Tooth

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Analysis of Tooth Growth data in R

```r
library(ggplot2)
library(datasets)
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 ...
```

```r
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
```

```r
qplot(dose ,len ,data = ToothGrowth,
      col = supp,
      main = "Length Growth by supplement type and dosage",
      xlab = "Dosage",
      ylab = "Length Growth")
```

Length Growth by supplement type and dosage
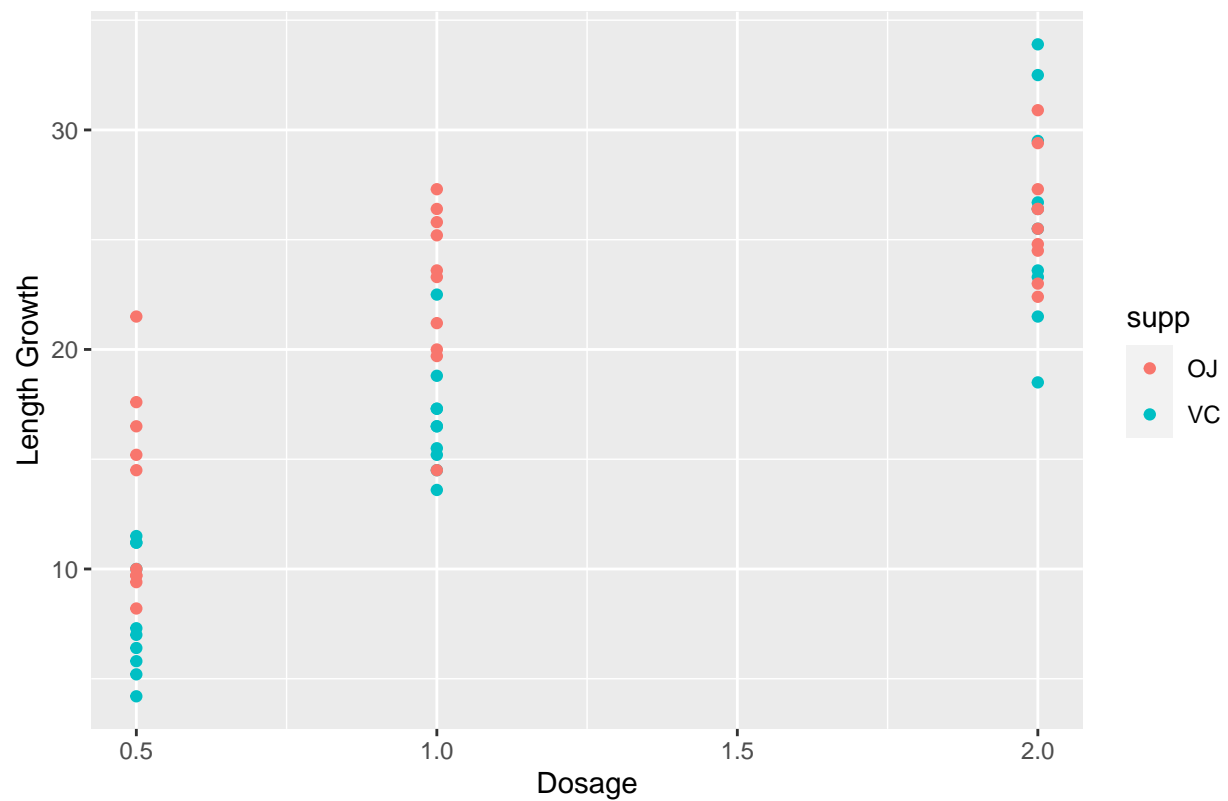

```
qplot(supp, len, data = ToothGrowth,
      facets = ~dose,
      main = "Tooth growth of guinea pigs by supplement type and dosage (mg)",
      xlab = "Supplement type",
      ylab = "Tooth length") +
        geom_boxplot(aes(fill = supp))
```

