Statistics 319/739: Intro. Bayesian Inference, Fall 2008

Section 001: T,Th 4:10-5:25pm. Location: HE 920.

Computer lab sessions will be held in HE 930.

Instructor: Prof. Makram Talih, Office HE 905.

Office hour: T 5:35-6:35pm or by appointment. Email: makram.talih@hunter.cuny.edu.

Required textbooks.

1. *Bayesian Statistics: An Introduction, Third Edition (2004)*, by Peter M. Lee.
2. *Bayesian Computation with R (2007)*, by Jim Albert.

In addition, you will be responsible for keeping up-to-date with my posts on the website for this class: http://math.hunter.cuny.edu/talih/stat319/fall08/stat319.html. Those will include transcripts of computer lab sessions, supplementary lecture notes, and homework assignments.

Grading.

You will be evaluated on regular homeworks and a final paper. The homeworks will be a mix of paper-and-pencil and of computer-based problems. You will be expected to discuss/present your solutions in class. The final paper will be a report on a computational project involving the application of Bayesian methods to the analysis of data from the natural, physical, health, or social sciences. You will be required to present your analysis in class.

Class participation.

This will be a small seminar-style class. During computer lab sessions, you will typically be paired up with another student in the class. Therefore, your active participation will be required at all times, and will be factored in determining your final grade.

Computer Labs.

Computer lab sessions will be held in HE 930, typically on Tuesdays. You will also be given access to the computer lab in HE 930 during the semester for your homeworks and final project.

Policy on Cheating.

Cheating is an extremely serious offence. A student caught copying someone else's work and claiming it as his/her own will receive an F for this class, and could face disciplinary action, including suspension from Hunter College and loss of academic benefits. Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The college is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.

Important dates.

No classes scheduled on the following days: September 30, October 9, October 14, November 27. The last class is on December 16. Final papers due on December 23.

NO LATE WORK WILL BE ACCEPTED.

Incomplete and Credit/Non-Credit.

All students wishing to request an INC grade must do so in writing explaining the reasons, AND have AT LEAST a C average. STAT 319 students wishing to request a CR/NCR grade must complete all required work, have at least a 40% average, and must make the request before the final paper is submitted. The CR/NCR option is not available to students in STAT 739.

Material covered (PML = Peter M. Lee, JA = Jim Albert)

1. Preliminaries
    - Probability and Bayes theorem (PML 1.1-1.2)
    - Random variables (PML 1.3-1.4)
    - Mean and variances (PML 1.5)
    - Introduction to Bayesian thinking (PML 2.1; JA 2.1-2.6)
2. Single-Parameter Models
    - Bayesian estimation of normal mean, when variance is known (PML 2.2-2.4)
    - Summary of the posterior distribution using high density regions (PML 2.6)
    - Bayesian estimation of normal variance, when mean is known (PML 2.7-2.8; JA 3.2)
    - Binomial likelihood and Bayesian estimation of proportions (PML 3.1-3.2; JA 3.5)
    - Poisson likelihood and Bayesian estimation of rates (PML 3.4; JA 3.3)
3. Multiparameter Models
    - Joint Bayesian estimation of normal mean and variance (PML 2.12-2.13; JA 4.2)
    - Binomial/Logistic setup: bioassay experiment (JA 4.4)
    - Comparing two proportions (PML 5.6; JA 4.5)
4. Markov chain Monte Carlo methods
    - Introduction to Markov chains (JA 6.2)
    - Metropolis-Hasting algorithms (JA 6.3; PML 9.6)
    - Gibbs sampling (JA 6.4; PML 9.4)
    - Binomial/Logistic setup, revisited using Gibbs (PML 9.8)
    - MCMC output analysis and applications (JA 6.5-6.10)
5. Additional topics selected from:
    - Hidden Markov chain models and the EM algorithm
    - Hierarchical models (PML 8.1; JA 7.2-7.9)
    - Bayesian hypothesis testing (PML 4.1-4.5; JA 8.2-8.4)
    - Bayesian regression analysis (PML 6.3-6.4; JA 9.2-9.3)
    - Further Gibbs sampling applications (JA 10.1-10.4)
    - R/BUGS interface (PML 9.7; JA 11.1-11.6)

MT. 08/25/07.