

STAT 689: Introduction to Applied Bayesian Methods

Spring 2011

Instructor

Dr. David Dahl

dahl@stat.tamu.edu

Course Description

Statistical inference based on probability as a measure of modeling uncertainty. Topics include: Prior distributions, Bayes' Theorem, conjugate and nonconjugate models, posterior simulation via the Gibbs sampler and Markov chain Monte Carlo, hierarchical modeling.

Course Objectives

The objective of this applied master's level course is to introduce students to the Bayesian paradigm for data analysis. Students learn how uncertainty regarding parameters can be explicitly described as a posterior distribution which blends information from a sampling model and prior distribution. Students are exposed to foundational principles, but the course emphasizes modeling and computations under the Bayesian paradigm.

Prerequisites

- STAT 604: Special Problems in Statistical Computations and Analysis
- STAT 608: Regression Analysis
- STAT 630: Overview of Mathematical Statistics

Textbook

A First Course in Bayesian Statistical Methods (2009), Peter D. Hoff, Springer.

Lecture Schedule

Lecture	Date	Topic	Reading in the Textbook
1	01/18	Introduction	1
2	01/20	Examples	1
3	01/25	Foundations	2
4	01/27	Foundations	2
5	02/01	One-Parameter Models	3
6	02/03	One-Parameter Models	3
7	02/08	Monte Carlo Approximation	4
8	02/10	Monte Carlo Approximation	4
9	02/15	Normal Model	5
10	02/17	Normal Model	5
11	02/22	Normal Model	5
12	02/24	Gibbs Sampler	6
13	03/01	Gibbs Sampler	6
14	03/03	Multivariate Normal Model	7
	03/08	Midterm Exam	
15	03/10	Multivariate Normal Model	7
16	03/22	Group Comparison	8
17	03/24	Hierarchical Modeling	8
18	03/29	Hierarchical Modeling	8
19	03/31	Linear Regression	9
20	04/05	Linear Regression	9
21	04/07	Linear Regression	9
22	04/12	Nonconjugate Priors	10
23	04/14	Metropolis-Hasting Algorithm	10
24	04/19	Metropolis-Hasting Algorithm	10
25	04/21	Linear Mixed Effects Models	11
25	04/26	Generalized Linear Mixed Effects Models	11
27	04/28	Latent Variable Methods for Ordinal Data	12
28	05/03	Latent Variable Methods for Ordinal Data	12
	TBA	Final Exam	

Homework

- Homework assignments will be assigned bi-weekly.
- Homework will be submitted electronically using the [WebAssign](#) system.

Exams

- There will be one midterm exam and a final exam.
- Local students will take the exams during the regularly scheduled University times.
- Distance students will take the exams through the usual proctoring system utilized by all distance courses offered by the Department.

Course Grade

- Total scores are computed using the following weights:
 - 30% -- Homework
 - 30% -- Midterm
 - 40% -- Final
- Course grades are assigned by total scores using the following scale:

90% ≤ score ≤ 100% ⇒ A

80% ≤ score < 90% ⇒ B

70% ≤ score < 80% ⇒ C

60% ≤ score < 70% ⇒ D

0% ≤ score < 60% ⇒ F

University Excused Absences

- Definition: Details of what constitutes a [University Excused Absence](#) is available in the [Student Rules](#).
- Homework: Late homework is only accepted in the case of a University Excused Absence.
- Exams: Quoting from the [University Excused Absence](#) section of the [Student Rules](#), "To be excused the student must notify his or her instructor in writing (acknowledged e-mail message is acceptable) prior to the date of absence if such notification is feasible. In cases where advance notification is not feasible (e.g. accident, or emergency) the student must provide notification by the end of the second working day after the absence. This notification should include an explanation of why

notice could not be sent prior to the class. If needed, the student must provide additional documentation substantiating the reason for the absence, that is satisfactory to the instructor, within one week of the last date of the absence." In short, if you are unable to take an exam at the scheduled time you must notify Dr. Dahl *as soon as possible*. Missed exams will be a given zero points except for a University Excused Absence. In that case, Dr. Dahl (at his discretion) may either administer a makeup exam or use the final exam grade to compensate for the missed exam.

- Incomplete Grade: An incomplete grade will be given only if a student, due to a University Excused Absence, is unable to make up the final before the semester grades are due.

Statement on Disabilities

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation for their disabilities. If you believe you have a disability requiring an accommodation, please contact the Office of Disabilities Services in Room B118, Cain Hall. The phone number is 845-1637.

Statement on Plagiarism

The handouts used in this course are copyrighted. By "handouts," I mean all materials generated for this class, which include but are not limited to syllabi, quizzes, exams, lab problems, in-class materials, review sheets, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy the handouts, unless I expressly grant permission. As commonly defined, plagiarism consists of passing off as one's own ideas, words, writing, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have the permission of that person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated. If you have any questions regarding plagiarism, please consult the latest issue of the Texas A&M University Student Rules, under the section "Scholastic Dishonesty."

Academic Integrity Statement:

The Aggie Honor Code states, "An Aggie does not lie, cheat, or steal or tolerate those who do." Please refer to the Honor Council Rules and Procedures on the web: <http://www.tamu.edu/aggiehonor>