Statistics 927
Spring 2020

Course Description: Bayesian Modeling and Computation

This graduate course will cover the modeling and computation required to perform advanced data analysis from the Bayesian perspective. We will cover fundamental topics in Bayesian probability modeling and implementation, including recent advances in both optimization and simulation-based estimation strategies. Key topics covered in the course include hierarchical and mixture models, Markov Chain Monte Carlo, hidden Markov and dynamic linear models, tree models, Gaussian processes and nonparametric Bayesian strategies.

Prerequisites: Probability (Statistics 510 or equivalent). Experience with the statistical software R and mathematical typesetting language LaTeX will also be assumed.

Professor:
Dr. Shane Jensen JMHH 463
stjensen@wharton.upenn.edu 215-573-2211

Lectures: TTh 10:30-12:00pm Location: JMHH F36

Office Hours: Wed 1:30-2:30pm JMHH 463

Required Textbook:
Bayesian Data Analysis (3nd Edition) by Gelman, et.al.

Required Software:
The R statistical package is needed and can be downloaded at `www.r-project.org`

Course Website:
All course materials will be available on Canvas

Evaluation:
Your course grade will be calculated from homeworks and a final project. Homework assignments will be assigned every three weeks or so and will be turned in for grading. ***No late homework will be accepted, for any reason whatsoever.***

Course Topics

1. Introduction to Bayesian Probability Modeling (Ch.1,2,3)
2. Regression Models from the Bayesian Perspective (Ch. 14,15)
3. Hierarchical and Mixture Models (Ch. 5,22)
4. Optimization for Model Estimation: EM and Variational Inference (Ch. 13)
5. Markov Chain Monte Carlo for Model Estimation (Ch. 10,11)
6. Recent Advances in Monte Carlo Simulation (Ch. 12)
7. Model Checking (Ch. 6,7)
8. General Linear Models (Ch. 16)
9. Hidden Markov Models
10. Dynamic Linear Models
11. Nonparametric Bayesian models (Ch. 23)
12. Gaussian Processes (Ch. 21)
13. Bayesian Tree Models

Important Dates

Thursday, January 16	First day of class
Tuesday, March 10	No Class -- Spring Break
Thursday, March 12	No Class -- Spring Break
Tuesday, April 28	Last day of class