STATS 115/205
BAYESIAN DATA ANALYSIS
University of California, Irvine
Winter 2018

SYLLABUS

Instructor	Time and Days
Michele Guindani Associate Professor Department of Statistics Email: michele.guindani@uci.edu Website: http://www.micheleguindani.info Phone: (949) 824-5968 Office Hours: W 1pm-2:30pm @ Bren Hall 2241	Lecture: TuTh 9:30-10:50 MSTB 110 Discussion: Fri 2:00- 2:50p DBH 1300

COURSE WEBSITE: http://www.micheleguindani.info/teaching/introBDA

CANVAS WEB SPACE: https://canvas.eee.uci.edu/courses/7636

COURSE DESCRIPTION:
The course will provide a basic introduction to Bayesian concepts and methods with an emphasis on the data analysis. We will discuss model choice, including the assessment of prior distributions. We will discuss how to conduct inference in a Bayesian setting, through posterior means, credible intervals and hypothesis testing.
The Analyses will be performed using the freely available software Jags as implemented in the R packages rjags and R2jags. I will also showcase the use of the package Rstan. I will not cover but I would suggest you to look also at the Nimble suite, which represents a flexible extension of Bugs, Winbugs, and Jags. Both R and RStudio will be required for this class.

OBJECTIVES:
Learn basic concepts of Bayesian analysis, including how to conduct posterior and predictive inference; learn how to use common Bayesian models in applications; learn common ways of prior elicitation; utilize R for Bayesian computation, visualization, and analysis of real-world data.

REQUIREMENTS:
Prerequisite: STATS 120C. Recommended: STATS 201 or STATS 210.

TEXTBOOK: Christensen R, Johnson W, Branscum A, Hanson T. E. (2011) Bayesian Ideas and Data Analysis, An Introduction for Scientists and Statisticians, *CRC press*

ADDITIONAL REFERENCES:
For MS-PhD students mainly:
Hoff P.D. (2009) A First Course in Bayesian Statistical Methods, *Springer*

GRADING POLICY:
For undergraduate students:
Homework (30%)
Midterm Take Home Exam (35%)
Take Home Exam (35%)
For graduate students:
Homework (30%)
Midterm Take Home Exam (35%)
Take Home Exam (35%)

HOMEWORK POLICY:

- Homework is due by 5pm on the due date.
- Homeworks need to be submitted in the EEE Dropbox on the CANVAS website, preferably as a PDF format or Rmd (R markdown) file.
  The timestamp recorded by the system for the upload of the file on the EEE Dropbox or the reception of the email will validate the submission of the homework at the required time.

TENTATIVE COURSE SCHEDULE

Week		
Week 1	Preliminaries & Review	The Bayes Theorem (revisited)
Discussion 1	*Intro to R and reproducibility*	
Week 2	The Normal Model and Conjugate Models	Posterior Summaries
Discussion 2	*Question Time + discussion on Conjugacy and the Exponential Family*	
Week 3	Monte Carlo Simulation - 1	Monte Carlo Simulation - 2
Discussion 3	*Posterior Inference in Jags*	
Week 4	Hierarchical Models	Comparing proportions - 1
Discussion 4	*Question Time + More on Hierarchical Models*	
Week 5	Comparing proportions - 2	Inference for Normal Populations
Discussion 5	*Question time + Inference for Normal Populations*	
Week 6	Inference for Normal Populations	Inference for rates
Discussion 6	*Question Time + discussion on : Intro to the Gibbs Sampler*	
Week 7	Discussion of prior choices	Regression Analysis
Discussion 7	*Question Time + Intro to Metropolis Hastings algorithm*	
Week 8	Regression Analysis	Regression Analysis
Disc: 3/4	*Question Time + Bayesian Variable Selection*	
Week 9	Model Checking	Model Comparison
Discussion 9	*Question Time + More on Regression*	
Week 10	Logistic Regression	Logistic Regression
Discussion 10	*Question time*	

ACADEMIC DISHONESTY POLICY

Students are responsible for adhering to the UCI Academic Honesty standards. Students are encouraged to talk to each other, the teaching assistants or the instructor about any homework assignment. However, this assistance is limited to the general and broad conceptual discussion of the problem. Any work turned in must be the original and independent work of each student.

Academic honesty is a requirement for passing this class. Any student who compromises the academic integrity of this course is subject to a failing grade. The work you submit must be your own. Academic dishonesty includes, but is not limited to copying answers from another student, allowing another student to copy your answers, communicating exam answers to other students during an exam, attempting to use notes or other aids during an exam, or tampering with an exam after it has been corrected and then returning it for more credit. If you do so, you will be in violation of the UCI Policies on Academic Honesty <see https://aisc.uci.edu/>. **It is your responsibility to read and understand these policies. Note that any instance of academic dishonesty will be reported to the Academic Integrity Administrative Office for disciplinary action and is cause for a failing grade in the course.**