

# STAT 447 Assignment 5

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## Question 1: Sequential Updating

Consider a joint a joint probabilistic model given by

$$\theta \sim \rho, \text{ and } (x_i \mid \theta) \stackrel{iid}{\sim} \nu_\theta, \text{ where } i \in \{1, 2, \dots, n\}$$

where  $\rho$  is a prior distribution for the unknown parameter  $\theta$ , and  $\{x_i\}_{i=1}^n$  is a sequence of observations with conditional distribution  $\nu_\theta$ .

### Part 1

Write down the posterior distribution of  $\theta$  given  $\{x_i\}_{i=1}^n$ .

### Part 2

Suppose now we get an additional data point  $x_{n+1}$  with the same conditional distribution  $\nu_\theta$ . Show that using the posterior from part 1 as the *prior* and data equal to just  $x_{n+1}$  gives the same posterior distribution as redoing part 1 with the  $n + 1$  data points.

## Question 2: Baesian Inference in the Limit of Increasing Data