

Bayesian Data Analysis Problem Set 1

1. Conditional independence.
 - (a) Suppose y_1 and y_2 are independent. Does that mean that $y_1|\theta$ and $y_2|\theta$ are independent (i.e. y_1 and y_2 are conditionally independent given θ)? Prove or disprove. (Note, you may not assume that y_i and θ are independent.)
 - (b) Suppose $y_1|\theta$ and $y_2|\theta$ are independent. Does that mean that y_1 and y_2 are independent? Prove or disprove. (Note, you may not assume that y_i and θ are independent.)
2. The exponential family and conjugacy.
 - (a) Find three members of the one parameter exponential family.
 - (b) What is the associated conjugate prior for each?
 - (c) Assume an *iid* sample of size n from each of your answers to (a). Using the associated conjugate prior, what is the posterior for each?
3. Conjugate prior for the variance of a normal.
 - (a) Suppose $\sigma^2 = \sigma_0^2 \nu_0 / X$ where $X \sim \chi_{\nu_0}^2$. Derive σ^2 's density.
 - (b) What are two names (and parameters) for your answer to (a)?
4. Exercise 6 on page 31.
5. Exercise 7 on page 68.
6. Exercise 13 on page 70.
7. Exercise 14 on page 70.