Home Work 2

Rick Galbo, Lost in Bayesian: Ergo not a nonparam overachiever

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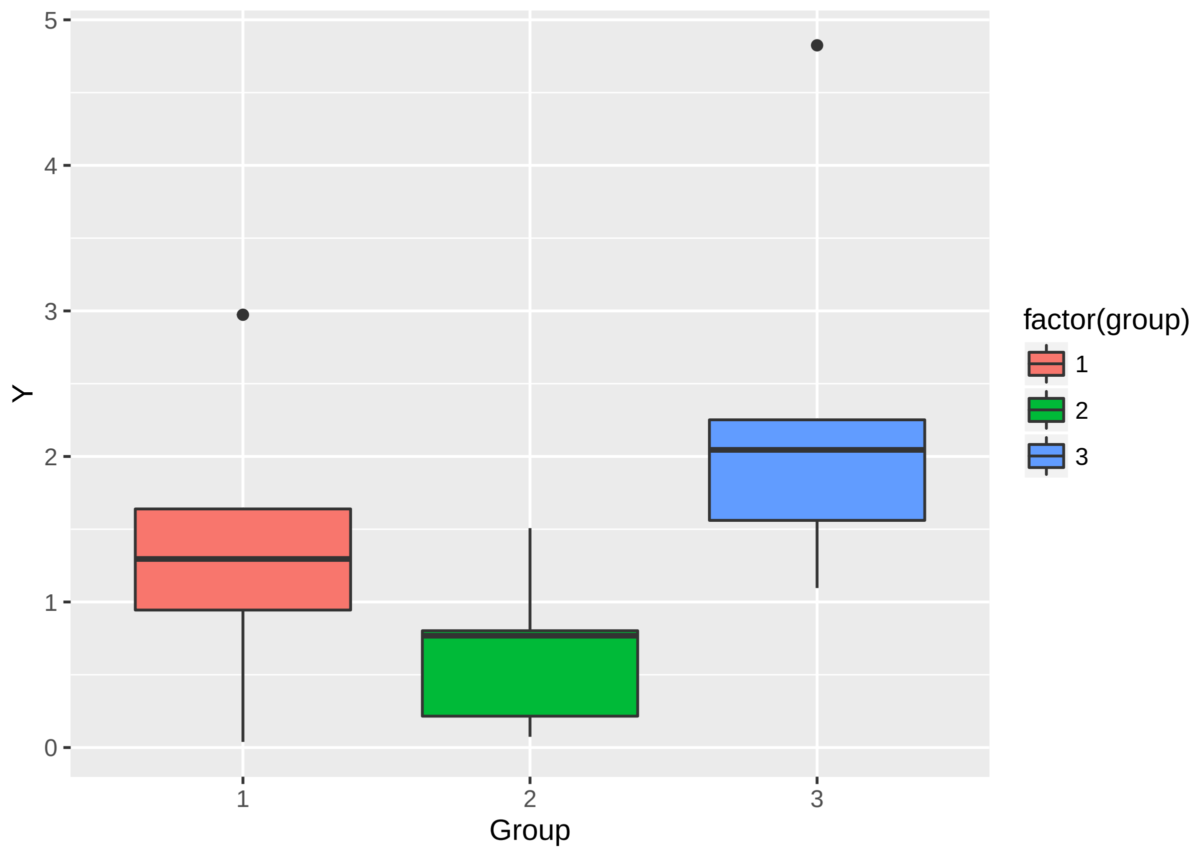
Problem 1

```
##   group   mean
## 1     1 1.3785
## 2     2 0.6736
## 3     3 2.3557
```



There is an observable difference in the group means which will be tested for significance.

a) ANOVA *F*-Test

H0: mu1 = mu2 = mu3 vs H1: mui != muj for some i,j

```
## Analysis of Variance Table
##
## Response: Y
##           Df  Sum Sq Mean Sq F value Pr(>F)
## group      1  2.3873  2.3873   1.628 0.2243
## Residuals 13 19.0635  1.4664
```

