

A short mini-Homework (Friday 18th December 9pm)

December 16, 2009

This has been updated to include some additional work (denoted by italic font). It will be the last homework for this course!

This is a mini-homework which shouldn't take too long, fits together very nicely with the homework you did on the algebraic properties of inference for the Poisson rate parameter λ and will consolidate our understanding of the simulation exercise we are doing in the lab.

1 Using simulation for inference-1

1. Write a script that can do rejection sampling for the Poisson rate parameter for a prior of your choosing (either a Gamma or a log-Normal), and include the script in your homework.
2. Use your rejection sampler to simulate the posterior distribution for λ given the following data:

$$x=(1, 3, 1, 1, 4, 3, 2, 2, 3, 4, 3, 1, 4, 1, 0, 3, 4, 5, 3, 4)$$

3. Summarise the posterior distribution in a suitable manner (this should comprise at least the posterior mean and the posterior 95% credible interval). *You should also estimate the posterior median. Make sure you use the simulation to estimate the posterior 95% credible interval, i.e. use the python quantile function.*
4. Compare the posterior mean from your simulation with the Posterior mean you would obtain if you had used a $Gamma(4, 1)$ prior.
5. *Use your simulated posterior to estimate the probability that the Poisson rate parameter $\lambda \geq 4$.*

2 Optional

- In the previous question (5) you estimate $Pr[\lambda \geq 4]$ based on your chosen posterior. Briefly explain how this answers a different question to the one you answer when you use a Frequentist hypothesis test.