midterm_project.R

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```
##Appendix - Computer Output
#1A
setwd("/Users/jiayuan/Documents/MA684/midterm")
tree <- read.csv("SpruceTrees.csv", header=TRUE)
attach(tree)
plot(height ~ diameter)

#1B, 1C
reg.tree <- lm(height ~ diameter)
summary(reg.tree)
```

```
##
## Call:
## lm(formula = height ~ diameter)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.1793  -3.7077  -0.9123   2.9753  10.1454
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   28.327      4.807   5.893 1.32e-06 ***
## diameter       4.412      0.612   7.210 2.89e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.185 on 33 degrees of freedom
## Multiple R-squared:  0.6117, Adjusted R-squared:  0.5999
## F-statistic: 51.98 on 1 and 33 DF,  p-value: 2.887e-08
```

```
#1D
predict(reg.tree,data.frame(diameter=10),interval="predict")
```

```
##        fit      lwr      upr
## 1 72.45046 61.38211 83.51881
```

```
predict(reg.tree,data.frame(diameter=12),interval="predict")
```

```
##        fit      lwr      upr
## 1 81.27521 69.32399 93.22643
```

```
#2A
memory <- read.csv("Elders_2015.csv", header=TRUE)
attach(memory)
head(memory)
```

```
##   studyid exercisegroup age sexf  iq hippochange
## 1       1             1  77    1  66        -1.5
## 2       2             1  76    0 116        -1.8
## 3       3             1  75    1  96        -1.5
## 4       4             1  70    1 127        -1.1
## 5       5             1  71    0 102        -0.1
## 6       6             1  71    0  96        -2.1
```

```
summary(age)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   55.00   65.00   74.00   72.32   80.00   85.00
```

```
sd(age)
```

```
## [1] 8.431688
```

```
summary(iq)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   58.00   89.75  100.00   99.66  111.00  130.00
```

```
sd(iq)
```

```
## [1] 15.70154
```

```
summary(hippochange)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -3.1000 -1.3000 -0.8000 -0.7433 -0.1000  1.8000
```

```
sd(hippochange)
```

```
## [1] 0.9493118
```

```
length(which(sexf==1))
```

```
## [1] 141
```

```
length(which(sexf==0))
```

```
## [1] 159
```

```
length(sexf)
```

```
## [1] 300
```

```r
#2B
cor.test(hippochange,age)
```

```
##
##  Pearson's product-moment correlation
##
## data:  hippochange and age
## t = -3.1156, df = 298, p-value = 0.002014
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.28512106 -0.06569544
## sample estimates:
##        cor
## -0.1776149
```

```r
cor.test(hippochange,iq)
```

```
##
##  Pearson's product-moment correlation
##
## data:  hippochange and iq
## t = 1.2873, df = 298, p-value = 0.199
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.03920736  0.18603786
## sample estimates:
##        cor
## 0.07436365
```

```r
#2C, 2D
reg.asi <- lm(hippochange ~ age+sexf+iq)
summary(reg.asi)
```

```
##
## Call:
## lm(formula = hippochange ~ age + sexf + iq)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.17129 -0.65160 -0.00638  0.64703  2.38101
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.309632   0.601127   0.515  0.60688
## age         -0.019500   0.006439  -3.029  0.00267 **
## sexf        -0.046122   0.108385  -0.426  0.67076
## iq           0.003802   0.003458   1.100  0.27242
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.9367 on 296 degrees of freedom
## Multiple R-squared:  0.03612,    Adjusted R-squared:  0.02635
## F-statistic: 3.698 on 3 and 296 DF,  p-value: 0.01223
```

```r
summary.aov(reg.asi)
```

```
##              Df Sum Sq Mean Sq F value  Pr(>F)
## age           1   8.50   8.501   9.688 0.00204 **
## sexf          1   0.17   0.172   0.196 0.65842
## iq            1   1.06   1.061   1.209 0.27242
## Residuals   296 259.72   0.877
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
#2E
library(QuantPsyc)
```

```
## Loading required package: boot
## Loading required package: MASS
##
## Attaching package: 'QuantPsyc'
##
## The following object is masked from 'package:base':
##
##     norm
```

```r
lm.beta(reg.asi)
```

```
##         age        sexf          iq
## -0.17319896 -0.02428901  0.06288197
```

```r
#2F, 2G
reg.asic <- lm(hippochange ~ age+sexf+iq+relevel(factor(exercisegroup),'1'))
summary(reg.asic)
```

