HW8_LIN

IST 772 Homework 8

Due November 30, 2021 at 8:00AM EDT

Homework 8 by Nora Lin: I produced the material below with no assistance.

```
library(BayesFactor)
```

```
## Loading required package: coda
```

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

```
## ************
## Welcome to BayesFactor 0.9.12-4.2. If you have questions, please contact Richard Morey (richarddmorey
##
## Type BFManual() to open the manual.
## ************
```

Excercise 1 p.181:

```
myCars <- data.frame(mtcars[,1:6])
myCars
```

```
##                     mpg cyl  disp  hp drat    wt
## Mazda RX4          21.0   6 160.0 110 3.90 2.620
## Mazda RX4 Wag      21.0   6 160.0 110 3.90 2.875
## Datsun 710         22.8   4 108.0  93 3.85 2.320
## Hornet 4 Drive     21.4   6 258.0 110 3.08 3.215
## Hornet Sportabout  18.7   8 360.0 175 3.15 3.440
## Valiant            18.1   6 225.0 105 2.76 3.460
## Duster 360         14.3   8 360.0 245 3.21 3.570
## Merc 240D          24.4   4 146.7  62 3.69 3.190
## Merc 230           22.8   4 140.8  95 3.92 3.150
## Merc 280           19.2   6 167.6 123 3.92 3.440
## Merc 280C          17.8   6 167.6 123 3.92 3.440
## Merc 450SE         16.4   8 275.8 180 3.07 4.070
## Merc 450SL         17.3   8 275.8 180 3.07 3.730
## Merc 450SLC        15.2   8 275.8 180 3.07 3.780
## Cadillac Fleetwood 10.4   8 472.0 205 2.93 5.250
## Lincoln Continental 10.4  8 460.0 215 3.00 5.424
## Chrysler Imperial  14.7   8 440.0 230 3.23 5.345
## Fiat 128           32.4   4  78.7  66 4.08 2.200
```

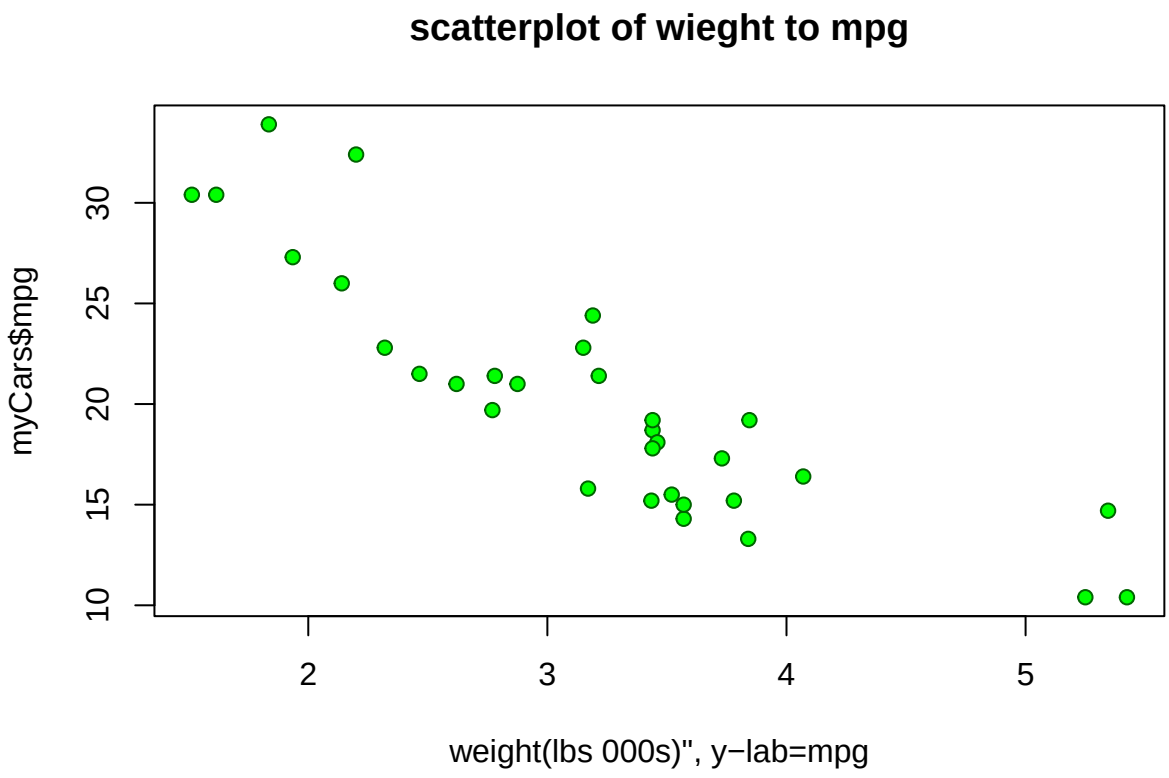
```
## Honda Civic         30.4   4  75.7  52 4.93 1.615
## Toyota Corolla      33.9   4  71.1  65 4.22 1.835
## Toyota Corona       21.5   4 120.1  97 3.70 2.465
## Dodge Challenger    15.5   8 318.0 150 2.76 3.520
## AMC Javelin         15.2   8 304.0 150 3.15 3.435
## Camaro Z28          13.3   8 350.0 245 3.73 3.840
## Pontiac Firebird    19.2   8 400.0 175 3.08 3.845
## Fiat X1-9           27.3   4  79.0  66 4.08 1.935
## Porsche 914-2       26.0   4 120.3  91 4.43 2.140
## Lotus Europa        30.4   4  95.1 113 3.77 1.513
## Ford Pantera L      15.8   8 351.0 264 4.22 3.170
## Ferrari Dino        19.7   6 145.0 175 3.62 2.770
## Maserati Bora       15.0   8 301.0 335 3.54 3.570
## Volvo 142E          21.4   4 121.0 109 4.11 2.780
```

