Statistical Inference Course Project 1

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October 19, 2020

Statistical Inference Final Project Part 2

This report pretends to analyze the data from ToothGrowth dataset.

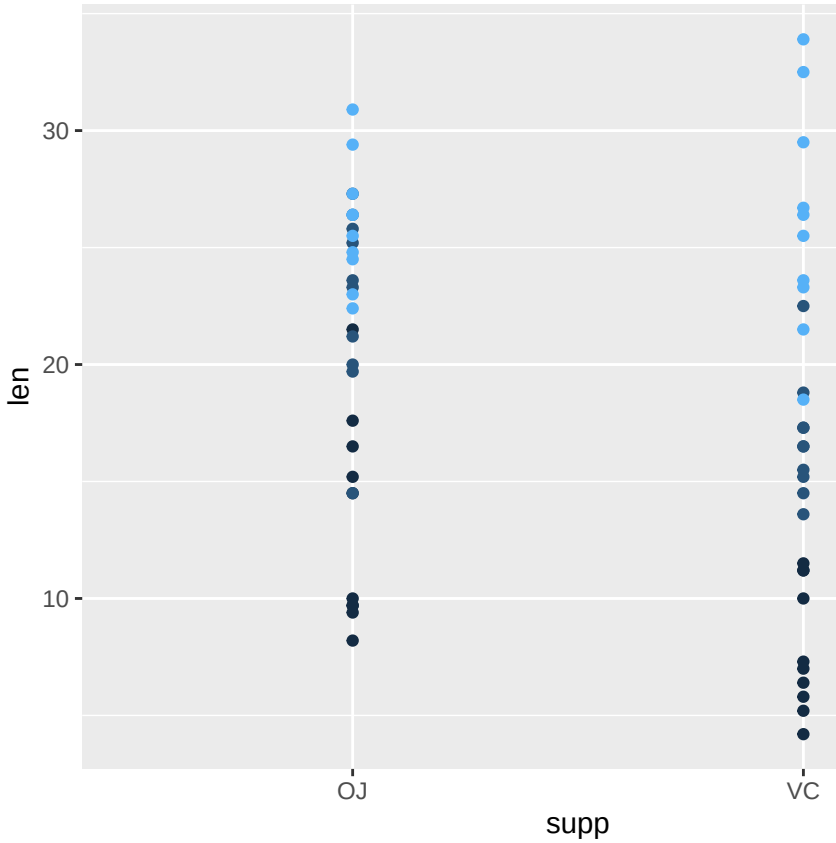
1. Load the ToothGrowth data and perfom basic analysis.
2. Provide a basic summary of the data.
3. Use confidence intervals and/or hypothesis tests to compare tooth growth by supp and dose.
4. Report conclusions and the reasons to back them up.

Start program. Load ToothGrowth Data and investigate its structure

```
library(datasets)
library(dplyr)
library(ggplot2)
# Load ToothGrowth Data
data("ToothGrowth")
str(ToothGrowth)
```

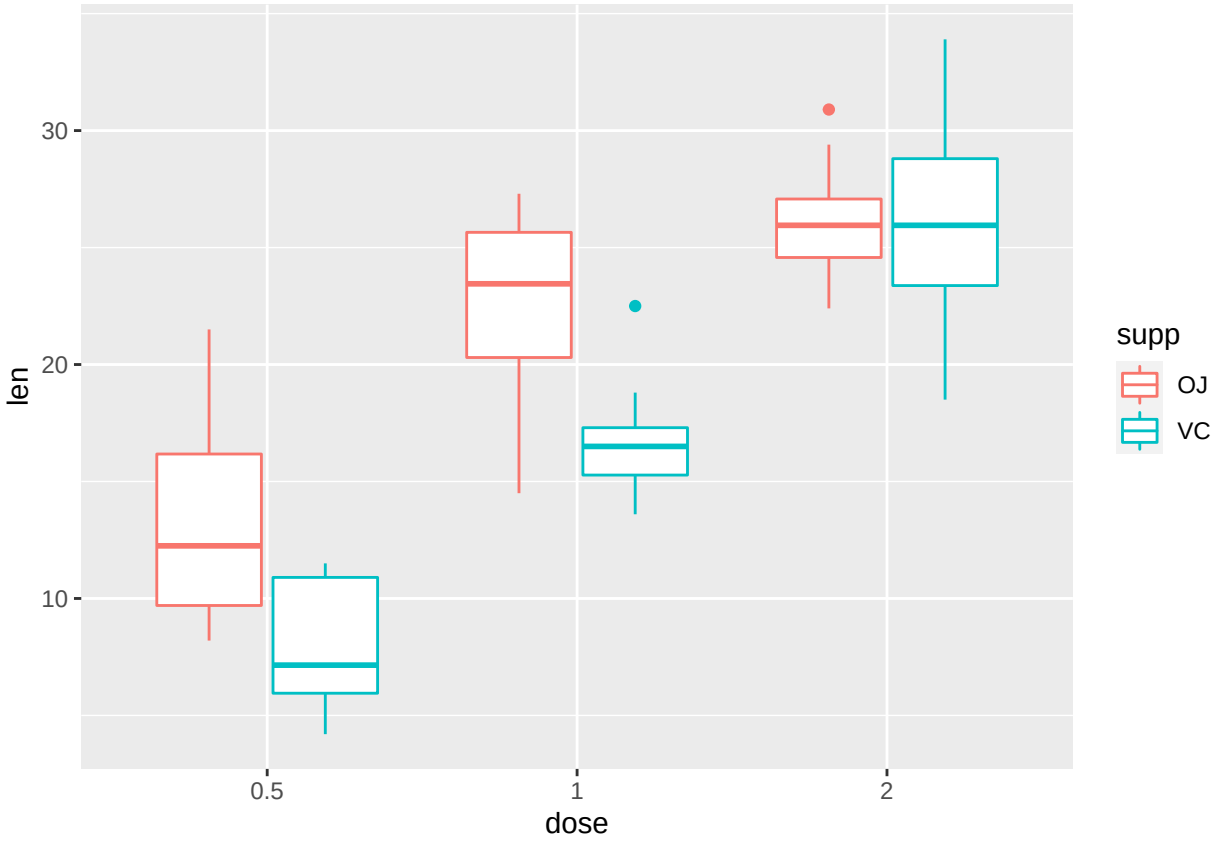
```
## 'data.frame':    60 obs. of  3 variables:
##  $ len : num  4.2 11.5 7.3 5.8 6.4 10 11.2 11.2 5.2 7 ...
##  $ supp: Factor w/ 2 levels "OJ","VC": 2 2 2 2 2 2 2 2 2 2 ...
##  $ dose: num  0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 ...
```

