

## Homework 8

Due: Wed 03/24/21 @ 11:59pm

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**Problem 1.** Problem 1 of Homework 7 revisited. Program parallel tempering for the Cauchy model posterior, with the same two data points, using inverse temperatures 1, 0.9, 0.8, ... and so on.

- Decide on a lowest inverse temperature, at which the “heated” proposal distribution is still proper.
- Run your parallel tempering algorithm for all temperatures from 1 to that lowest inverse temperature, at  $-0.1$  increments. Perform the various convergence diagnostics introduced in class. Discuss whether things look satisfactory.
- Compare your posterior inference with those from the two methods you implemented in Homework 7, using overlaid histograms and densities, appropriately scaled.

**Problem 2.** Simulate a fake dataset

$$y_i \stackrel{iid}{\sim} t_4(\mu, \sigma^2),$$

for  $i = 1, \dots, 10$ , using  $\mu = 1, \sigma^2 = 5$ . Then, forget about these true values, and implement the parameter expanded Gibbs sampler discussed in class to draw posterior inference for  $\mu$  and  $\sigma^2$  based on the simulated  $y_i$ 's. Display convergence diagnostics of your sampler, and discuss whether things appear satisfactory. Summarize your posterior inference for  $\mu$  and  $\sigma^2$ .