ST495/590 – Assignment 5 – Due 3/2

The objective of this assignment is to write a Gibbs sampler for the concussions data found at

`http://www4.stat.ncsu.edu/~reich/ABA/code/Concussion`

Define Y_i as the number of concussions for team $i = 1, ..., n = 32$ aggregated over 2012 and 2013 (as in part 3 of course website listed above). The statistical model for these data is

$$\begin{aligned} Y_i|\lambda_i &\sim \text{Poisson}(\lambda_i) \\ \lambda_i|\gamma &\sim \text{Gamma}(a, \gamma) \\ \gamma &\sim \text{Gamma}(0.1, 0.1) \end{aligned}$$

where a is fixed at 1 giving an exponential prior.

(1) Explain in words the steps of a Gibbs sampler to study the joint posterior of $(\lambda_1, ..., \lambda_n, \gamma)$.

(2) Derive the full conditional distributions of λ_i and γ.

(3) Write a Gibbs sampler in `R` following the steps in (2). Compute the posterior mean of each λ_i, and make a scatter plot of the n posterior means versus the n observations Y_i. Also, provide a posterior histogram of γ.

(4) Write a Gibbs sampler `JAGS` and verify your answers from (3) are correct.

(5) Repeat this analysis in either `R` or `JAGS` with $a = 10$ and compare the results with the $a = 1$ case.

You should turn in your responses to these questions in 1-2 pages (i.e., one piece of paper with text on both sides). You should also turn in a separate file with carefully commented code. Only output in the 1-2 page document will be graded. Please staple both documents together!