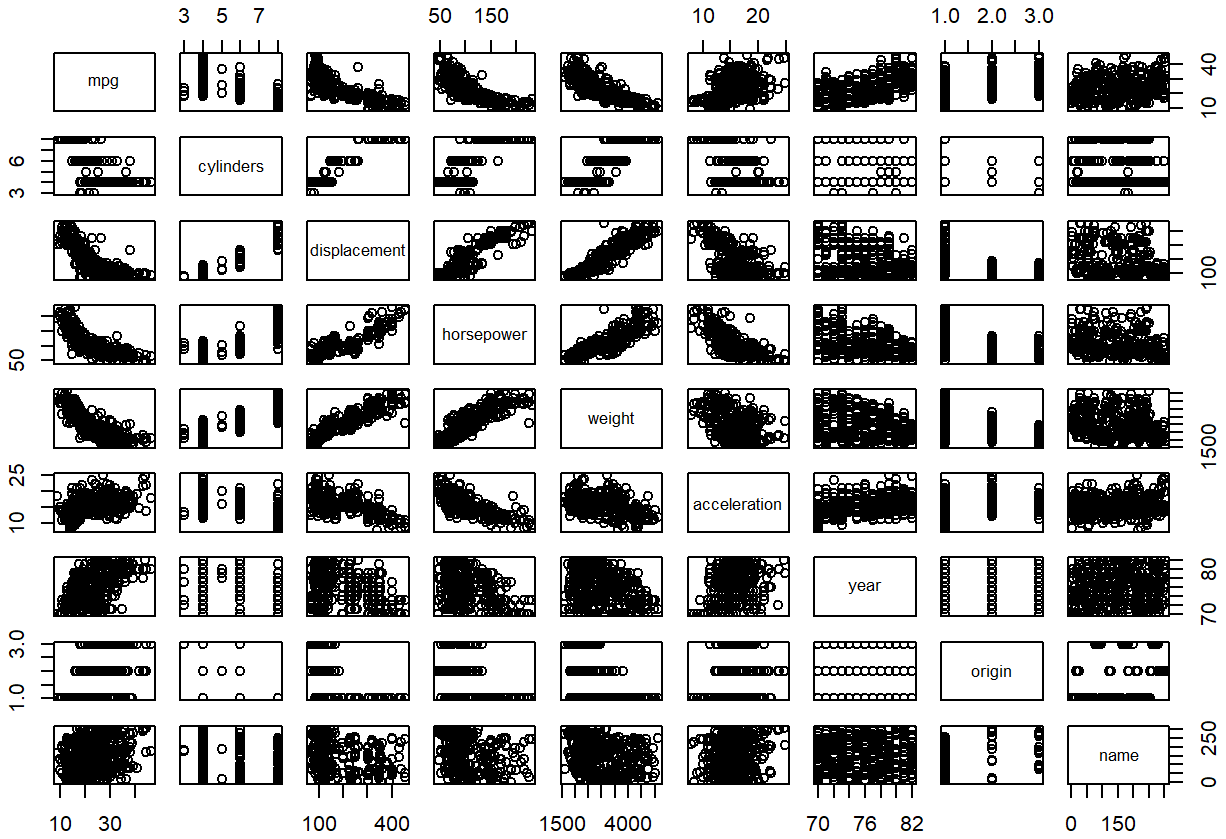
```
dat = read.csv("Auto1a.csv")
names(dat)
```

```
## [1] "mpg"          "cylinders"    "displacement" "horsepower"   "weight"
## [6] "acceleration" "year"         "origin"       "name"
```

2. mutiple linear regression

Scatterplot matrix that include all the variable in the dataset

```
library(ISLR2)
dat = read.csv("Auto1a.csv")
pairs(Auto)
```