Excercise 2 p.181:

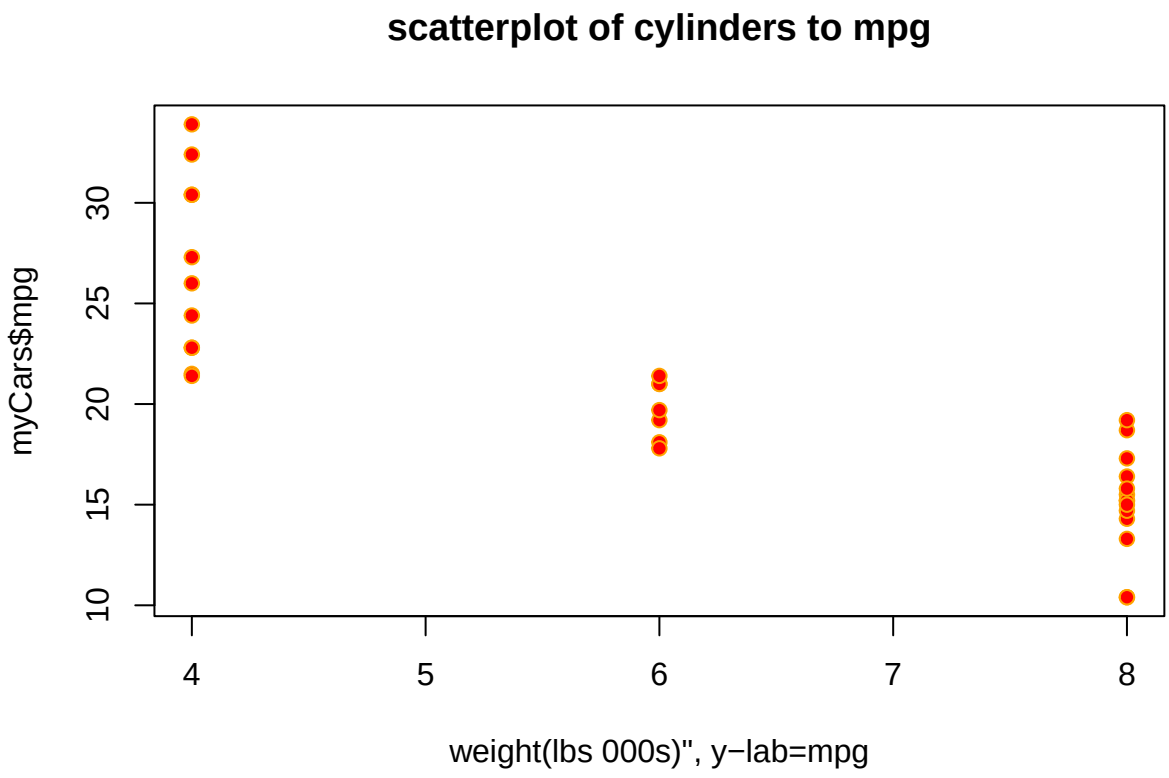
```
cor(myCars)
```

```
##             mpg        cyl       disp         hp       drat         wt
## mpg   1.0000000 -0.8521620 -0.8475514 -0.7761684  0.6811719 -0.8676594
## cyl  -0.8521620  1.0000000  0.9020329  0.8324475 -0.6999381  0.7824958
## disp -0.8475514  0.9020329  1.0000000  0.7909486 -0.7102139  0.8879799
## hp   -0.7761684  0.8324475  0.7909486  1.0000000 -0.4487591  0.6587479
## drat  0.6811719 -0.6999381 -0.7102139 -0.4487591  1.0000000 -0.7124406
## wt   -0.8676594  0.7824958  0.8879799  0.6587479 -0.7124406  1.0000000
```

