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 ...
```

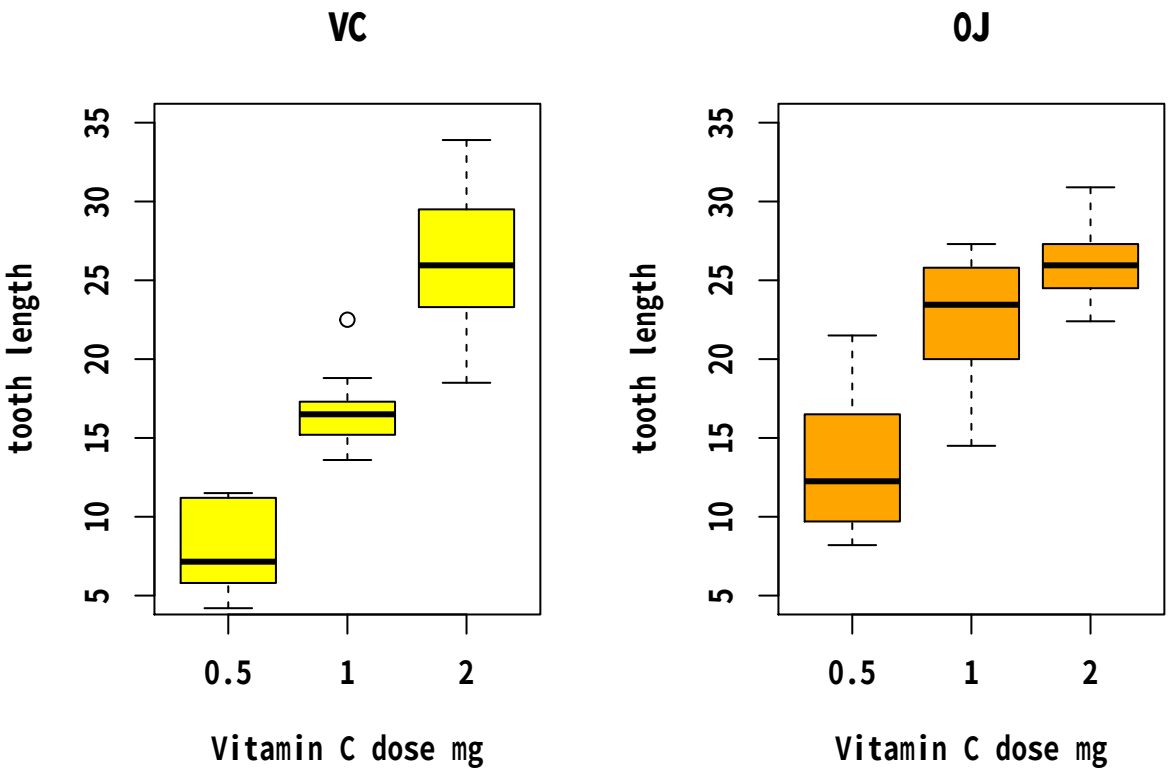
```
summary(ToothGrowth)
```

```
##       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.