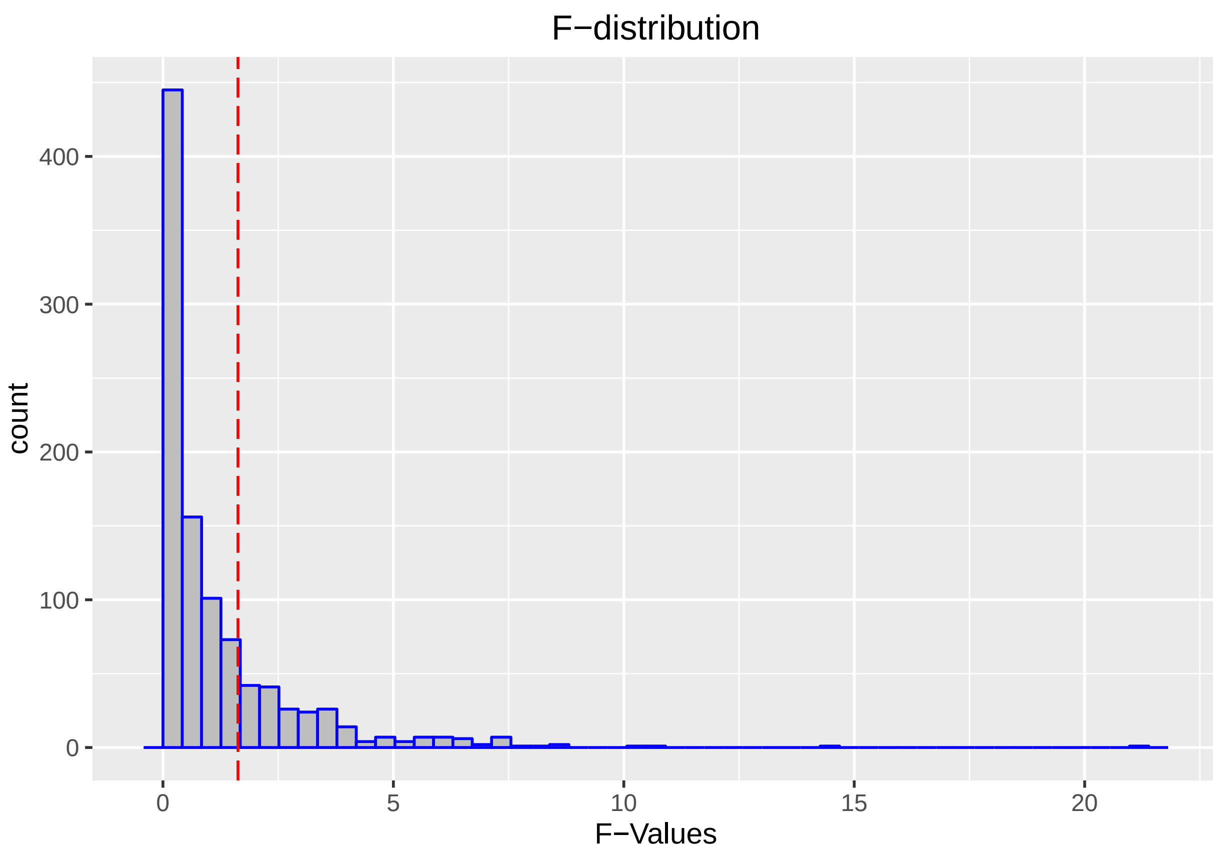
Can see that this is not significant at the $a = 0.05$ significance level.

