CLPS 2910
Doing Bayesian Data Analysis

"Instructors"
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Meeting place & time: Metcalf 107 (computer classroom), MWF 12-1:30

Textbook: Kruschke, J. K. (2011). *Doing Bayesian data analysis*. New York: Elsevier.

Software: Software will be available on the computers in the computer classroom. To install software on your own machine, see http://doingbayesiandataanalysis.blogspot.com/2012/01/complete-steps-for-installing-software.html

This is a tutorial introduction to doing Bayesian statistics for data analysis, starting from the fundamentals of probabilities and Bayes' theorem, working through Kruschke's text. The first half of the course will work through contemporary Monte Carlo methods in the context of simple binomial analyses, building up to simple linear regression and Bayesian versions of single-factor ANOVA and contrasting null hypothesis significance testing with Bayesian approaches to null value assessment. The second half of the course will consider a variety of more sophisticated realistic applications, including Bayesian versions of multiple linear regression, logistic regression, analysis of variance, etc., including consideration of repeated measures designs.

We have organized this course not only because we think Bayesian approaches to data analysis are more principled than classical frequentist statistics and should be made accessible to CLPS students, but also because we are interested in learning more of the nitty gritty ourselves. Be warned: at least one of us is not an expert on the topic! Therefore, the course schedule below is completely tentative – as we work through the text, we will doubtless find topics that we can move through more quickly than planned, as well as topics on which we will need to dwell longer than anticipated.

The classroom is reserved 12-2 MWF, though we will generally meet 12-1:30. Mondays and Wednesdays will typically be devoted to lectures, and Fridays to labs.

Tentative Course Schedule

Week	Date	Lecture Topic	Lab
0	1/23	Introduction Read Kruschke, Chapter 1, http://www.ejwagenmakers.com/2008/BayesFreqBook.pdf	Introduction to R
1	1/28	Contrasting NHST & Bayesian approaches; Review of Probability Read Kruschke, Chapters 2-3	Exercises from Chapters 2-3
2	2/4	Bayes Rule; Beginning with Binomials Read Kruschke, Chapters 4-5	Exercises from Chapters 4-5
3	2/11	Approaches to inferring binomial proportions; Markov chain Monte Carlo Read Kruschke, Chapters 6-7	Exercises from Chapters 6-7
4	2/20	Gibbs sampling; Hierarchial priors Read Kruschke, Chapters 8-9	Exercises from Chapters 8-9
5	2/25	Hierarchical modeling; NHST revisited Read Kruschke, Chapters 10-11	Exercises from Chapters 10-11
6	3/4	Null-hypothesis testing, Bayesian style; Power Read Kruschke, Chapters 12-13	Exercises from Chapters 12-13
7	3/11	GLM, Bayesian t-Test Read Kruschke, Chapters 14-15	Exercises from Chapters 14-15
8	3/18	Bayesian Linear Regression Read Kruschke, Chapter 16	Exercises from Chapter 16
9	4/1	Bayesian Multiple Regression Read Kruschke, Chapter 17	Exercises from Chapter 17
10	4/8	Bayesian Oneway ANOVA Read Kruschke, Chapter 18	Exercises from Chapter 18
11	4/15	Bayesian Factorial ANOVA Read Kruschke, Chapter 19	Exercises from Chapter 19

Week	Date	Lecture Topic	Lab
12	4/22	Bayesian Logistic Regression Read Kruschke, Chapter 20	Exercises from Chapter 20
13	4/29	Further Issues (Monday only) Read Kruschke, Chapter 23	

Course Requirements

1. Labs: Participate in labs each week. One or two additional exercises based on those at the end of each chapter in the text will be assigned each Friday; these will be due in class the following Wednesday (auditors are encouraged to do these exercises for their edification, but their work will not be graded).

2. Lectures: In each of weeks 7-12, two students will be responsible for presenting course material (instructors and TA will be available for consultation during preparation) with the instructors. Each student should anticipate presenting twice over the course of these six weeks (auditors, too!).

3. Final project: Reanalyze one of your own data sets using the Bayesian techniques you have learned. Contrast this analysis with your original NHST analysis (enrolled students only).