STAT 331 Homework 9

Due date: In class on TUESDAY, November 23, 2004

Instructor: Dr. Rudolf Riedi

37. (10 points)

A discrete random variable X is uniformly distributed over the values $\{0, ..., k\}$ where k is some unknown positive integer. Since the mean of the distribution is $k/2$, an estimator of the parameter k is proposed as twice the sample mean:

$$\widehat{k} = \frac{2}{n} \cdot (x_1 + ... + x_n).$$

Ignore the fact that this estimator will not return an integer in general.

(a) Is $\widehat{k}$ biased? (explain)

(b) Is $\widehat{k}$ consistent? (explain)

38. (5 points)

A statistician is able to estimate the mean of Gaussian data with known σ to ± 2 within the true mean μ with 90% confidence, given 10 samples. How many more data points are needed to guarantee the accuracy ± 1.6 or better with the same confidence?

39. (10 points)

A Laplace random variable has the density

$$f(x) = \frac{a}{2} \exp(-a|x|)$$

for all x.

(a) Determine the MLE for the parameter a based on a sample of n independent data points $x_1, ...x_n$. ($\widehat{a} = n/(|x_1| + ... + |x_n|)$)

(b) Apply this estimator to the data set -4.31, -3.71, -0.0201, 1.71, 2.64, 0.936, 1.81, -2.41, 0.271, -0.303, -0.348, 1.22, -0.111, 2.56, 0.253, -1.69, 0.797, -4.64, 0.388, -0.273.