len : Tooth Length is numeric
supp: Supplement is Factor consisting of OJ and VC
dose: Dosage is numeric. As it is just 0.5, 1 and 2, we will have to convert it to factor so that it is easier for analysis



Doing a quick plot to check for any potential paterns

There is are several apparent relations between supp and dose. Let's boxplot to explore further.



We noticed: 1. There is a trend between dose and len.
2. There is a trend between dose and supp.

Hypothesis Testing No.1: Overall impact of dosage on tooth growth

###Null Hypothesis - There is no effect of dosage on tooth growth ###Alternate Hypothesis - Higer doses produce greater tooth growth.

```
# arrange our dateset
dose05 <- filter(ToothGrowth, dose == 0.5)
dose1 <- filter(ToothGrowth, dose == 1)
dose2 <- filter(ToothGrowth, dose == 2)
```

Comparing dosage of 1mg vs 0.5mg

```
# compare between dose of 0.5 and 1
t.test(dose1$len, dose05$len, alternative = "greater")
```

```
##
##  Welch Two Sample t-test
##
## data:  dose1$len and dose05$len
## t = 6.4766, df = 37.986, p-value = 6.342e-08
## alternative hypothesis: true difference in means is greater than 0
## 95 percent confidence interval:
```

```
##  6.753323      Inf
## sample estimates:
## mean of x mean of y
##    19.735    10.605
```

As P value is less than 0.001, it is highly significant and we can reject the null hypothesis

Comparing dosage of 2mg vs 1mg

```
t.test(dose2$len, dose1$len, alternative = "greater")
```

```
##
##  Welch Two Sample t-test
##
## data:  dose2$len and dose1$len
## t = 4.9005, df = 37.101, p-value = 9.532e-06
## alternative hypothesis: true difference in means is greater than 0
## 95 percent confidence interval:
##  4.17387     Inf
## sample estimates:
## mean of x mean of y
##    26.100    19.735
```

As P value is less than 0.001, it is highly significant and we reject the null hypothesis

So in both casess, the null hypothesis is rejected.
We accept the althernative: higher dosages do have a positive influence on toothgrowth.

##Hypothesis Testing No 2: Differences between supplements by dosage ###Null Hypothesis - There is no effect between supplement OJ and VC ###Alternate Hypothesis - OJ is better on toothgrowth than VC Three tests will be done and compared based on dosages.

