STAT 345-01: Nonparametric Statistics

Problem Set 11

Assigned 2018 November 29
Due 2018 December 6

Show your work on all problems! Be sure to give credit to any collaborators, or outside sources used in solving the problems. Note that if using an outside source to do a calculation, you should use it as a reference for the method, and actually carry out the calculation yourself; it's not sufficient to quote the results of a calculation contained in an outside source.

Please hand in parts one and two separately. If you wish to submit your part one electronically, please send it directly to the grader as pdf only.

1 Part One: Conover Problems on Cochran's Q Test

Exercise 4.6.1

Exercise 4.6.2

Problem: If we define $K_j^{(i)}$ to be the rank within block i of the response X_{ij} to treatment j (using $K_j^{(i)}$ rather than R_{ij} to avoid notational confusion with the row sums in this chapter), the Friedman test statistic, adjusted for ties, can be written, in the present notation,

$$T_1 = \frac{\sum_{j=1}^{c} \left(K_j - \frac{r(c+1)}{2} \right)^2}{\frac{1}{c-1} \sum_{i=1}^{r} \sum_{j=1}^{c} \left(K_j^{(i)} - \frac{c+1}{2} \right)^2} \tag{1.1}$$

where $K_j = \sum_{i=1}^{r} K_j^{(i)}$ is the rank-sum in column j.

(a) Work out expressions for the ranks $K^{(i)}(0)$ and $K^{(i)}(1)$ of 0 and 1 responses within block i, which will depend on the row sum R_i, which is the total nunber of 1 observations in row i.

(b) Use the expression $K_j^{(i)} = (1 - X_{ij})K^{(i)}(0) + X_{ij}K^{(i)}(1)$ to work out the value of K_j.

(c) Show that the Friedman test statistic T_1 is equal to the Cochran Q statistic, and that therefore the Cochran test is equivalent to the Friedman test with ties applied to the 0 and 1 data.

2 Project Report (one per team)

Submit a final written report on your project, detailing your methods and results.