Tooth growth of guinea pigs by supplement type and dosage (mg)
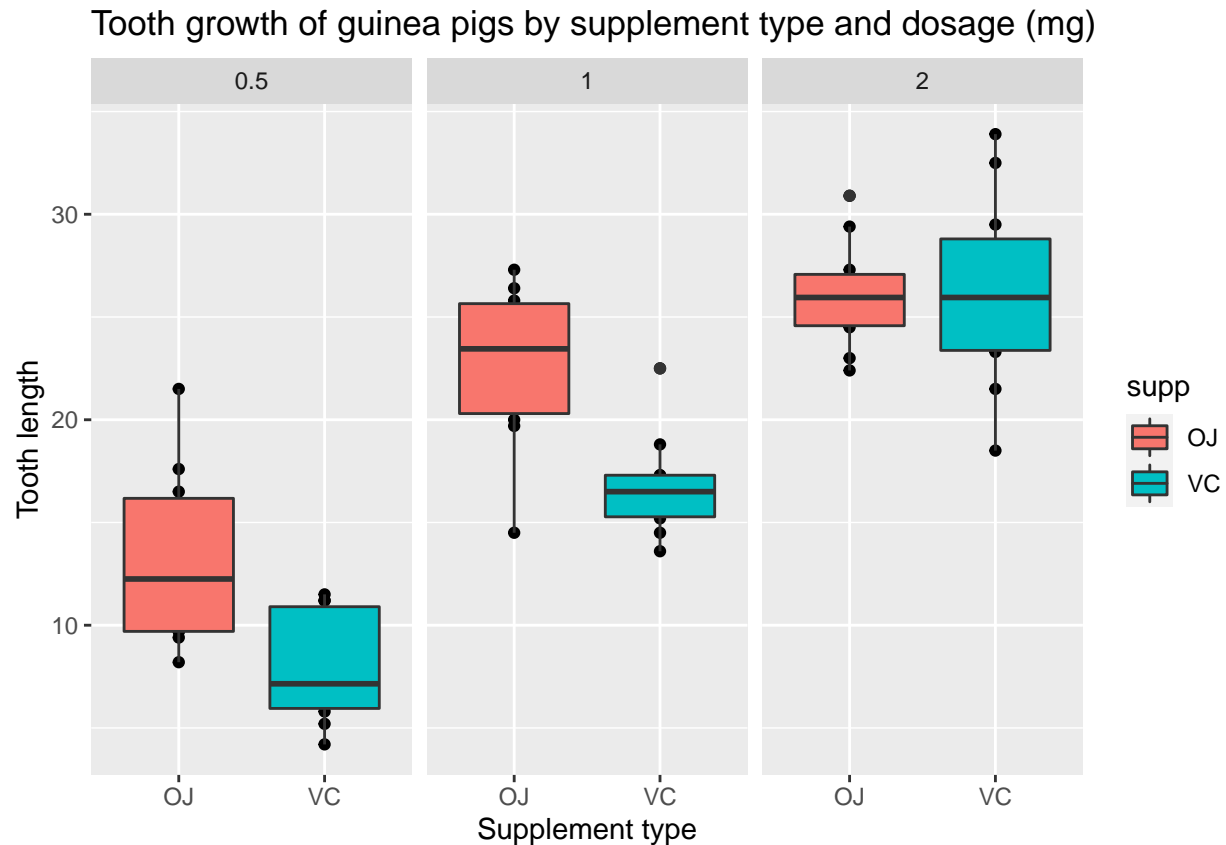
The null hypothesis is VC supplementary growth is more than OJ supplementary growth.

```
VC <- ToothGrowth$len[ToothGrowth$supp == "VC"]
OJ<- ToothGrowth$len[ToothGrowth$supp == "OJ"]
t.test(VC, OJ,
       alternative = "greater", # testing hypothesis if Vc is greater than VC
       paired = FALSE, # the data point are not paired with each other
       var.equal = FALSE, # the variances are not equal
       conf.level = 0.98) # a 98% confidence interval is taken as the default if nothing else is define
```

```
##
##  Welch Two Sample t-test
##
## data:  VC and OJ
## t = -1.9153, df = 55.309, p-value = 0.9697
## alternative hypothesis: true difference in means is greater than 0
## 98 percent confidence interval:
##  -7.763289       Inf
## sample estimates:
## mean of x mean of y
##  16.96333  20.66333
```

The P-value is 0.9697, so null hypothesis is true.

The null hypothesis is that tooth growth for 0.5 is less than 1.

```
d0.5 <- ToothGrowth$len[ToothGrowth$dose == "0.5"]
d1   <- ToothGrowth$len[ToothGrowth$dose == "1"]
d2   <- ToothGrowth$len[ToothGrowth$dose == "2"]
t.test(d0.5, d1, alternative = "greater", # is the alternative that d1 has a greater mean than d0.5
       paired = FALSE,
       var.equal = FALSE,
       conf.level = 0.98)
```

```
##
##  Welch Two Sample t-test
##
## data:  d0.5 and d1
## t = -6.4766, df = 37.986, p-value = 1
## alternative hypothesis: true difference in means is greater than 0
## 98 percent confidence interval:
##  -12.12797       Inf
## sample estimates:
## mean of x mean of y
##    10.605    19.735
```

The P-Value is 1, so the null hypothesis is true.

The null hypothesis is that for d1 growth is less than for d2

```
t.test(d1, d2,
       alternative = "greater", # is the alternative that dose_1 has a greater mean than dose_2
       paired = FALSE,
       var.equal = FALSE,
       conf.level = 0.98)
```

```
##
##  Welch Two Sample t-test
##
## data:  d1 and d2
## t = -4.9005, df = 37.101, p-value = 1
## alternative hypothesis: true difference in means is greater than 0
## 98 percent confidence interval:
##  -9.129608       Inf
## sample estimates:
## mean of x mean of y
##    19.735    26.100
```

The P-value is also 1, so the null hypothesis is also true