

# Lab 7

STA-360/602, Spring 2018, March 21

August 1, 2020

## 1 Agenda

In this lab, we will deriving conditional distributions, code a Gibbs sampler, and analyze the output of the Gibbs sampler.

Consider the following Exponential model for observation(s)  $\mathbf{x} = (\mathbf{x}_1, \dots, \mathbf{x}_n)$ .<sup>1</sup>:

$$p(x|a, b) = ab \exp(-abx)I(x > 0),$$

where the  $x_i$  are assumed to be iid for  $i = 1, \dots, n$ . and suppose the prior is

$$p(a, b) = \exp(-a - b)I(a, b > 0).$$

You want to sample from the posterior  $p(a, b|x_{1:n})$ . You may assume that

$$a = 0.25, b = 0.25$$

when coding up your Gibbs sampler.

1. Find the conditional distributions needed for implementing a Gibbs sampler.
2. Code up your own Gibbs sampler using part (1).
3. (5 pts) Plot a histogram or a density estimate of the estimated posterior using (2).
4. (10 pts) How do you know that your estimated posterior in (3) is reliable? Provide convergence diagnostic plots and commentary.

---

<sup>1</sup>Please note that in the attached data there are 40 observations, which can be found in data-exponential.csv.