

## Assignment 2 STA113

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Spring 05

1. Consider the file of time stamps on packet arrivals `iptraffic.txt` on a local wireless network. The complete data from the application Ethernet is in `ethereal.txt`.

- (a) Do a histogram of the interarrival times.
- (b) Plot the process of arrival times (x-axis) and arrival number (y-axis) as a step-function. It should not be smoothly interpolated.
- (c) Does this resemble a homogeneous Poisson process, and if so at what rate?

2. A design engineer is trying to find the optimal average lifetime of a battery in order to minimize total warranty costs on a cell phone.

The warranty requires a battery to work for 2 years, and the battery can be replaced any number of times. The engineer can use a sequence of batteries that cost \$15 each, and last on average 1 year each, or he/she can use a sequence of batteries that cost \$30 each and last on average 2 years each.

- (a) Suppose the lifetimes of the batteries have the exponential distribution.
  - i. Find the expected costs under the two strategies exactly, using the Poisson distribution.
  - ii. Verify the above result with a simulation. Assume the battery can be replaced immediately without cost.
- (b) Suppose the lifetimes of the parts have the Gamma distribution with density  $f(x)$  proportional to  $xe^{-x/b}$  for  $x > 0$ , where  $b$  depends on whether the mean is 1 or 2, and  $f(x)$  vanishes when  $x < 0$ .
  - i. Find the constant  $b$  in the two cases.
  - ii. Work out the expected costs with a Monte Carlo simulation, assuming now that each replacement has a service charge of \$20.00. Use 10000 experiments in your simulation for reasonable accuracy.
  - iii. Get 95% confidence intervals for the true expected costs from your simulated costs.