IE 306.02 Spring 2023 Assignment 2

Due Date: May 2 2023

1) A 24/7 open restaurant is subject to customer arrivals with random interarrival times. Customers arrive one by one. The interarrival times are observed in seconds for two full days (48 hours). The task is to fit a distribution to the interarrival times of customers if possible (and show why not, if it is not possible). To this end, first analyze the data as discussed in class and perform the tasks given below.

1. Find sample mean, standard deviation and other descriptive statistics that you deem appropriate.
2. One of the managers claims that it is safe to assume that inter-arrival times are distributed normally with mean 200 seconds and standard deviation 50 seconds. Test the validity of this claim using the Kolmogorov-Smirnov test with a significance level of 0.05.
3. Draw frequency histograms of the data for 5, 10 and 25 intervals. Comment on the shape of the histograms.
4. Perform a chi-square test at a significance level of 0.05 with 10 intervals to test whether the data comes from an exponential distribution where the mean is as found in step 1.
5. Draw the QQ-plot to test whether the data comes from an exponential distribution.
6. **Plot the** inter-arrival times with respect to observation times (times of arrival). Is there an obvious pattern? Analyze visually if the data is stationary or not.
7. Test whether the data is autocorrelated. Plot the lag 1, lag 2 and lag 3 differences. Find and report the correlation for lag 1,2 and 3 differences. Comment on the results.
8. Based on the arrival process you have concluded in part one, generate new interarrival times for 10 consecutive days using the appropriate random variate generation method from the lectures.

Using Excel is sufficient for this assignment. In obtaining QQ-plots with Excel you have to understand the logic behind drawing them. If you need to use a statistical package a good choice is the R project which is publicly available. Here is a tutorial on the use of R.

The data is given in a separate excel file in the Moodle link. Every group has a unique dataset for this assignment. **Use the dataset in the tab that matches your group number**.

Please do not use any other software or try to develop your own programs for the assignment. Upload **a single zip file** that contains a **well written report** along with your Excel or R codes and your random variate generation algorithm you have developed in Python.