

Tooth Growth Data Inferential Analysis

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Data Preprocessing

```
library(datasets)
data("ToothGrowth")
```

Exploratory Data Analysis

```
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 ...
```

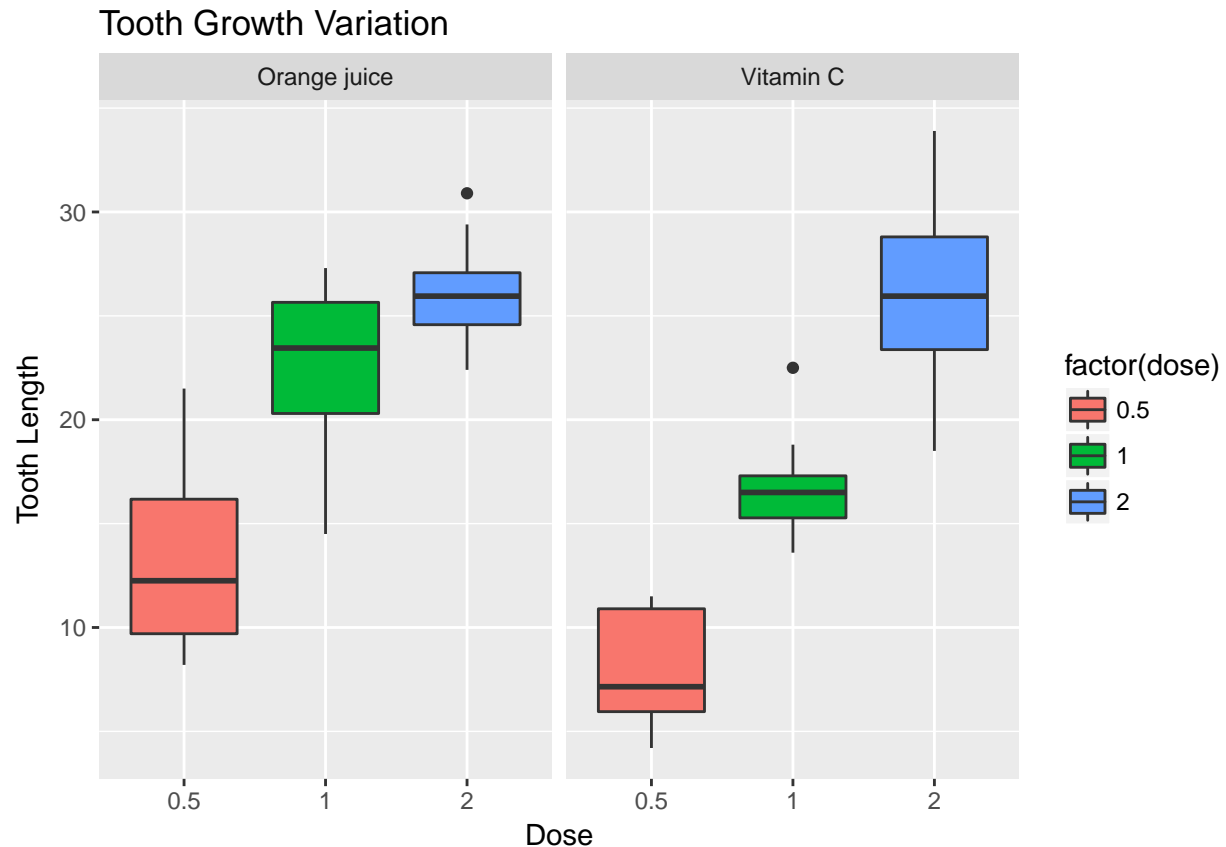
```
summary(ToothGrowth)
```

```
##      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
```

```
levels(ToothGrowth$supp)<-c("Orange juice","Vitamin C")
```

```
library(ggplot2)
```

```
ggplot(data = ToothGrowth,aes(x=factor(dose),len,fill=factor(dose)))+geom_boxplot()+facet_grid(facets =
```



Statistical Tests and Inference

Hypothesis 1

Both Orange Juice and Vitamin C enables equal tooth growth for all doses

```
hypo1<-t.test(len~supp,ToothGrowth)
hypo1$conf.int
```

```
## [1] -0.1710156  7.5710156
## attr("conf.level")
## [1] 0.95
```

```
hypo1$p.value
```

```
## [1] 0.06063451
```

The confidence intervals include 0 and the p-value is greater than the threshold of 0.05. The null hypothesis cannot be rejected.

Hypothesis 2

Both Orange Juice and Vitamin C enables equal tooth growth for dose = 0.5 mg/day

```
hypo2<-t.test(len~supp,ToothGrowth,dose==0.5)
hypo2$conf.int
```

```
## [1] 1.719057 8.780943
## attr(,"conf.level")
## [1] 0.95
```

```
hypo2$p.value
```

```
## [1] 0.006358607
```

The confidence interval does not include 0 and the p-value is below the 0.05 threshold. The null hypothesis can be rejected.

Hypothesis 3

Both Orange Juice and Vitamin C enables equal tooth growth for dose = 1.0 mg/day

```
hypo3<-t.test(len~supp,ToothGrowth,dose==1.0)
hypo3$conf.int
```

```
## [1] 2.802148 9.057852
## attr(,"conf.level")
## [1] 0.95
```

```
hypo3$p.value
```

```
## [1] 0.001038376
```

The confidence interval does not include 0 and the p-value is smaller than the 0.05 threshold. The null hypothesis can be rejected.

Hypothesis 4

Both Orange Juice and Vitamin C enables equal tooth growth for dose = 2.0 mg/day

```
hypo4<-t.test(len~supp,ToothGrowth,dose==2.0)
hypo4$conf.int
```

```
## [1] -3.79807 3.63807
## attr(,"conf.level")
## [1] 0.95
```

```
hypo4$p.value
```

```
## [1] 0.9638516
```

The confidence interval does include 0 and the p-value is larger than the 0.05 threshold. The null hypothesis cannot be rejected.

Conclusion

As evident from above hypotheses, for dosages of 0.5 and 1.0 mg/day, tooth growth occurs more in the case of Orange Juice than Vitamin C.

In the case of dose of 2.0 mg/day, equal tooth growth can be said to be achieved with p-value equal to 0.96