Statistical Inference Course Project 2

Introduction

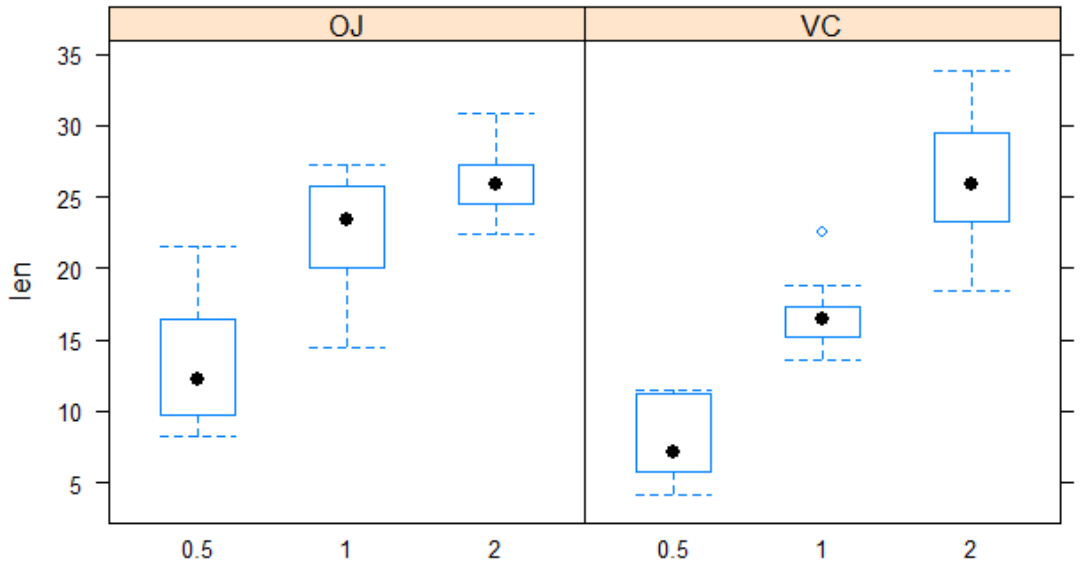
Load the ToothGrowth data and perform some basic exploratory data analyses, provide a basic summary of the data. Use confidence intervals and/or hypothesis tests to compare tooth growth by supp and dose. (Only use the techniques from class, even if there's other approaches worth considering). State your conclusions and the assumptions needed for your conclusions.

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

```
library(lattice)

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 ...
```

```
ToothGrowth$dose <- as.factor(ToothGrowth$dose)

bwplot(len ~ dose | supp, data = ToothGrowth)
```



Provide a basic summary of the data

Below is the mean of the data set

```
supp dose   len
1   OJ  0.5 13.23
2   VC  0.5  7.98
3   OJ  1.0 22.70
4   VC  1.0 16.77
5   OJ  2.0 26.06
6   VC  2.0 26.14
```

Below is the standard deviation n of the data set

```
supp dose      len
1   OJ  0.5 4.459709
2   VC  0.5 2.746634
3   OJ  1.0 3.910953
4   VC  1.0 2.515309
5   OJ  2.0 2.655058
6   VC  2.0 4.797731
```

Use confidence intervals and/or hypothesis tests to compare tooth growth by su pp and dose

```
g1_supp <- mean_len[mean_len$supp == "OJ", ]$len
g2_supp <- mean_len[mean_len$supp == "VC", ]$len
t.test(g1_supp - g2_supp)
```

```
        One Sample t-test

data:  g1_supp - g2_supp
t = 1.9472, df = 2, p-value = 0.1909
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
 -4.475757 11.875757
sample estimates:
mean of x
      3.7
```

Calculate the confidence interval of the tooth growth by different dose

```
g_dose_2 <- mean_len[mean_len$dose == 2.0, ]$len

g_dose_1 <- mean_len[mean_len$dose == 1.0, ]$len

g_dose_0.5 <- mean_len[mean_len$dose == 0.5, ]$len

t.test(g_dose_2 - g_dose_1)
```

```
        One Sample t-test
```

```
data:  g_dose_2 - g_dose_1
t = 2.1181, df = 1, p-value = 0.2808
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
 -31.81715  44.54715
sample estimates:
mean of x
    6.365
```

t.test(g_dose_1 - g_dose_0.5)

```
One Sample t-test

data:  g_dose_1 - g_dose_0.5
t = 26.853, df = 1, p-value = 0.0237
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
  4.80989 13.45011
sample estimates:
mean of x
     9.13
```

t.test(g_dose_2 - g_dose_0.5)

```
        One Sample t-test

data:  g_dose_2 - g_dose_0.5
t = 5.8143, df = 1, p-value = 0.1084
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
 -18.36704  49.35704
sample estimates:
mean of x
   15.495
```

State your conclusions and the assumptions needed for your conclusions

The result shows inefficiency in the change of supp. Increasing the dose has a positive effect. If we set the unit of increasing dose to 0.5. Then the dose increasing from 0.5 to 1 is the most efficient one. And the confidence interval of the dose increasing from dose 0.5 to 1 is the narrowest.