Analysis of variance(ANOVA)

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19BLC1186
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Aim-To StudyANOVA in R

Code-

```
group1<-c(551,457,450,731,499,632)

group2<-c(595,580,508,583,633,517)

group3<-c(693,615,511,573,648,677)

group4<-c(417,449,517,438,415,555)

group5<-c(563,631,522,613,656,679)

group<-
data.frame(cbind(group1,group2,group3,group4,group5))

summary(group)

stgr<-stack(group)

crd<-aov(values~ind,data = stgr)

summary(crd)

boxplot(group)
```

```
Item1<-c(22,42,44,52,45,37)

Item2<-c(52,33,8,47,43,32)

Item3<-c(16,24,19,18,34,39)

group<-
data.frame(cbind(Item1,Item2,Item3))

summary(group)

stgr<-stack(group)

crd<-aov(values~ind,data = stgr)

summary(crd)

boxplot(group)


data<-read.table(file.choose(),header =
TRUE)

time=c(t(as.matrix(data)))

f=c("Oper1","Oper2","Oper3","Oper4","Oper5"
,"Oper6")

g=c("M1","M2","M3","M4")

k=ncol(data)

n=nrow(data)
```

Operators=gl(k,l,n*k,factor(f))

Machines=gl(n,k,n*k,factor(g))

anova=aov(time~Machines+Operators)

summary(anova)

	Operator					
Machine	1	2	3	4	5	6
1	42.5	39.3	39.6	39.9	42.9	43.6
2	39.8	40.1	40.5	42.3	42.5	43.1
3	40.2	40.5	41.3	43.4	44.9	45.1
4	41.3	42.2	43.5	44.2	45.9	42.3

Output-

> group1<-c(551,457,450,731,499,632)

> group2<-c(595,580,508,583,633,517)

> group3<-c(693,615,511,573,648,677)

> group4<-c(417,449,517,438,415,555)

> group5<-c(563,631,522,613,656,679)

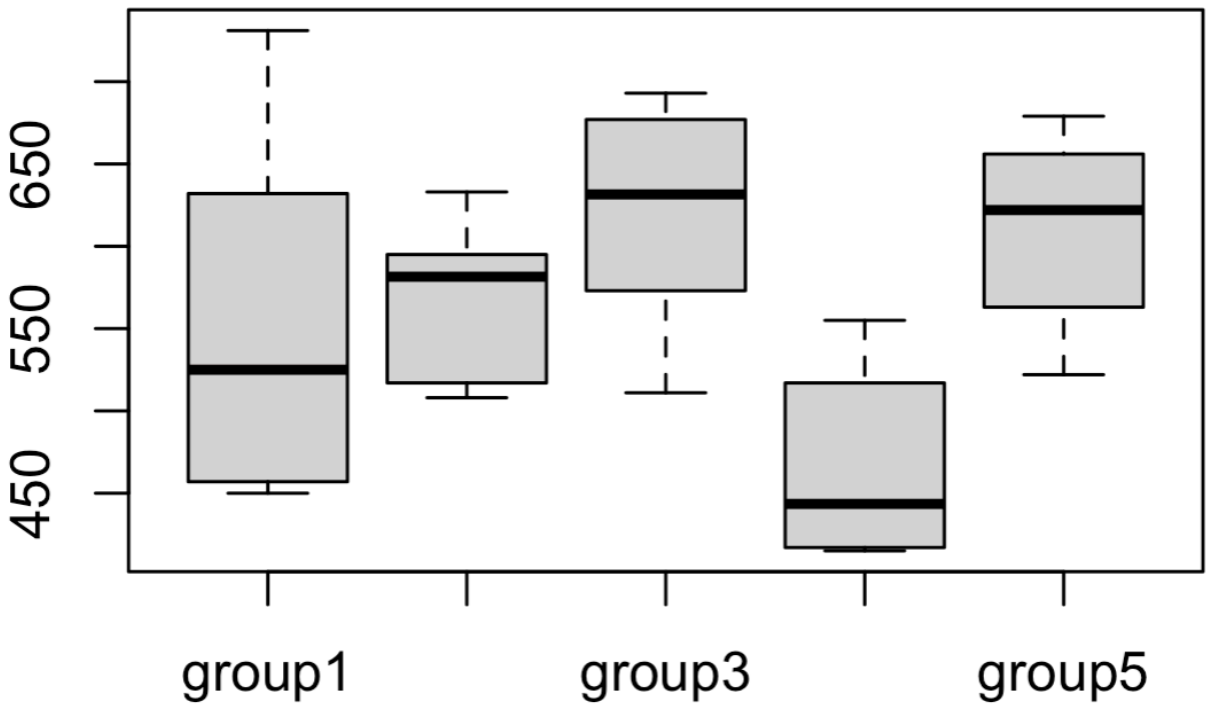
> group<-
data.frame(cbind(group1,group2,group3,
group4,group5))

