Bayesian Data Analysis

Required Text: Bayesian Core by Marin and Robert

Instructor: John Staudenmayer
jstauden<at>math.umass.edu
www.math.umass.edu/~jstauden
LGRT 1440
X5-0999
My office hours are listed on the website above.

Course Requirements:

There will be three problem sets (33% of grade), a take home final (33% of grade), and a project write up and presentation (34% of grade). The projects will be done in groups of ≤ 2 people (negotiable). They will include a write up, a simulation experiment, and (possibly) data analysis. I will distribute a list of possible topics. Your may come up with your own topic if you prefer.

The computing in this course will be done in R, an open source statistical computing language. We will meet in a computer lab periodically to work on R. You can download and install your own copy from www.r-project.org. There are versions for just about every computing platform. For your project, you may use another language, but my ability to provide support may be limited.

Other Texts that I have found useful (This is *not* a comprehensive bibliography!)

Statistical Inference (Casella and Berger) General statistics and probability.
All of Statistics (Wasserman) General statistics and probability.
Bayesian Statistics: An Introduction (Lee) Similar to our book, but a bit easier.
Bayesian Data Analysis (Gelman, Carlin, Stern, and Rubin) Similar to our book, and a bit harder.
Bayesian Computation with R (Albert) Similar to our book, a bit easier, and includes many computational examples.
The Bayesian Choice (Robert) Bayesian textbook with more theoretical foundation
Statistical Decision Theory and Bayesian Analysis (Berger) Bayesian textbook with more theoretical foundation
Markov Chain Monte Carlo in Practice (Gilks, Richardson, and Spiegelhalter) Focus on modeling and fitting with Bayesian methods.

A tentative schedule and course outline is on the next page. This will be updated on the web when necessary! *You will get more out of this course if you do the reading and computing before lecture.* The readings are often short and dense. One goal I have for this course is to help you develop, improve, and/or practice your skills at reading technical and sometimes mathematically sophisticated material.

Date		Topic	Reading (Textbook)
28-Jan		Likelihood, Prior and Posterior	1.1-1.3, 2.1 & 2.2
30-Jan		Likelihood, Prior and Posterior	2.1 & 2.2
1-Feb		Likelihood, Prior and Posterior	2.1, 2.2, & 2.5
4-Feb		Hypothesis Testing	2.3
6-Feb		Meet in computer lab (intro to R and computation for Bayesian methods so far)	1.4
8-Feb		In class problem session	
11-Feb	PS 1 Due	Monte Carlo Methods I, Direct simulation	2.4
13-Feb		snow day!	
15-Feb		Monte Carlo Methods II, Importance Sampling	2.4
19-Feb		Meet in computer lab (Monte Carlo Methods I & II)	
20-Feb		Review of linear regression	3.1
22-Feb		Bayesian view of linear regression	3.2-3.3
25-Feb		Bayesian view of linear regression	3.4
27-Feb		In class problem session	
29-Feb	PS 2 Due	Hierarchical models	handout
3-Mar		Monte Carlo Methods III, Gibbs Sampling	3.4
5-Mar		Meet in computer lab (Monte Carlo Methods III)	3.4
7-Mar		Generalized linear models	4.1
10-Mar		Monte Carlo Methods IV, Metropolis Hastings	4.2
12-Mar		Probit Regression	4.3
14-Mar	Project Proposal Due	Meet in computer lab (Monte Carlo Methods IV)	4.2-4.3
24-Mar		Logistic Regression	4.4
26-Mar		Log linear models	4.5
28-Mar		In class problem session	
31-Mar	PS 3 Due	Finite Mixture Models	6.1-6.2
2-Apr		MCMC Sampling from Finite Mixture Models	6.3-6.5
4-Apr		MCMC Sampling from Finite Mixture Models	6.3-6.5
7-Apr		Tempering	6.6
9-Apr		Variable Dimension Models	6.7
11-Apr		The Dirichlet Process and Mixture Models	handout
14-Apr		The Dirichlet Process and Mixture Models	handout
16-Apr		Image Analysis	8.1-8.3
18-Apr		Image Analysis	8.1-8.3
23-Apr		Hierarchical models, smoothing, and spatial models (and Introduction to WinBUGS)	handout
25-Apr		Hierarchical models, smoothing, and spatial models (and Introduction to WinBUGS)	handout
28-Apr		Hierarchical models, smoothing, and spatial models (and Introduction to WinBUGS)	handout
30-Apr		PROJECTS	
2-May		PROJECTS	
5-May		PROJECTS	
7-May		PROJECTS	
9-May		PROJECTS	
12-May		PROJECTS	