b) permutation *F*-test

H0 : t1 = t2 = . . . = tk = 0
H1 : t1,t2, . . . , tk notallequal0

p-value:

```
## [1] 0.232
```



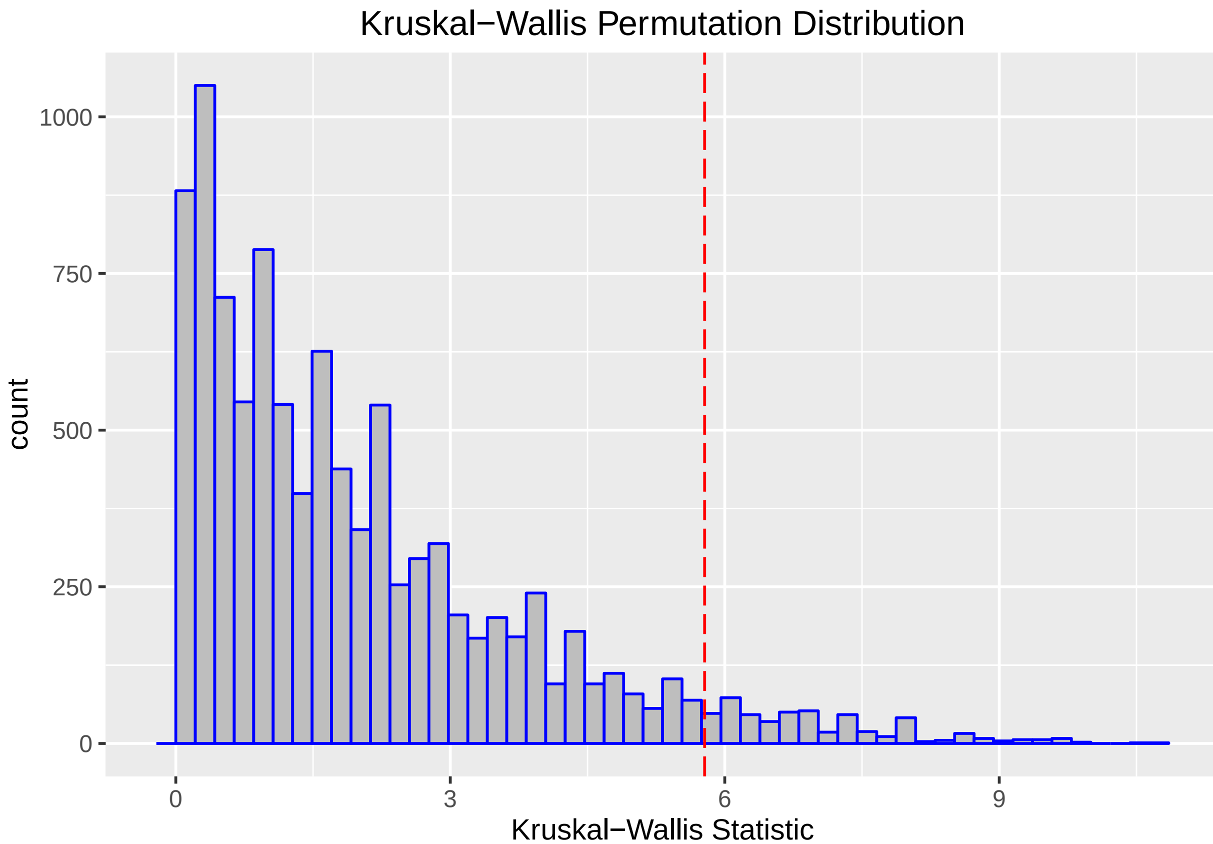
This p-value is comparable to the ANOVA F-test value and is also non-significant.

c) Kruskal-Wallis Test

p-value:

```
## [1] 0.0491
```

```
##
##  Kruskal-Wallis rank sum test
##
## data:  Y and group
## Kruskal-Wallis chi-squared = 5.78, df = 2, p-value = 0.05558
```