Compute the matrix of correlations between the variables using the function

```
cor= cor(dat[,-9])
cor
```

```
##                      mpg  cylinders displacement horsepower     weight
## mpg           1.0000000 -0.7830225   -0.8151730 -0.7799376 -0.8407863
## cylinders    -0.7830225  1.0000000    0.9518758  0.8442297  0.8999313
## displacement -0.8151730  0.9518758    1.0000000  0.9000725  0.9342206
## horsepower   -0.7799376  0.8442297    0.9000725  1.0000000  0.8652063
## weight       -0.8407863  0.8999313    0.9342206  0.8652063  1.0000000
## acceleration  0.4316216 -0.5243642   -0.5644714 -0.7053185 -0.4375583
## year          0.5153320 -0.2844881   -0.3237214 -0.3789386 -0.2588493
## origin        0.5980460 -0.6095630   -0.6445736 -0.4802563 -0.6091412
##              acceleration       year     origin
## mpg             0.4316216  0.5153320  0.5980460
## cylinders      -0.5243642 -0.2844881 -0.6095630
## displacement   -0.5644714 -0.3237214 -0.6445736
## horsepower     -0.7053185 -0.3789386 -0.4802563
## weight         -0.4375583 -0.2588493 -0.6091412
## acceleration    1.0000000  0.2751593  0.2566660
## year            0.2751593  1.0000000  0.1762578
## origin          0.2566660  0.1762578  1.0000000
```

Use the lm() function to perform a multiple linear regression with mpg as the response and all other variables except name as the predictors. Use the summary() function to print the results. Comment

on the output.

Is there a relationship between the predictors and the response?

Answer: Yes, b/c the relationship between the predictors and the response of weight, year, and origin (p-value < 0.05)

Which predictors appear to have a statistically significant relationship to the response?

Answer: Yes, b/c the relationship between the predictors and the response of weight, year, and origin (p-value < 0.05)

What does the coefficient for the year variable suggest?

Answer: the coefficient for the year variable suggest is 0.730911899

```
model4 = lm(mpg~. - name, data = dat)
summary(model4)
```

```
##
## Call:
## lm(formula = mpg ~ . - name, data = dat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.8040 -2.0424 -0.1774  1.7970 13.2491
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -1.568e+01  5.237e+00  -2.995  0.00295 **
## cylinders    -4.047e-01  3.370e-01  -1.201  0.23057
## displacement  1.484e-02  7.857e-03   1.888  0.05984 .
## horsepower   -1.581e-02  1.439e-02  -1.098  0.27277
## weight       -6.099e-03  6.719e-04  -9.077  < 2e-16 ***
## acceleration  2.666e-02  1.055e-01   0.253  0.80076
## year          7.309e-01  6.009e-02  12.164  < 2e-16 ***
## origin        1.441e+00  3.104e-01   4.644  4.9e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.291 on 339 degrees of freedom
## Multiple R-squared:  0.8144, Adjusted R-squared:  0.8106
## F-statistic: 212.5 on 7 and 339 DF,  p-value: < 2.2e-16
```

Use the * symbols to fit linear regression models with interaction effects. Do any interactions appear to be statistically significant?

Answer Yes,it shows the p-value < 0.05

```
model5 = lm(mpg ~ horsepower * weight ,data = dat)

summary(model5)
```

```
##
## Call:
## lm(formula = mpg ~ horsepower * weight, data = dat)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.8013 -1.9648 -0.3125  1.5417 15.5804
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)        6.234e+01  2.279e+00  27.352  < 2e-16 ***
## horsepower        -2.458e-01  2.632e-02  -9.342  < 2e-16 ***
## weight            -1.079e-02  7.511e-04 -14.370  < 2e-16 ***
## horsepower:weight  5.418e-05  6.409e-06   8.453 8.21e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.67 on 343 degrees of freedom
## Multiple R-squared:  0.7665, Adjusted R-squared:  0.7645
## F-statistic: 375.4 on 3 and 343 DF,  p-value: < 2.2e-16
```

model_interaction

```
model_interaction = lm(mpg ~.*.-name, data=dat)

summary(model_interaction)
```