PSTAT122_Hw4

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5.12 An experiment in conducted is conducted to study the influence of operating temperature and three types of faceplate glass in the light output of an oscillope tube. The following data are collected:

```
GlassType= factor(c(rep(1:2, each = 9)))
TempLevel = factor(c(rep(c(100,125,150), times =6)))
light <-c(580,1090,1392,
                568,1087,1380,
                570,1085,1386,
                550,1070,1328,
                530,1035,1312,
                579,1000,1299)
df.data_points = cbind(GlassType,TempLevel,light)
df.data_points
```

```
##       GlassType TempLevel light
##  [1,]         1         1   580
##  [2,]         1         2  1090
##  [3,]         1         3  1392
##  [4,]         1         1   568
##  [5,]         1         2  1087
##  [6,]         1         3  1380
##  [7,]         1         1   570
##  [8,]         1         2  1085
##  [9,]         1         3  1386
## [10,]         2         1   550
## [11,]         2         2  1070
## [12,]         2         3  1328
## [13,]         2         1   530
## [14,]         2         2  1035
## [15,]         2         3  1312
## [16,]         2         1   579
## [17,]         2         2  1000
## [18,]         2         3  1299
```

Model: $y_{ij} = \mu + \tau_i + \beta_j + \epsilon_{ijk}$ with $i = 1,\ldots,$a; $j = 1,\ldots,$b; k=1,...,n

Assumptions: $\sum_i \tau_i = \sum_j \beta_j = \sum_i \tau\beta_{ij} = \sum_j \tau\beta_{ij} = 0$; normal iid ϵ_{ijk}

(a) Use $\alpha = .05$ in the analysis. Is there a significant interaction effect? Does glass type or temperature affect the response? What conclusions can you draw $H_0 : (\tau\beta)_{ij} = 0$ for all i,j

$H_A : (\tau\beta)_{ij} \neq 0$ for some i,j

```r
aov.output<- aov(light~ GlassType*TempLevel)
summary(aov.output)
```

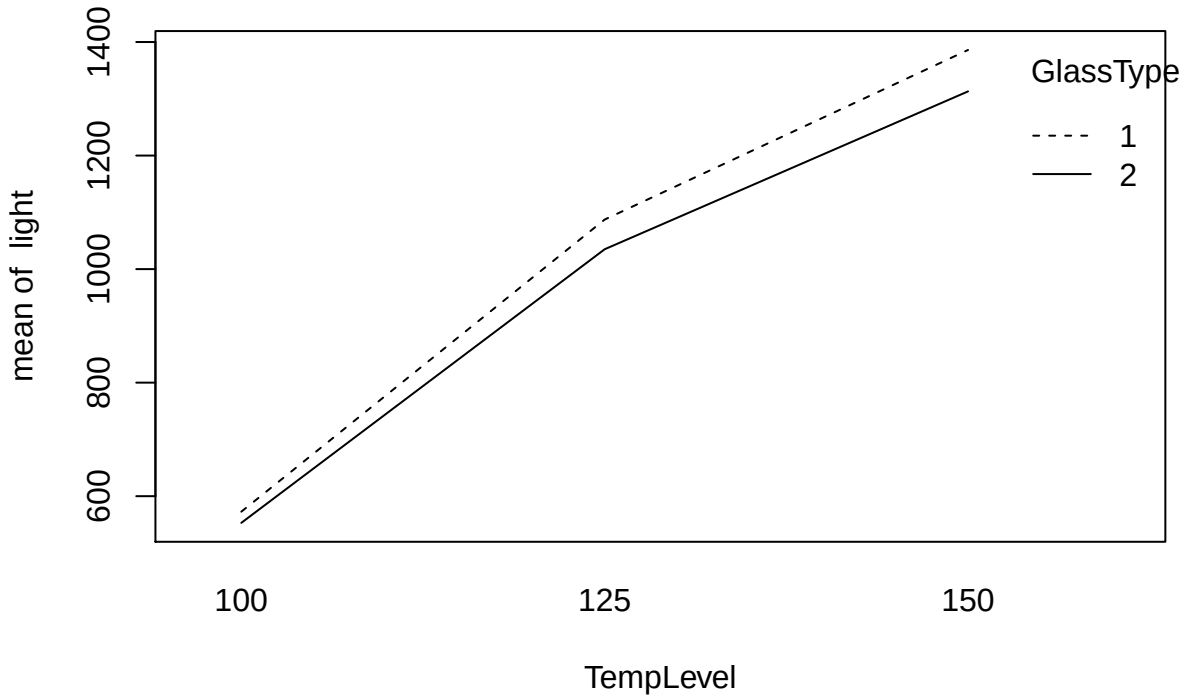
```
##                      Df  Sum Sq Mean Sq F value   Pr(>F)
## GlassType             1   10513   10513   29.66 0.000149 ***
## TempLevel             2 1900633  950317 2681.14  < 2e-16 ***
## GlassType:TempLevel   2    2169    1085    3.06 0.084350 .
## Residuals            12    4253     354
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

$F = 3.06$ p-value $= 0.084350$

Since the p-value is greater then our $\alpha = .05$, we do not reject our null hypothesis. There is not enought sufficent evidence to conclude that there is a signficant interaction effect..

Yes, the glass type does affect the response because both p-values are less than $\alpha = .05$

```r
library(stats)
interaction.plot(TempLevel,GlassType,light)
```



There shows no significant interaction betweeen temperature levels and glass types, the lines in the interaction plot are almost parallel towards one another. The plot shows that temperature levels rise as the mean of light rises. Althought they all show good life span of light, both glass types shows an increase in temperatures and the response.