Course Project Part Two

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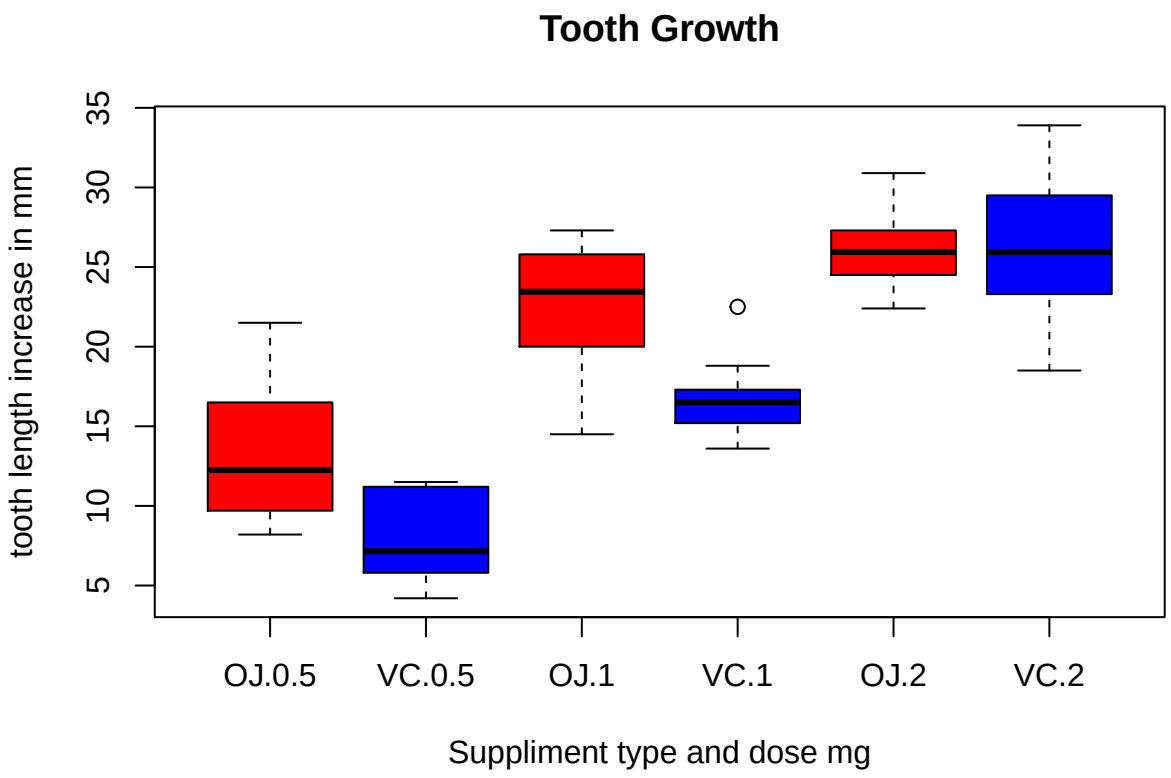
```
#In this project we will analyze the ToothGrowth data
library(datasets)
data(ToothGrowth)

#This datasets consists of 60 observations and three variables. Variables are
#len (numeric: tooth length increase),
#supp (categorical: VC or OJ) and
#dose (numerical: dose level - 0.5mg, 1mg or 2mg)
summary(ToothGrowth)
```

```
##       len        supp         dose
##  Min.   : 4.20   OJ:30   Min.   :0.500
##  1st Qu.:13.07   VC:30   1st Qu.:0.500
##  Median :19.25           Median :1.000
##  Mean   :18.81           Mean   :1.167
##  3rd Qu.:25.27           3rd Qu.:2.000
##  Max.   :33.90           Max.   :2.000
```

```
table(ToothGrowth$supp, as.factor(ToothGrowth$dose))
```

```
##
##      0.5  1  2
##   OJ  10 10 10
##   VC  10 10 10
```

```
#We will plot boxplots for each suppliment type (red are OJ, blue are VC)
#and dosage vs tooth length increase
boxplot(len~supp*dose, data = ToothGrowth, col = c("red", "blue"),
        main = "Tooth Growth", xlab ="Suppliment type and dose mg",
        ylab = "tooth length increase in mm")
```




```
#We can see that as dosage increases, tooth length also increases
#We will prove this for dosages 1.0mg vs 2.0mg which is not obvious
ToothGrowth.dose1.0= subset(ToothGrowth, dose == 1)
ToothGrowth.dose2.0= subset(ToothGrowth, dose == 2)
doseEffect1.0_to_2.0  <- t.test( ToothGrowth.dose2.0$len,ToothGrowth.dose1.0$len)
doseEffect1.0_to_2.0$conf.int
```

```
## [1] 3.733519 8.996481
## attr(,"conf.level")
## [1] 0.95
```

```
#95% C.I. of the difference in tooth-length means between observations
#that received 1.0mg and 2.0mg dosage does not contain 0.
#We reject the null hypothesis that the true difference in means is zero.

#Now lets compare the tooth length increase between different suppliment types.
ToothGrowth.typeOJ = subset(ToothGrowth, supp == "OJ")
ToothGrowth.typeVC = subset(ToothGrowth, supp == "VC")
typeEffect <- t.test(ToothGrowth.typeOJ$len, ToothGrowth.typeVC$len)
typeEffect$conf.int
```

```
## [1] -0.1710156  7.5710156
## attr(,"conf.level")
## [1] 0.95
```

```
typeEffect$p.value
```

```
## [1] 0.06063451
```

```r
#The 95% c.i. of the difference in mean tooth length increase between observations of
#supp type OJ and supp type VC does contain 0. We fail to reject the
#null hypothesis that states the difference in means is zero.
#However p-value is only 6%. We will perform more tests. From the boxplots we can see that
#the means for 2.0mg between the two supp types looks the same. We will perform different tests
#for 2mg dosage and less than 2.0mg dosage
ToothGrowth.typeOJ.doselt2.0 = subset(ToothGrowth, supp == "OJ" & dose<2.0)
ToothGrowth.typeOJ.doseeq2.0 = subset(ToothGrowth, supp == "OJ" & dose==2.0)
ToothGrowth.typeVC.doselt2.0 = subset(ToothGrowth, supp == "VC" & dose<2.0)
ToothGrowth.typeVC.doseeq2.0 = subset(ToothGrowth, supp == "VC" & dose==2.0)
typeEffect_lt2.0 <- t.test(ToothGrowth.typeOJ.doselt2.0 $len, ToothGrowth.typeVC.doselt2.0 $len)
typeEffect_eq2.0<- t.test(ToothGrowth.typeOJ.doseeq2.0$len, ToothGrowth.typeVC.doseeq2.0$len)
#For the tests below:
#Null Hypothesis: True difference in means is equal to 0
#Alternative hypothesis: True difference in means is not equal to 0
#Significance level: 5%

typeEffect_lt2.0$conf.int
```

```
## [1] 1.875234 9.304766
## attr(,"conf.level")
## [1] 0.95
```

```r
#95% C.I. does not contain zero. We reject the null hypothesis and conculde there is a
#difference in tooth length increase between types when dosage is less than 2.0mg

typeEffect_eq2.0$conf.int
```

```
## [1] -3.79807  3.63807
## attr(,"conf.level")
## [1] 0.95
```

```r
#95% C.I. does  contain zero. We fail to reject the null hypothesis
```