Dosage: 0.5mg

```
OJdose05 <- filter(dose05, supp == "OJ")
VCdose05 <- filter(dose05, supp == "VC")
t.test(OJdose05$len, VCdose05$len, alternative = "greater")
```

```
##
##  Welch Two Sample t-test
##
## data:  OJdose05$len and VCdose05$len
## t = 3.1697, df = 14.969, p-value = 0.003179
## alternative hypothesis: true difference in means is greater than 0
## 95 percent confidence interval:
##  2.34604     Inf
## sample estimates:
## mean of x mean of y
##     13.23      7.98
```

P value is lower than 0.05. The null hypothesis is rejected.
The alternative is accepted: OJ is a better supplement than VC at dosage of 0.5mg

Dosage: 1mg

```r
OJdose1 <- filter(dose1, supp == "OJ")
VCdose1 <- filter(dose1, supp == "VC")
t.test(OJdose1$len, VCdose1$len, alternative = "greater")
```

```
##
##  Welch Two Sample t-test
##
## data:  OJdose1$len and VCdose1$len
## t = 4.0328, df = 15.358, p-value = 0.0005192
## alternative hypothesis: true difference in means is greater than 0
## 95 percent confidence interval:
##  3.356158      Inf
## sample estimates:
## mean of x mean of y
##     22.70     16.77
```

P value is lower than 0.05. The null hypothesis is rejected.
We accept the alternative: OJ is a better supplement than VC at dosage of 1mg

Dosage: 2mg

```r
OJdose2 <- filter(dose2, supp == "OJ")
VCdose2 <- filter(dose2, supp == "VC")
t.test(OJdose2$len, VCdose2$len, alternative = "greater")
```

```
##
##  Welch Two Sample t-test
##
## data:  OJdose2$len and VCdose2$len
## t = -0.046136, df = 14.04, p-value = 0.5181
## alternative hypothesis: true difference in means is greater than 0
## 95 percent confidence interval:
##  -3.1335     Inf
## sample estimates:
## mean of x mean of y
##     26.06     26.14
```

P value is higher than 0.05.
The null hypothesis is rejected: at dosage of 2mg, there is no significant difference between the two supplement

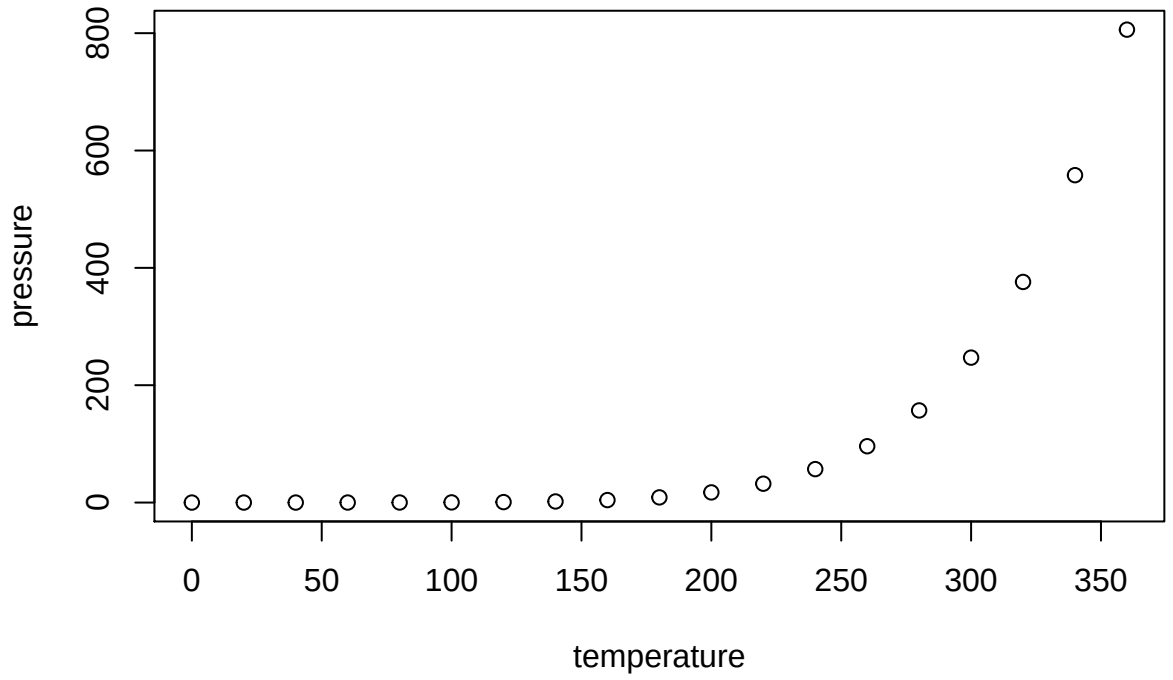
###Conclusion for Hypothesis Testing 2 **For dosages of 0.5mg and 1mg, there are significant differences: OJ is better than VC in promoting tooth growth. At 2mg however, there is no significant differences.**

```r
summary(cars)
```

```
##      speed           dist
##  Min.   : 4.0   Min.   :  2.00
##  1st Qu.:12.0   1st Qu.: 26.00
##  Median :15.0   Median : 36.00
##  Mean   :15.4   Mean   : 42.98
##  3rd Qu.:19.0   3rd Qu.: 56.00
##  Max.   :25.0   Max.   :120.00
```

Including Plots

You can also embed plots, for example:



Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.