Introduction to Bayesian Statistics
PSY 757

Time: 10:00am – 12:40pm Mondays
Classroom: David King Hall 2072
Instructor: **James Thompson**
2056 David King Hall
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Office Hours: 1:00pm-2:00pm Mondays

Objectives:
Bayesian methods are a formal, quantitative way of combining evidence from the world with prior knowledge to solve real and practical problems. These methods are becoming increasingly important to fields as disparate as clinical decision-making, personnel management, user-interface design, and cognitive and neural modeling. Much of this growth can be attributed to shortcomings in classical statistical methods. In this course we will introduce Bayesian methods and provide a bridge between these methods and the classical statistics that you have typically been taught. Through this, we hope to convey how a Bayesian thinks about an inference problem, and show how this relates to intuitive reasoning. We will cover the key concepts associated with Bayes theory, including prior and posterior probabilities, likelihoods, and the decision process. With hands on experience with data from a variety of applications, this course will provide a conceptual basis for the understanding of Bayesian statistics.

Required Readings:
Weekly readings will be posted on the course website.

Suggested Reading:
I highly recommend purchasing the following book:
Bolstad, W.M. (2004). Introduction to Bayesian Statistics. Wiley: Hoboken, New Jersey.

Format:
The course will consist of brief lectures to introduce basic concepts, in-class and take home exercises, and discussion of weekly readings. Much of the discussion is expected to be led by students, so it is essential that you come to class having read the weekly reading and prepared some points to discuss.

Attendance Policy:
Although you will not be graded on attendance, this is a graduate level course and I expect to see you in class each week.

GMU Honor Code:
George Mason University has a code of Honor that each of you accepts by enrolling as a

student. You should read and become familiar with this code at http://mason.gmu.edu/%7Emontecin/plagiarism.htm. The expectation is that all of the work you do for this class will be the work of one individual. However, you are fully encouraged to discuss the readings and topics raised in this class with your fellow students.

Disabilities:
If you are a student with a disability and you need academic accommodations, please see me and contact the Disability Resource Center (DRC) at 703-993-2474. All academic accommodations must be arranged through that office.

Evaluation:
Class Discussion 20%
A significant proportion of this class will involve discussion of the reading material and related topics. It is expected that you will have done the reading and will come to class with points to discuss.

In-Class and Take-Home Exercises 20%
There will be a number of in-class and take-home exercises to illustrate different analysis methods. For the take home exercises, you will need to come to class prepared to present a single Powerpoint slide of your results. These will be graded on a complete/incomplete basis.

HFES Conference Exercise 10%
As it is expected that most of the class will attend at least part of the HFES conference, you will be expected to gather details (handout, notes) of any HF project at the conference that used Bayesian analyses and bring them to the following class. This will be graded on an incomplete/complete basis. If you will not be attending the HFES conference let me know and we can make an alternative exercise.

Class Project and Presentations 50%
You will be provided with a dataset and will be expected to form hypotheses about the relationship between variables and test these hypotheses and draw conclusions using classical, null hypothesis significance testing (NHST) methods. You will then reanalyze the data using the appropriate Bayesian methods and make inferences based on your beliefs drawn from the data. You will present the two analyses to the class in the final two weeks of the semester.

Grades:
Total 100 points, letter grades as follows:

A: 87-100	B: 77-86
C: 67-76	F: 0-66

SCHEDULE OF CLASSES

Monday, August 27th
Introduction I

Monday, September 3rd
No classes – Labor Day

Monday, September 10th
Introduction II

Monday, September 17th
Choosing your Priors

Monday, September 24th
The Decision Process

Monday, October 1st
Field Trip to HFES Conference – Bayesian Analysis in Practice

Tuesday, October 9th
Experimental Designs

Monday, October 15th
Observational Designs

Monday, October 22nd
Markov Chain Monte Carlo (MCMC) Methods

Monday, October 29th
State-Dependent Models

Monday, November 5th
State-Dependent Models

Monday, November 12th
Bayesian Networks

Monday, November 19th
Bayesian Networks

Monday, November 26th
Class Presentations

Monday, December 3rd.
Class Presentations