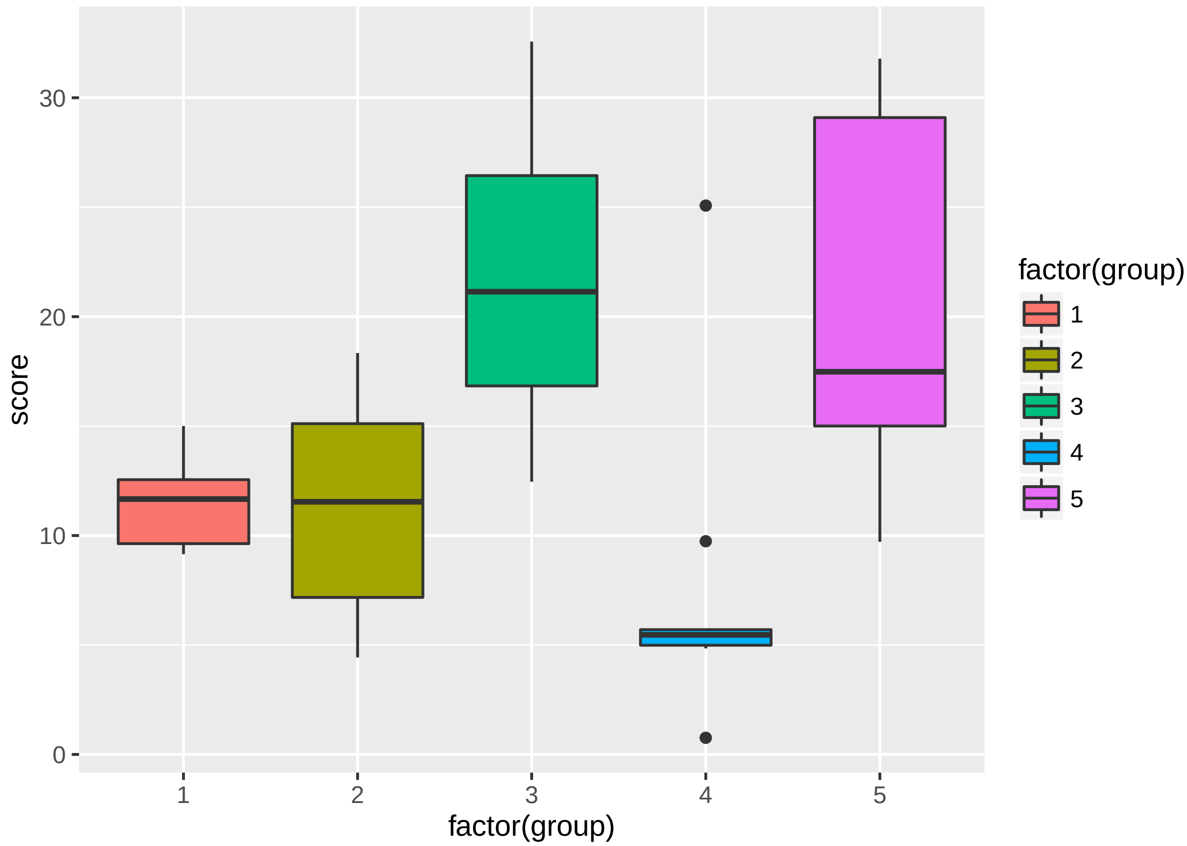


d)

We can see that for all the test performed that the p-value was never significant at the alpha = 0.05 level except for the Kruskal-Wallis when done by hand. However, this was only slightly significant and very close to the programmed version of the test. The Kruskal-Wallis test was the most significant and did the best at detecting the difference in the groups because it is a rank based test and was able to perform more accurately on a small sample with outliers. The nature of the F-test allows for skew due to outliers.

Probem 2

After loading the data set, run a Kruskal-Wallis test to identify if there are differences between the ranked values belonging to each group.



