

# Lab 22 R Script

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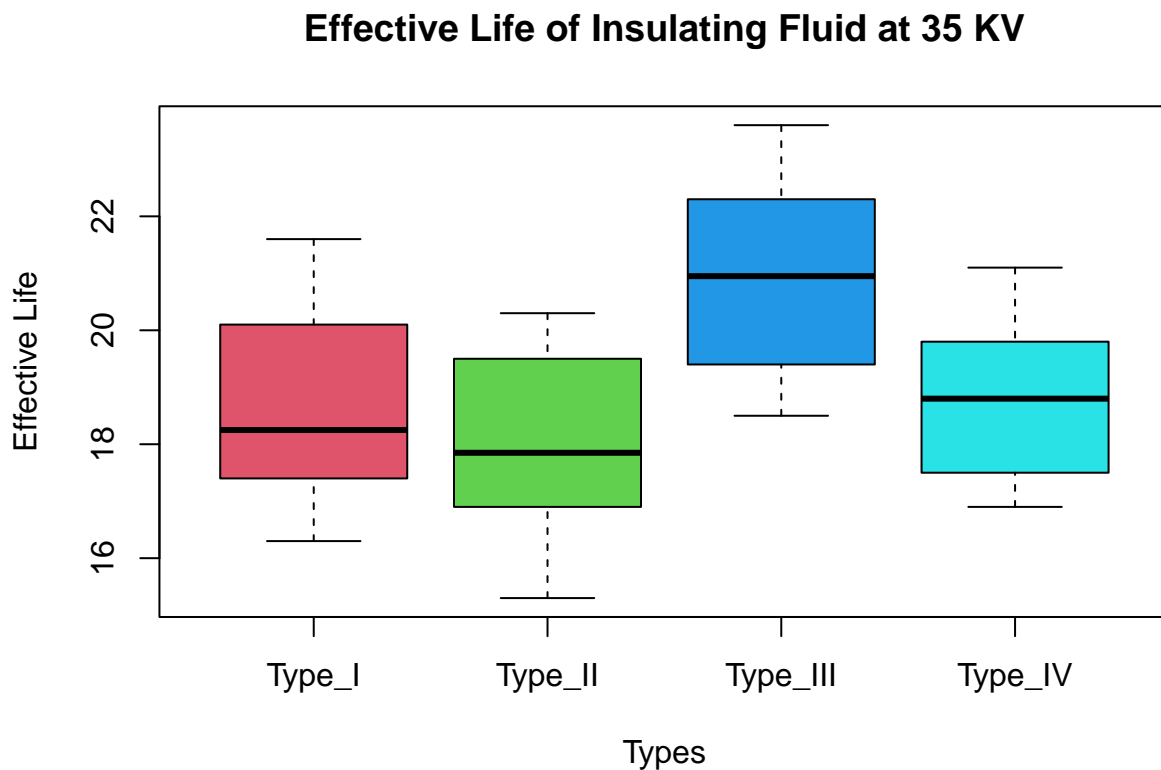
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## 1) Insulating Fluids

```
fluids = read.table("C:\\repos\\STAT 50001\\Lab 22\\fluids.txt", header = TRUE)
attach(fluids)

types = factor(rep(c("Type_I", "Type_II", "Type_III", "Type_IV"), c(6,6,6,6)))
y = c(Type_I, Type_II, Type_III, Type_IV)

plot(types, y, names=c("Type_I", "Type_II", "Type_III", "Type_IV"),
     xlab="Types", ylab="Effective Life",
     main="Effective Life of Insulating Fluid at 35 KV",
     col=c(2,3,4,5))
```



a) Is there any indication that the fluids differ at  $\alpha = 0.1$ ? What about at  $\alpha = 0.05$ ?

```
summary(aov(y ~ types))

##              Df Sum Sq Mean Sq F value Pr(>F)
## types          3  30.17   10.05    3.047 0.0525 .
## Residuals     20  65.99    3.30
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# Based on the summary, the effective life between types based on the summary:
# is significantly different at 0.1 confidence,
# is not significantly different at .05 confidence.
```

