

## Stat 544 – SPRING 2005

### GRADING and COURSE INFORMATION

#### Plan for the course:

The two main objectives of this course are:

- To gain an understanding of the fundamentals of Bayesian inference
- To learn how to analyze data from a Bayesian point of view.

During the first two or three weeks we will concentrate on a bit of theory and on reviewing the fundamental ideas behind Bayesian inference. We will then move on to discussing single-parameter models, mostly for illustration (the Bayesian approach does not offer any real advantages over the classical approach to estimation in these simple models.) We will then spend no more than a couple of weeks discussing simple multi-parameter models.

One change from earlier course plans is the following: towards week 5 of the semester, approximately, we will switch gears and talk about computation. Much of what we will discuss will not become crystal clear until later in the semester, but you will be able to do some real data analysis with complex models. We will discuss various numerical methods for Bayes (and non-Bayes) computation, but will focus on Markov chain Monte Carlo (MCMC) methods. Software for the class is R (or SPlus) and WinBUGS. Please refer to the course website to learn how to download WinBUGS free of charge on to your own computer.

About one half of the course will be dedicated to discussing Bayesian estimation and inference in complex, multi-parameter models including linear models, generalized linear models (such as logistic and Poisson regression) and hierarchical and multi-level models. Time permitting, we will briefly discuss mixture models and models for spatial data.

#### Grading:

The grade will be computed as a weighted average of your homework, your mid-term exams and your final grades. The weights are the following:

- Homework: 25% of the grade. We will have about 8 assignments during the semester.
- Midterms: two (one during the first half of March and the other during the second half of April, approximately). Each exam is worth 25% of the grade.
- Project and presentation of project: 25% of the grade. Due during the next to last week of the semester. Presentations will be scheduled for dead week and for the day during which we would have a final exam for the course.

- Final exam: we will not have a final exam. Instead, we will schedule project presentations for the two hours allocated to our final exam. *Attendance to all project presentations is expected. No attendance will bring your final grade down one notch (e.g., from B+ to A-)!*

### **Project:**

A project is part of the requirements of this course. A project will typically consist of a serious data analysis, but it may also consist of a review of the literature on a topic of your choice, a theoretical result, or any other substantive piece of work that can be written up in the form of a “paper” and that can be presented to the rest of the class.

You are expected to find a team of classmates to work on the project. Teams of three people are ideal, teams of two to four are fine. If you wish to work alone or if your project is hefty enough to justify a team of size five or larger, please talk to me. I strongly discourage you from working alone.

The topic for the project will be your choice entirely, but I will need to approve a plan for the project before you get started. You should begin thinking about the project no later than mid-March or so, because I expect not only a nice piece of work but also a report written in the form of a manuscript, with references and all. Most students in the past have chosen to analyze a set of data and have typically contributed the data they wished to analyze. Good choices include data used for a creative component, or in a consulting project or provided by one of your friends in another department. If you run into a wall and cannot think of a dataset you would like to analyze, let me know and I will provide you with some.

We will talk more about the project once the semester progresses. Some projects in the past have been very nice, and in fact one is being written up for possible publication in a peer-reviewed journal.