Tutorial 9

1. A flexible working hour program permits employees to design their own 42-hour work week to meet their personal needs. The management of a large manufacturing firm may adopt a flextime program for its administrators and professional employees, depending on the success or failure of a pilot program. Ten employees were randomly selected and given a questionnaire designed to measure their attitudes toward their jobs. Each was then permitted to design and follow a flextime workday. After six months, attitudes toward their jobs were again measured. The resulting attitude scores are given in the data file `flextime.txt`. The higher the score, the more favorable the employee's attitude toward his or her work.

   (a) Use a nonparametric test procedure in SAS to evaluate the success of the pilot flextime program (hint: Wilcoxon Signed Rank test)

   (b) Repeat question 2(a) above using R and Python. Report the p-values and test statistics for this test in R and Python.

2. Consider the automobile gasoline mileage data, given in `gasoline.csv`. This dataset helps to investigate on the factors that affect the gasoline mileage performance, GMP (y, miles/gallon). Among many factors, we are interested in the effect of type of transmission (x_{11}, 1=automatic, 0=manual) on GMP.

   (a) Use SAS to perform a t-test to check if the GMP of manual vehicles is better the automatic vehicles. Provide a 99% CI for the difference in GMP between the vehicles using two type of transmission.

   (b) In R and Python, perform a test to check for equal variances of two groups and perform a t-test to check that the GMP of manual vehicles is better than that of the automatic vehicles. Report the p-value.

3. The retailing manager of a supermarket chain wants to determine whether product location has any effect on the sale of pet toys. Three different aisle locations are considered: front, middle, and rear. A random sample of 18 stores is selected with 6 stores randomly assigned to each aisle location. The size of the display area and price of the products are constant for all stores. At the end of a one-month trial period, the sales volumes (in thousands of dollars) of the product in each store were recorded in the file `locate.txt`.

   (a) Check the normality assumption for the sales at each aisle location. At the 5% level of significance, is there any evidence of a significant difference in average sales among the various aisle locations. Use SAS.

   (b) If appropriate, which aisle locations appear to differ significantly in average sales? Use SAS.

   (c) Repeat (a) to (b) using R.

   (d) Repeat (a) to (b) using Python.