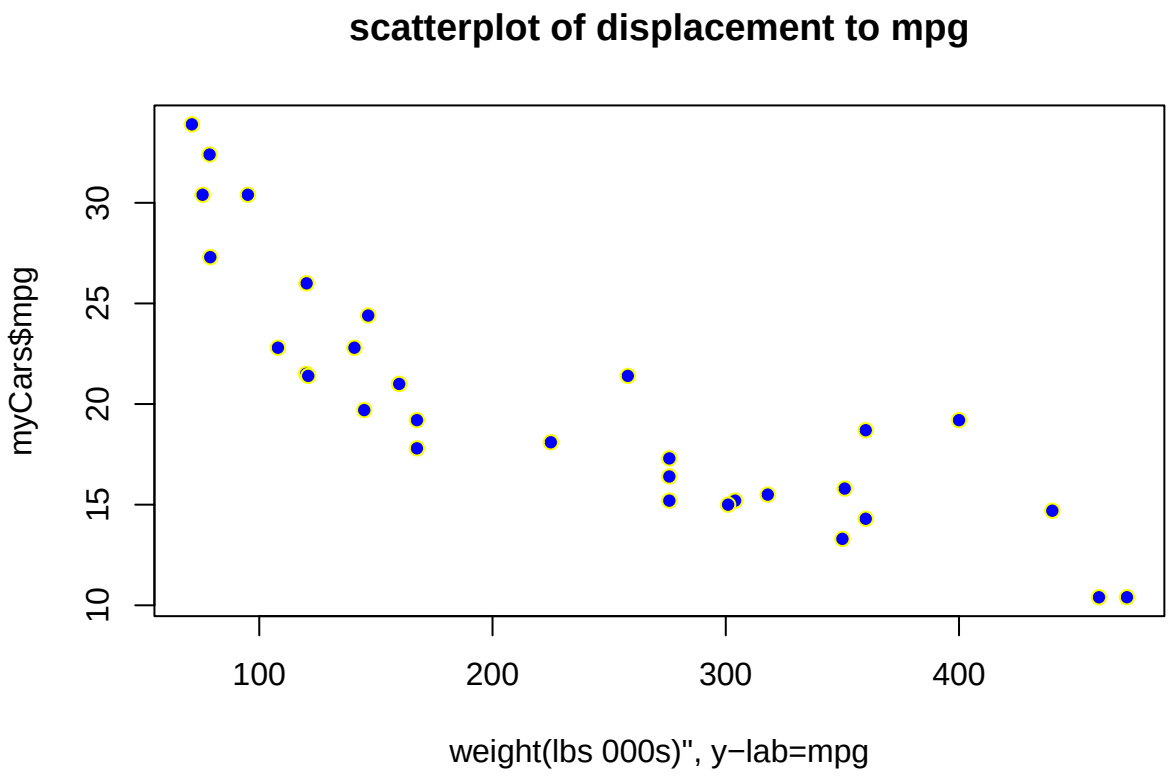
```
plot(myCars$wt, myCars$mpg, main="scatterplot of wieght to mpg",xlab='weight(lbs 000s)", y-lab=mpg', pc
```




```
plot(myCars$cyl, myCars$mpg, main="scatterplot of cylinders to mpg",xlab='weight(lbs 000s)", y-lab=mpg'
```




```
plot(myCars$disp, myCars$mpg, main="scatterplot of displacement to mpg",xlab='weight(lbs 000s)", y-lab=m
```




```
#interpret the matrix: there is a high  degree of correlation between any of the variables. Rear axle r
```