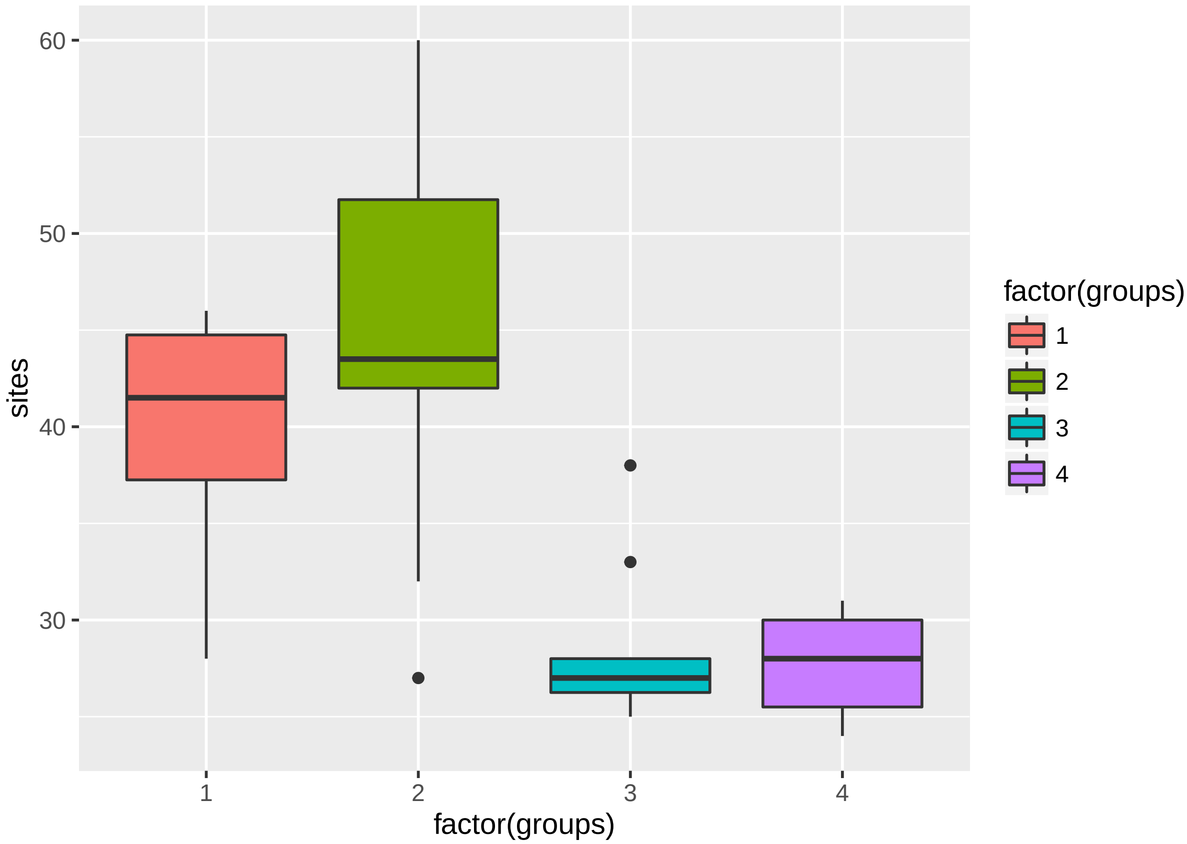

```
##
##  Kruskal-Wallis rank sum test
##
## data:  dat2$score and dat2$group
## Kruskal-Wallis chi-squared = 26.0329, df = 4, p-value = 3.116e-05
```

The p-value from the Kruskal-Wallis test is very small, p = 3.116e-05. Since we have five groups preforming 10 different tests, which will create false positives by chance. To correct for this we reduce the significance level using the Bonferroni cut-off. This reduces the alpha level to match the number of test preformed. It is what is considered a conservative correction.

```
## [1] 0.005
```

We can see that even though we have made a conservative correction of alpha that the test statistic is still significant.

Problem 3




```
##
##  Kruskal-Wallis rank sum test
##
## data:  sites and groups
## Kruskal-Wallis chi-squared = 22.8524, df = 3, p-value = 4.335e-05
```

Here the data is loaded and plotted to show the difference between the groups. A Kruskal-Wallis test is preformed to see if the ranks between any of the groups are significantly different. This test produced a p-value of 4.335e-05 which is significant at the 0.05 level. However, since there are 4 groups it is good to check the Bonferroni cut-off on alpha.

```
## [1] 0.008333333
```

The test p-value is still significant after this conservative correction.