Statistics 442
Spring 2022

Course Description: Introduction to Bayesian Data Analysis

The course will introduce data analysis from the Bayesian perspective to undergraduate students. We will cover important concepts in Bayesian probability modeling as well as estimation using both optimization and simulation-based strategies. Key topics covered in the course include hierarchical models, mixture models, hidden Markov models and Markov Chain Monte Carlo.

Prerequisites:

1. A course in probability (Statistics 430 or equivalent)
2. A course in statistical inference (Stat 431 or equivalent)
3. Basic knowledge of linear algebra (e.g. matrix multiplication and inversion, etc.)
4. Experience with the statistical software R (at the level of Stat 405 or Stat 470)

Professor:
Dr. Shane Jensen WARB 415
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Lectures: TTh 1:45-3:15pm (Location TBA)

Office Hours: Wed 2:30-4:00pm (WARB 415)

Recommended 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 as:
- 50% homeworks
- 25% midterm exam
- 25% final exam

Midterm Exam will be a **24 hr take home exam,** starting at **date and time TBA**

Final Exam will be a **24 hr take home exam,** starting at **date and time TBA**

Notes about Grading:

- ***No late homeworks will be accepted, for any reason whatsoever.***
- **No make-up midterm will be given**

Course Topics

1. Introduction to Bayesian Inference (Ch.1)
2. Simple Parametric Models (Ch. 2, 3)
3. Regression Models from the Bayesian Perspective (Ch. 14,15)
4. Hierarchical and Mixture Models (Ch. 5)
5. Optimization Algorithms for Model Estimation (Ch. 13)
6. Monte Carlo Simulation Algorithms for Model Estimation (Ch. 10,12,13)
7. Model Checking (Ch. 6,7)
8. Bayesian Logistic Regression
9. Nonparametric and Semiparametric Bayesian models (Ch. 23)
10. Hidden Markov Models
11. Bayesian Tree Models