Excercise 3 p.181:

```
mod<- lm(mpg~wt+hp, myCars)
summary(mod)
```

```
##
## Call:
## lm(formula = mpg ~ wt + hp, data = myCars)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -3.941 -1.600 -0.182  1.050  5.854
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 37.22727    1.59879  23.285  < 2e-16 ***
## wt          -3.87783    0.63273  -6.129 1.12e-06 ***
## hp          -0.03177    0.00903  -3.519  0.00145 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 2.593 on 29 degrees of freedom
## Multiple R-squared:  0.8268, Adjusted R-squared:  0.8148
## F-statistic: 69.21 on 2 and 29 DF,  p-value: 9.109e-12
```

```
#The y-intercept is 37.22. The weight of the vehicle would reduce the mpg by -3.87 per 1 unit of weight
```

Excercise 4 p.181:

```
new_mpg <- 37.22727 - 3.87783 * 6 - 0.03177 *110
print(new_mpg)
```

```
## [1] 10.46559
```

```
# We would predict that there  is 10.46559 mpg for a  car with 110 horsepower and a weight of 3 tons.
```

Excercise 5 p.181:

```
mpgOut <- lmBF(mpg~wt+hp, data=myCars, posterior=F)
summary(mpgOut)
```

```
## Bayes factor analysis
## --------------
## [1] wt + hp : 788547604 ±0%
##
## Against denominator:
##   Intercept only
## ---
## Bayes factor type: BFlinearModel, JZS
```

```
#The Bayes factor is a really large, 7.88e+8. There is strong evidence to reject the null hypothesis th
```

Excercise 6 p.181:

```
mgpOut <- lmBF(mpg~wt+hp, data=myCars, posterior=T, iterations=10000)
summary(mpgOut)
```

```
## Bayes factor analysis
## --------------
## [1] wt + hp : 788547604 ±0%
##
## Against denominator:
##   Intercept only
## ---
## Bayes factor type: BFlinearModel, JZS
```

```
#The Bayes factor is a really large, 7.88e+8. There is strong evidence to reject the null hypothesis th
```

Excercise 7 p.181:

```
#install.packages('car')
library(car)
```

```
## Loading required package: carData
```

```
vif(mod)
```

```
##       wt       hp
## 1.766625 1.766625
```

```
#The vif helps us identify co-variance. The vif values are greater than 1 but smaller than 5 so this sh
```

Excercise 8 p.181:

```
mod2 <- lm(mpg~ ., myCars)
vif(mod2)
```

```
##       cyl      disp        hp      drat        wt
##  7.869010 10.463957  3.990380  2.662298  5.168795
```

```
#The number of cylinders, displacement, and weight passed the 5 threshold. This means that there is sig
```