Statistical Inference Course Project Part2

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Part2 Basic inferential data analysis.

1. Load the ToothGrowth data and perform some basic exploratory data analyses

```
setwd("~/Rdata/Inference")
library(datasets)
data(ToothGrowth)
```

2. Provide a basic summary of the data.

```
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 ...
```

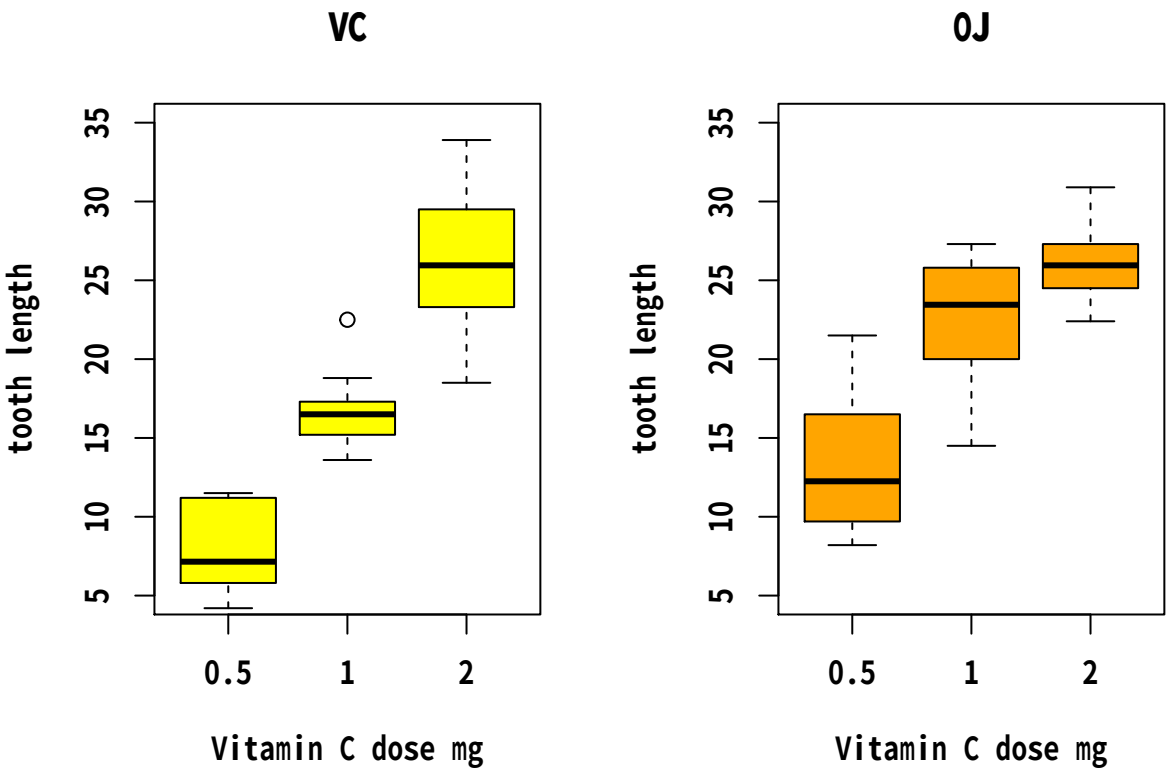
```
summary(ToothGrowth)
```

```
##       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$supp,ToothGrowth$dose)
```

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

```
# barplot
library(ggplot2)
par(mfrow = c(1, 2))
boxplot(len ~ dose, data=ToothGrowth,subset = supp == "VC", col = "yellow", main="VC", xlab = "Vitamin C
boxplot(len ~ dose, data=ToothGrowth,subset = supp == "OJ", col = "orange", main="OJ", xlab= "Vitamin C
```



3. Use confidence intervals and/or hypothesis tests to compare tooth growth by supp and dose. (Only use the techniques from class, even if there's other approaches worth considering)

We used t.test in order to perform confidence intervals. First, comparing whether there is a difference in the growth of the teeth depending on the type of supplement "OJ" or "VC".

```
t.test(len ~ supp, data=ToothGrowth, var.equal=TRUE)
```

```
##
##  Two Sample t-test
##
## data:  len by supp
## t = 1.9153, df = 58, p-value = 0.06039
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.1670064  7.5670064
## sample estimates:
## mean in group OJ mean in group VC
##         20.66333         16.96333
```

The p-value is 0.06. We can not reject the null hypothesis that Growth of teeth there is a difference depending on the type of supplements.

```
t.test(ToothGrowth$len[ToothGrowth$dose==0.5], ToothGrowth$len[ToothGrowth$dose==1], var.equal=TRUE)
```

```
##
##  Two Sample t-test
##
## data:  ToothGrowth$len[ToothGrowth$dose == 0.5] and ToothGrowth$len[ToothGrowth$dose == 1]
```

```
## t = -6.4766, df = 38, p-value = 1.266e-07
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -11.983748  -6.276252
## sample estimates:
## mean of x mean of y
##    10.605    19.735
```

```
t.test(ToothGrowth$len[ToothGrowth$dose==0.5], ToothGrowth$len[ToothGrowth$dose==2], var.equal=TRUE)
```

```
##
##  Two Sample t-test
##
## data:  ToothGrowth$len[ToothGrowth$dose == 0.5] and ToothGrowth$len[ToothGrowth$dose == 2]
## t = -11.799, df = 38, p-value = 2.838e-14
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -18.15352 -12.83648
## sample estimates:
## mean of x mean of y
##    10.605    26.100
```

```
t.test(ToothGrowth$len[ToothGrowth$dose==1], ToothGrowth$len[ToothGrowth$dose==2], var.equal=TRUE)
```

```
##
##  Two Sample t-test
##
## data:  ToothGrowth$len[ToothGrowth$dose == 1] and ToothGrowth$len[ToothGrowth$dose == 2]
## t = -4.9005, df = 38, p-value = 1.811e-05
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -8.994387 -3.735613
## sample estimates:
## mean of x mean of y
##    19.735    26.100
```

For all three dose level pairs, the p-value is less than 0.05. The mean tooth length increases on raising the dose level. This indicates that we can reject the null hypothesis, and establish that increasing the dose level leads to an increase in tooth length.

4. State your conclusions and the assumptions needed for your conclusions.

conclusion

It can not be said that the growth of the tooth is relevant to two types of supplements. It can be said a 5% significance level statistically, the intake of vitamin C is relevant to growth of teeth.

assumption

To prove the assumption that growth of teeth was relevant to the type of supplement, We made a null hypothesis that there is no relevance to growth teeth and the type of supplement tried to reject .

To prove the assumption that intake of vitamin C was relevant to growth of teeth, we made a null hypothesis that there is no relevance to the intake of vitamin C and tooth growth.