b) Use the Tukey's HSD test to identify the fluid types that are different (if any)

```
TukeyHSD(aov(y ~ types), conf.level = 0.90)

##      Tukey multiple comparisons of means
##      90% family-wise confidence level
##
## Fit: aov(formula = y ~ types)
##
## $types
##              diff              lwr              upr              p adj
## Type_II-Type_I  -0.7000000 -3.2670196  1.8670196  0.9080815
## Type_III-Type_I   2.3000000 -0.2670196  4.8670196  0.1593262
## Type_IV-Type_I    0.1666667 -2.4003529  2.7336862  0.9985213
## Type_III-Type_II   3.0000000  0.4329804  5.5670196  0.0440578
## Type_IV-Type_II    0.8666667 -1.7003529  3.4336862  0.8413288
## Type_IV-Type_III  -2.1333333 -4.7003529  0.4336862  0.2090635

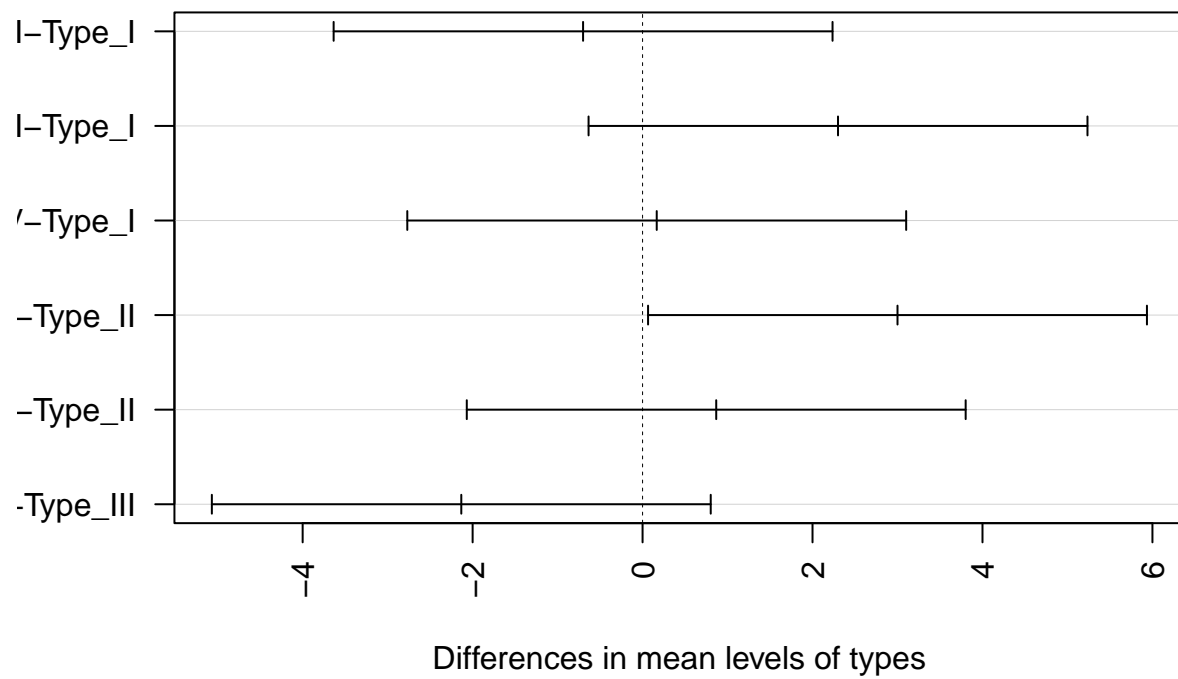
TukeyHSD(aov(y ~ types), conf.level = 0.95)

##      Tukey multiple comparisons of means
##      95% family-wise confidence level
##
## Fit: aov(formula = y ~ types)
##
## $types
##              diff              lwr              upr              p adj
## Type_II-Type_I  -0.7000000 -3.6354007  2.2354007  0.9080815
## Type_III-Type_I   2.3000000 -0.6354007  5.2354007  0.1593262
## Type_IV-Type_I    0.1666667 -2.76873407  3.1020674  0.9985213
## Type_III-Type_II   3.0000000  0.06459927  5.9354007  0.0440578
## Type_IV-Type_II    0.8666667 -2.06873407  3.8020674  0.8413288
## Type_IV-Type_III  -2.1333333 -5.06873407  0.8020674  0.2090635

# At both a 90% and 95% confidence level, a p-value of 0.044 shows
# there is a significant difference between Type_III and Type_II.

plot(TukeyHSD(aov(y ~ types), conf.level = 0.95), las = 2)
```

### 95% family-wise confidence level



```
plot(TukeyHSD(aov(y ~ types), conf.level = 0.90), las = 2)
```

### 90% family-wise confidence level

