BAYESIAN DATA ANALYSIS (16:960:668)
INSTRUCTOR: HARRY CRANE (STATISTICS AND BIOSTATISTICS)
MONDAY 8:40-11:40, HILL CENTER ROOM 552

Topics Covered. The course will cover the basics of Bayesian inference and Bayesian computation, including single and multiple parameter models, hierarchical models, and select topics from Bayesian nonparametrics, including the Dirichlet process and Gaussian process priors, Chinese restaurant process and Indian buffet process. Bayesian computational techniques, including Gibbs sampling, MCMC, Hamiltonian Monte Carlo, and variational inference. Introduction to Bayesian inference using R and Stan.

Texts.
> Gelman, et al. *Bayesian Data Analysis*. (Main)
> Müller, Quintana, Jara, Hanson. *Bayesian Nonparametric Data Analysis*. (Supplemental)
> Ghoshal and van der Vaart. *Fundamentals of Bayesian Nonparametric Inference*. (Supplemental)

Grading.
- **Homework** (40%)
- **Final Project** (60%): Each student will complete a substantial data analysis project on an applied problem of their choice. A 1-2 page topic proposal for topic should be submitted to me no later than February 25th. The proposal should contain a description of the problem, where the data will be obtained, and what the inferential questions of interest are. The proposal need not give a complete description of the analysis, and details of the project can be changed as the need arises later in the semester. Students will complete projects individually and each student must work on a unique topic.

Final project guidelines. The Final Project entails a detailed data analysis of a substantive problem. For the final submission, all code, data, and a (maximum) 10 page written report must be submitted by May 6, 2019 at 12:00pm.

Homework policy. Students are discouraged from working together on homework assignments, but no measures will be taken to police this. All code should be submitted with homework.

Some larger homework problems may be assigned to small groups, with methods and analysis later presented in class.