CSCI 410: Modeling and Simulation

Written Assignment 4

Due November 22th, 23:59:59PM.

1. If the following data are hypothesized to be drawn from an exponential distribution,
   a) Calculate the MLE of the parameter.
   b) Draw a Q-Q plot for the distribution with the estimated parameter and the data.

   5.07, 2.70, 0.29, 1.23, 4.00, 5.18, 2.63, 1.12, 1.43, 8.27
   7.51, 2.04, 3.05, 1.50, 3.14, 4.98, 1.91, 1.54, 8.07, 6.24
   5.82, 0.71, 9.53, 4.60, 5.76, 0.71, 9.50, 1.03, 0.70, 2.78

2. If the following data are hypothesized to be drawn from a Poisson distribution,
   a) Calculate the MLE of the parameter.
   b) Draw a P-P plot for the distribution with the estimated parameter and the data.

   3, 0, 7, 2, 6, 4, 3, 4, 3, 4, 5, 0
   0, 3, 2, 1, 0, 3, 4, 4, 7, 2, 3, 6
   2, 1, 2, 2, 1, 1, 3, 0, 3, 4, 3, 5

3. If the following data are hypothesized to be drawn from a gamma distribution,
   a) Calculate the MLE of the parameters using Table 6.21 on the textbook.
   b) Perform the Chi-square test for the distribution and the data.

   1.48, 0.24, 1.95, 0.20, 0.58, 1.38, 0.04, 0.55, 4.56, 3.96
   1.20, 1.79, 0.23, 0.08, 0.56, 2.11, 1.38, 0.09, 0.12, 0.21
   0.68, 0.05, 3.24, 2.52, 0.01, 0.00, 2.06, 0.85, 0.76, 3.55

4. Fit the following data to a shifted log-normal distribution by calculating the MLE of the parameters.

   159.5, 24.8, 270.7, 0.3, 23.0, 287.3, 90.2, 708.3, 3387.0, 6037.5, 909.1, 12.6
   157.1, 141.8, 1.2, 329.2, 125.0, 22.4, 12.8, 1.1, 226.7, 3.6, 710.6, 2.1
   363.8, 1.3, 18.9, 145.6, 54.6, 92.1, 4119.9, 490.5, 151.0, 359.4, 8.5, 12385.6

5. The distance of marathon is 42.195 kilometers. The world record is about 2 hours and 3 minutes or 123 minutes. It is known that people's normal walking speed ranges from 4.5 to 6.5 kilometers per hour. Suppose in the worst case, a marathon athlete would finish the race by walking. Also suppose the most likely time to finish a marathon race is four and a half hours. Use the triangle-distribution approach and beta-distribution approach respectively to specify the distribution of marathon running time in minutes. Round the numbers if necessary. Provide the density functions.