Fundamentals of Data Analysis: Assignment #6

Deadline: 11/17/2003 (Monday)

Please post to the mailbox next to the IS management office (2nd floor of IS building)

1. **You are doing a game with a dice. Here, you win the game if you get "1" when throwing this dice.**

a. Assume that the probability of getting "1" with this dice is 1/6. Calculate the probability distribution of the number of your win and its cumulative probability distribution, when you repeat this game 20 times (You need not plot a graph of distribution. You only have to make a table of these values).

b. Let us set the significant level 5%. Then, find the rejection region of the hypothesis (that is, the range of the number of your win for rejecting the hypothesis) "the probability of getting "1" is 1/6".

c. How about the case that you set the significant level 1%.

2. **Prove mathematically that the unbiased estimator of the parameter *m* of a Poisson distribution is given by the sample mean $\overline{X}$.**

3. **Perform the following numerical experiment. This problem is designed for helping you to understand the unbiased estimator of variance.**

   a. First, you can get a pseudo random number obeying a standard Normal distribution N(0, 1) by summing up 12 uniform pseudo-random numbers in the range (0, 1) and then subtracting 6 from this sum.

   b. Utilizing the property described above, make n (= 4, 16, and 64) pseudo-random numbers obeying a standard Normal distribution, and calculate their variance.

   c. Repeat the operation in step b 200 times, and calculate the mean of variance values of 200 times. Then, compare the resultant mean and the true variance (i.e., 1) for the cases n = 4, 16, and 64.

   d. Calculate the unbiased estimator of variance in step b.

   e. Repeat the operation in step d. 200 times, and calculate their mean. Compare the resultant mean to the true variance 1.

   f. Do the same procedures (step b-e) for the uniform random number (not the normal random number) in the range (0, 1). Note that the true variance of a uniform distribution in this range is given by 1/12.

4. **Write your comments and requests on this lecture (if any).**