Course_Project_2

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1. Project Introduction

The response is the length of odontoblasts (cells responsible for tooth growth) in 60 guinea pigs. Each animal received one of three dose levels of vitamin C (0.5, 1, and 2 mg/day) by one of two delivery methods, (orange juice or ascorbic acid (a form of vitamin C and coded as VC).

The goal of the analysis is to establish the relation between VC doses and tooth growth and compare the two methods of supplements (orange juice and ascorbic acid)

1.1. Load Necessary Library

Tooth growth data is loaded from datasets library. Also ggplot2 library is loaded for ploting. Dose level is converted to factors for convenience.

```
library(datasets)
library(ggplot2)
data<-ToothGrowth
data$dose<-as.factor(data$dose)
```

2. Basic Analysis

The mean, median, standard deviation and variance are calculated for different supplement methods and different doses

```
data_summary<-aggregate(data=data,len~supp+dose,FUN = mean)
names(data_summary)<-c("Supplement Type","Dose","Len_Mean")
data_summary$Len_Median<-aggregate(data=data,len~supp+dose,FUN = median)$len
data_summary$Len_Std<-aggregate(data=data,len~supp+dose,FUN = sd)$len
data_summary$Len_Var<-aggregate(data=data,len~supp+dose,FUN = var)$len
data_summary
```

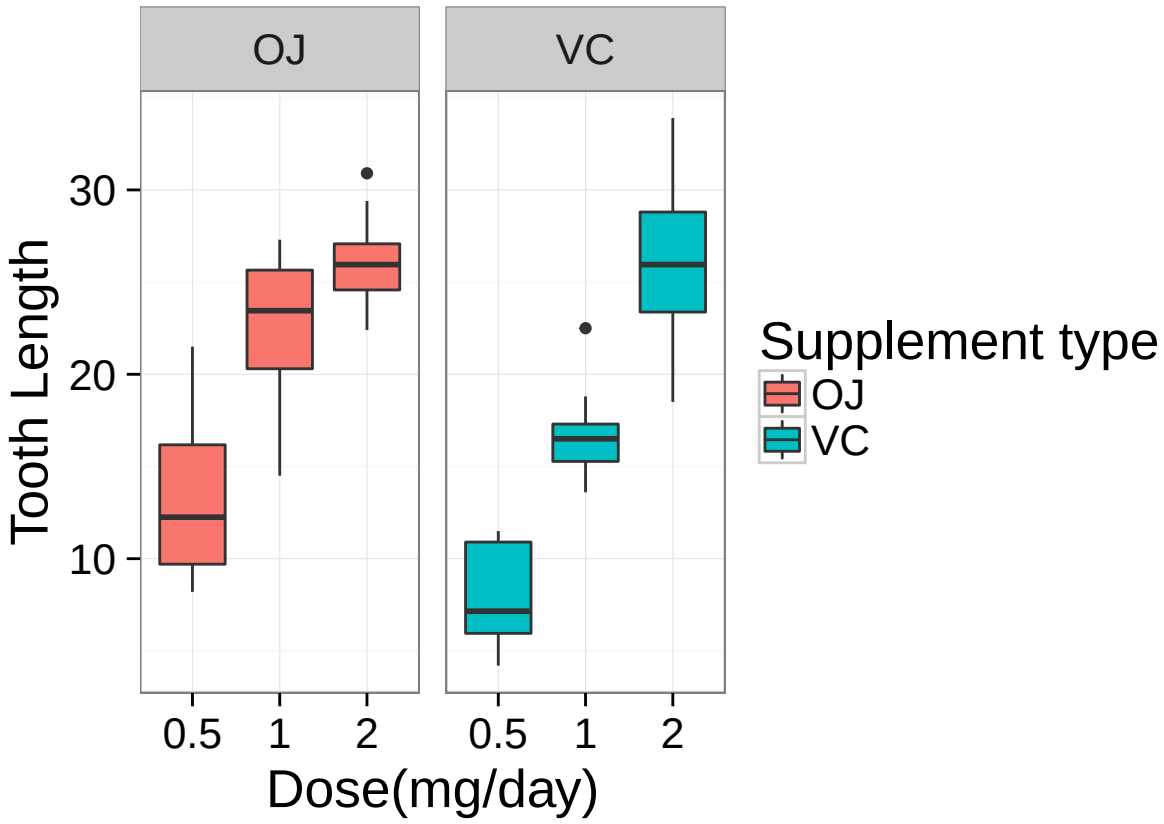
```
##   Supplement Type Dose Len_Mean Len_Median  Len_Std   Len_Var
## 1              OJ  0.5    13.23      12.25 4.459709 19.889000
## 2              VC  0.5     7.98       7.15 2.746634  7.544000
## 3              OJ    1    22.70      23.45 3.910953 15.295556
## 4              VC    1    16.77      16.50 2.515309  6.326778
## 5              OJ    2    26.06      25.95 2.655058  7.049333
## 6              VC    2    26.14      25.95 4.797731 23.018222
```

From this point, orange juice induces longer tooth comparing to VC for 0.5 or 1 mg/day. However, for 2mg/day, orange juice and VC are equaly powerful. Also, the intake dose of VC is positively correlated with tooth length.

3. Explotary Analysis

Boxplots are generated to give an intuitive concept of the data

```
figure <- ggplot(data, aes(x = dose, y = len, fill = supp))
figure <- figure + geom_boxplot()
figure <- figure + facet_grid(. ~ supp)
figure<-figure+theme_bw(base_size = 20)+xlab("Dose(mg/day)")+ylab('Tooth Length')
figure<-figure+guides(fill=guide_legend(title="Supplement type"))
print(figure)
```



As shown in the graph, with higher dose, the tooth length increases. Also orange juice has better effects than vc for lower dose but almost the same for 2mg/day.

4. Hyopothesis Tests

4.1. Comparing Two Methods of Supplement