```
##
## Call:
## lm(formula = hippochange ~ age + sexf + iq + relevel(factor(exercisegroup),
##     "1"))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.87096 -0.56384 -0.00159  0.61191  1.91990
##
## Coefficients:
##                                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)                          -0.569519   0.515239  -1.105  0.26991
## age                                  -0.017340   0.005523  -3.139  0.00186
## sexf                                 -0.091468   0.091809  -0.996  0.31993
## iq                                    0.006747   0.002938   2.296  0.02236
## relevel(factor(exercisegroup), "1")2  1.152753   0.112646  10.233  < 2e-16
## relevel(factor(exercisegroup), "1")3  0.199491   0.113466   1.758  0.07976
##
## (Intercept)
## age                                  **
```

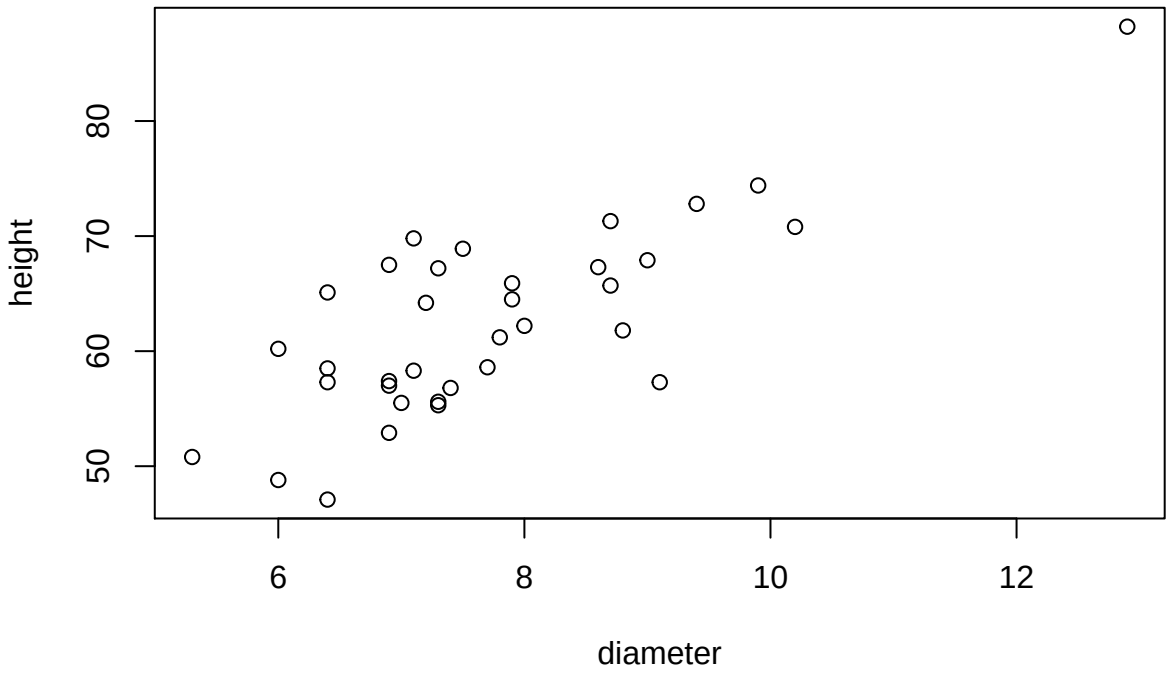
```
## sexf
## iq                                  *
## relevel(factor(exercisegroup), "1")2 ***
## relevel(factor(exercisegroup), "1")3 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.7926 on 294 degrees of freedom
## Multiple R-squared:  0.3146, Adjusted R-squared:  0.303
## F-statistic: 26.99 on 5 and 294 DF,  p-value: < 2.2e-16
```

```
anova(reg.asic,reg.asi)
```

```
## Analysis of Variance Table
##
## Model 1: hippochange ~ age + sexf + iq + relevel(factor(exercisegroup),
##     "1")
## Model 2: hippochange ~ age + sexf + iq
##   Res.Df    RSS Df Sum of Sq      F    Pr(>F)
## 1    294 184.68
## 2    296 259.72 -2   -75.045 59.734 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#2H
library(car)
```

```
##
## Attaching package: 'car'
##
## The following object is masked from 'package:boot':
##
##     logit
```




```
Anova(reg.asic,type="II")
```

```
## Anova Table (Type II tests)
##
## Response: hippochange
##                                      Sum Sq  Df F value    Pr(>F)
## age                                   6.191   1  9.8563  0.001865 **
## sexf                                  0.623   1  0.9926  0.319931
## iq                                    3.313   1  5.2735  0.022355 *
## relevel(factor(exercisegroup), "1")  75.045   2 59.7343 < 2.2e-16 ***
## Residuals                           184.678 294
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#2I
reg.int <- lm(hippochange ~ age+sexf+iq+relevel(factor(exercisegroup),'1')
              +relevel(factor(exercisegroup),'1')*age)
summary(reg.int)
```

```
##
## Call:
## lm(formula = hippochange ~ age + sexf + iq + relevel(factor(exercisegroup),
##     "1") + relevel(factor(exercisegroup), "1") * age)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.90188 -0.52536  0.00829  0.60964  1.93809
##
## Coefficients:
##                                       Estimate Std. Error t value
## (Intercept)                          -0.913112   0.730217  -1.250
```

```
## age                                       -0.012564   0.009027  -1.392
## sexf                                      -0.090517   0.092087  -0.983
## iq                                         0.006784   0.002944   2.304
## relevel(factor(exercisegroup), "1")2       1.280418   0.937734   1.365
## relevel(factor(exercisegroup), "1")3       1.289234   1.012061   1.274
## age:relevel(factor(exercisegroup), "1")2 -0.001821   0.013033  -0.140
## age:relevel(factor(exercisegroup), "1")3 -0.014885   0.013797  -1.079
##                                           Pr(>|t|)
## (Intercept)                                 0.2121
## age                                         0.1651
## sexf                                        0.3264
## iq                                          0.0219 *
## relevel(factor(exercisegroup), "1")2        0.1732
## relevel(factor(exercisegroup), "1")3        0.2037
## age:relevel(factor(exercisegroup), "1")2    0.8890
## age:relevel(factor(exercisegroup), "1")3    0.2816
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.7935 on 292 degrees of freedom
## Multiple R-squared:  0.3177, Adjusted R-squared:  0.3013
## F-statistic: 19.42 on 7 and 292 DF,  p-value: < 2.2e-16
```