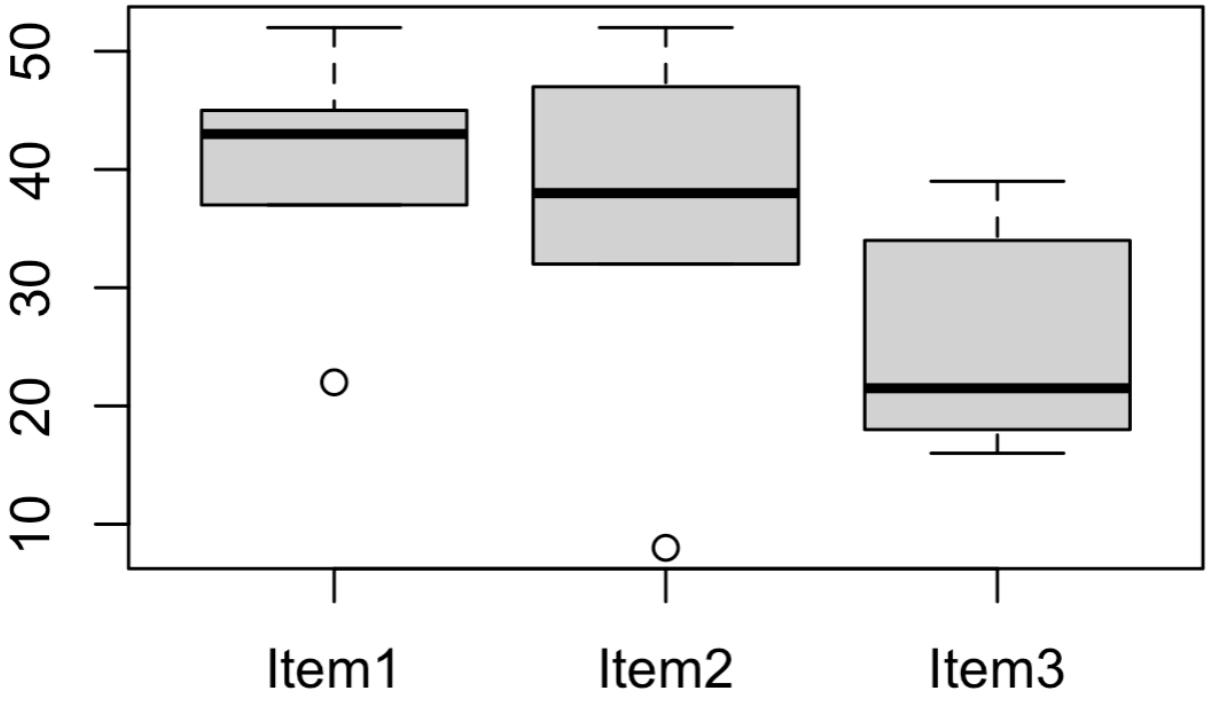
```
> summary(group)

   group1       group2       group3       group4       group5

 Min.   :450.0   Min.   :508.0   Min.   :511.0   Min.   :415.0   Min.   :522.0

 1st Qu.:467.5   1st Qu.:532.8   1st Qu.:583.5   1st Qu.:422.2   1st Qu.:575.5

 Median :525.0   Median :581.5   Median :631.5   Median :443.5   Median :622.0

 Mean   :553.3   Mean   :569.3   Mean   :619.5   Mean   :465.2   Mean   :610.7

 3rd Qu.:611.8   3rd Qu.:592.0   3rd Qu.:669.8   3rd Qu.:500.0   3rd Qu.:649.8

 Max.   :731.0   Max.   :633.0   Max.   :693.0   Max.   :555.0   Max.   :679.0

> stgr<-stack(group)

> crd<-aov(values~ind,data = stgr)

> summary(crd)

            Df Sum Sq Mean Sq F value  Pr(>F)
```

```
ind          4  91005   22751   4.391 0.00795
**
Residuals   25 129528    5181
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’
0.05 ‘.’ 0.1 ‘ ’ 1
> boxplot(group)
>
> Item1<-c(22,42,44,52,45,37)
> Item2<-c(52,33,8,47,43,32)
> Item3<-c(16,24,19,18,34,39)
> group<-
data.frame(cbind(Item1,Item2,Item3))
> summary(group)
    Item1          Item2          Item3
 Min.   :22.00   Min.   : 8.00   Min.   :16.00
 1st Qu.:38.25   1st Qu.:32.25   1st
Qu.:18.25
 Median :43.00   Median :38.00   Median
:21.50
```

```
 Mean   :40.33   Mean   :35.83   Mean
:25.00

 3rd Qu.:44.75   3rd Qu.:46.00   3rd
Qu.:31.50

 Max.   :52.00   Max.   :52.00   Max.
:39.00

> stgr<-stack(group)

> crd<-aov(values~ind,data = stgr)

> summary(crd)

            Df Sum Sq Mean Sq F value Pr(>F)

ind          2  745.4   372.7   2.541  0.112

Residuals   15 2200.2   146.7

> boxplot(group)

>

> data<-read.table(file.choose(),header =
TRUE)

Error in scan(file = file, what = what, sep =
sep, quote = quote, dec = dec,  :

  line 2 did not have 2 elements

> time=c(t(as.matrix(data)))
```

```
>
f=c("Oper1","Oper2","Oper3","Oper4","Oper
5","Oper6")
> g=c("M1","M2","M3","M4")
> k=ncol(data)
> n=nrow(data)
> Operators=gl(k,1,n*k,factor(f))
> Machines=gl(n,k,n*k,factor(g))
> anova=aov(time~Machines+Operators)
> summary(anova)
            Df Sum Sq Mean Sq F value Pr(>F)
Machines     1  140.2  140.17   30.04
0.0317 *
Operators    2  585.3  292.67   62.71
0.0157 *
Residuals    2    9.3    4.67
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*'
0.05 '.' 0.1 ' ' 1
```


650
550
450
group1
group3
group5


50
40
30
20
10
Item1
Item2
Item3