

Stat 6021: Guided Question Set 7

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Car drivers like to adjust the seat position for their own comfort. Car designers find it helpful to know where different drivers will position the seat. Researchers at HuMoSim laboratory at the University of Michigan collected data on 38 drivers. The response variable is *hipcenter*, the horizontal distance of the midpoint of the hips from a fixed location in the car in *mm*. They measured the following eight predictors:

- x_1 : Age: Age in years
- x_2 : Weight: Weight in pounds
- x_3 : HtShoes: Height with shoes in *cm*.
- x_4 : Ht: Height without shoes in *cm*.
- x_5 : Seated: Seated height in *cm*.
- x_6 : Arm: Arm length in *cm*.
- x_7 : Thigh: Thigh length in *cm*.
- x_8 : Leg: Lower leg length in *cm*.

The data are from the `faraway` package in R. After installing the `faraway` package, load the `seatpos` data set.

```
library(faraway)
head(seatpos, n = 3)
```

```
##   Age Weight HtShoes   Ht Seated  Arm Thigh  Leg hipcenter
## 1  46    180   187.2 184.9   95.2 36.1  45.3 41.3  -206.300
## 2  31    175   167.5 165.5   83.8 32.9  36.5 35.9  -178.210
## 3  23    100   153.6 152.2   82.9 26.0  36.6 31.0   -71.673
```

1. Fit the full model with all the predictors. Using the `summary` function, comment on the results of the `t` tests and ANOVA F test from the output.

```
library(TomLeversRPackage)
linear_model <- lm(hipcenter ~ ., data = seatpos)
summarize_linear_model(linear_model)
```

```
##
## Call:
## lm(formula = hipcenter ~ ., data = seatpos)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -73.827 -22.833  -3.678  25.017  62.337
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  436.43213   166.57162   2.620   0.0138 *
## Age           0.77572    0.57033   1.360   0.1843
## Weight        0.02631    0.33097   0.080   0.9372
```

```

## HtShoes      -2.69241      9.75304  -0.276   0.7845
## Ht           0.60134     10.12987   0.059   0.9531
## Seated       0.53375      3.76189   0.142   0.8882
## Arm          -1.32807      3.90020  -0.341   0.7359
## Thigh        -1.14312      2.66002  -0.430   0.6706
## Leg          -6.43905      4.71386  -1.366   0.1824
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 37.72 on 29 degrees of freedom
## Multiple R-squared:  0.6866, Adjusted R-squared:  0.6001
## F-statistic:  7.94 on 8 and 29 DF,  p-value: 1.306e-05
##
## E(y | x) =
##      B_0 +
##      B_Age * Age +
##      B_Weight * Weight +
##      B_HtShoes * HtShoes +
##      B_Ht * Ht +
##      B_Seated * Seated +
##      B_Arm * Arm +
##      B_Thigh * Thigh +
##      B_Leg * Leg
## E(y | x) =
##      436.43212822533 +
##      0.775716195411176 * Age +
##      0.0263130815934825 * Weight +
##      -2.69240773927674 * HtShoes +
##      0.601344580352112 * Ht +
##      0.533751697568726 * Seated +
##      -1.32806863757197 * Arm +
##      -1.14311887823954 * Thigh +
##      -6.43904626562725 * Leg
## Number of observations: 38
## Estimated variance of errors: 1422.82012070282
## Multiple R:  0.828585225565444  Adjusted R:  0.774651837544867
## Critical value t(alpha/2 = 0.05/2, DFRes = 29): 2.0452296421327
## Critical value F(alpha = 0.05, DFR = 8, DFRes = 29): 2.27825084905155

```