MechaCarChallenge

Deliverable 1: Linear Regression to Predict MPG

Use the library() function to load the dplyr package.

```
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
```

Import and read in the MechaCar_mpg.csv file as a dataframe

```
mechacar_mpg_df <- read.csv(file='../MechaCar_mpg.csv', check.names = F, stringsAsFactors = F)
head(mechacar_mpg_df)
```

```
##   vehicle_length vehicle_weight spoiler_angle ground_clearance AWD      mpg
## 1       14.69710       6407.946      48.78998         14.64098   1 49.04918
## 2       12.53421       5182.081      90.00000         14.36668   1 36.76606
## 3       20.00000       8337.981      78.63232         12.25371   0 80.00000
## 4       13.42849       9419.671      55.93903         12.98936   1 18.94149
## 5       15.44998       3772.667      26.12816         15.10396   1 63.82457
## 6       14.45357       7286.595      30.58568         13.10695   0 48.54268
```

Perform linear regression using the lm() function. In the lm() function, pass in all six variables (i.e., columns), and add the dataframe you created as the data parameter.

```
lm(mpg~vehicle_length+vehicle_weight+spoiler_angle+ground_clearance+AWD, data = mechacar_mpg_df)
```

```
##
## Call:
## lm(formula = mpg ~ vehicle_length + vehicle_weight + spoiler_angle +
##     ground_clearance + AWD, data = mechacar_mpg_df)
## 
## Coefficients:
##      (Intercept)    vehicle_length    vehicle_weight     spoiler_angle  
##       -1.040e+02         6.267e+00         1.245e-03         6.877e-02  
## ground_clearance               AWD  
##        3.546e+00        -3.411e+00  
```

Using the summary() function, determine the p-value and the r-squared value for the linear regression model.

```
summary(lm(mpg~vehicle_length+vehicle_weight+spoiler_angle+ground_clearance+AWD, data = mechacar_mpg_df
```

```
## 
## Call:
## lm(formula = mpg ~ vehicle_length + vehicle_weight + spoiler_angle + 
##     ground_clearance + AWD, data = mechacar_mpg_df)
## 
## Residuals:
##      Min       1Q   Median       3Q      Max 
## -19.4701  -4.4994  -0.0692   5.4433  18.5849 
## 
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)    
## (Intercept)      -1.040e+02  1.585e+01  -6.559 5.08e-08 ***
## vehicle_length    6.267e+00  6.553e-01   9.563 2.60e-12 ***
## vehicle_weight    1.245e-03  6.890e-04   1.807   0.0776 .  
## spoiler_angle     6.877e-02  6.653e-02   1.034   0.3069    
## ground_clearance  3.546e+00  5.412e-01   6.551 5.21e-08 ***
## AWD              -3.411e+00  2.535e+00  -1.346   0.1852    
## ---
## Signif. codes:  0 ’***’ 0.001 ’**’ 0.01 ’*’ 0.05 ’.’ 0.1 ’ ’ 1
## 
## Residual standard error: 8.774 on 44 degrees of freedom
## Multiple R-squared:  0.7149, Adjusted R-squared:  0.6825 
## F-statistic: 22.07 on 5 and 44 DF,  p-value: 5.35e-11
```

Deliverable 2: Create Visualizations for the Trip Analysis

In your MechaCarChallenge.RScript, import and read in the Suspension_Coil.csv file as a table.

```
suspension_coil_df <- read.csv(file = '../Suspension_Coil.csv', check.names = F, stringsAsFactors = F)
head(suspension_coil_df)
```

```
##   VehicleID Manufacturing_Lot  PSI
## 1    V40858              Lot1 1499
## 2    V40607              Lot1 1500
## 3    V31443              Lot1 1500
## 4     V6004              Lot1 1500
## 5     V7000              Lot1 1501
## 6    V17344              Lot1 1501
```

Write an RScript that creates a total_summary dataframe using the summarize() function to get the mean, median, variance, and standard

```
total_summary <- suspension_coil_df %>% summarize(Mean = mean(PSI), Median = median(PSI), Variance = va
```

Write an RScript that creates a lot_summary dataframe using the group_by() and the summarize() functions to group each manufacturing lot by the mean, median, variance, and standard deviation of the suspension coil's PSI column.

```
lot_summary <- suspension_coil_df %>% group_by(Manufacturing_Lot) %>% summarize(Mean = mean(PSI), Media
```

Deliverable 3: T-Tests on Suspension Coils

Write an RScript using the t.test() function to determine if the PSI across all manufacturing lots is statistically different from the population mean of 1,500 pounds per square inch.

```
t.test(suspension_coil_df$PSI, mu=1500)
```

```
##
##  One Sample t-test
##
## data:  suspension_coil_df$PSI
## t = -1.8931, df = 149, p-value = 0.06028
## alternative hypothesis: true mean is not equal to 1500
## 95 percent confidence interval:
##  1497.507 1500.053
## sample estimates:
## mean of x
##   1498.78
```

Write three more RScripts in your MechaCarChallenge.RScript using the t.test() function and its subset() argument to determine if the PSI for each manufacturing lot is statistically different from the population mean of 1,500 pounds per square inch.

```
t.test(subset(suspension_coil_df,Manufacturing_Lot=="Lot1")$PSI, mu = 1500)
```

```
##
##  One Sample t-test
##
## data:  subset(suspension_coil_df, Manufacturing_Lot == "Lot1")$PSI
## t = 0, df = 49, p-value = 1
## alternative hypothesis: true mean is not equal to 1500
## 95 percent confidence interval:
##  1499.719 1500.281
## sample estimates:
## mean of x
##      1500
```

```
t.test(subset(suspension_coil_df,Manufacturing_Lot=="Lot2")$PSI, mu = 1500)
```

```
##
##  One Sample t-test
##
## data:  subset(suspension_coil_df, Manufacturing_Lot == "Lot2")$PSI
## t = 0.51745, df = 49, p-value = 0.6072
## alternative hypothesis: true mean is not equal to 1500
## 95 percent confidence interval:
##  1499.423 1500.977
## sample estimates:
## mean of x
##    1500.2
```

```
t.test(subset(suspension_coil_df,Manufacturing_Lot=="Lot3")$PSI, mu = 1500)
```

```
##
##  One Sample t-test
##
## data:  subset(suspension_coil_df, Manufacturing_Lot == "Lot3")$PSI
## t = -2.0916, df = 49, p-value = 0.04168
## alternative hypothesis: true mean is not equal to 1500
## 95 percent confidence interval:
##  1492.431 1499.849
## sample estimates:
## mean of x
##   1496.14
```