STA 371: Course Syllabus

Statistics and Modeling

Spring 2011

Course overview

Course Details

Section: 04215
Time: T TH 2:00–3:30 PM
Place: UTC 4.102

Section: 04220
Time: T TH 3:30–5:00 PM
Place: UTC 4.102

Instructor: James Scott
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THE PURPOSE OF STATISTICS is to help answer tough questions in the face of uncertainty and randomness. How can we better predict the risk of credit default? Which factors contribute the most to creating sustained economic growth? What educational policies actually make our kids smarter? Questions like these can't be studied using controlled experiments. Rather, we have to use statistics to tease out relationships in complex, noisy systems that don't always behave like they would if we could draw things up in a laboratory.

In this course, you will learn to use the language of probability to study relationships such as these in a formal quantitative way. We will explore two major themes:

1. The use of visual and quantitative evidence to aid cause-and-effect reasoning in highly multivariate situations.

2. The tradeoff between fit and parsimony that all quantitative models of the world must negotiate.

Throughout the course, I will emphasize the analysis of actual datasets, and will provide examples from finance, politics, sports, marketing, economics, and science to help illustrate the material you'll be learning. By the end of the semester, you will have learned some lessons that will serve you well throughout the rest of your life, both as a producer and as a consumer of statistical information. (Today more than ever, understanding the role that quantitative methods play in business and policy decisions is the difference between having a seat at the table, and not.)

Our methodological focus will be on linear regression—one of the most powerful, widely used tools in modern statistics. We will start with a review of basic probability, statistics, and decision analysis. Our goal here will be to develop a common language for making sense of uncertainty. From there, we gradually build to a thorough understanding of regression. The rough order of topics will be: (i) probability and decision-making; (ii) correlation, causality, and the logic of statistical inference; (iii) simple linear regression; (iv) multiple regression; (v) time series and forecasting; and (vi) logistic regression. We will also encounter two other important topics—Monte Carlo simulation and research design—that won't stand on their own as independent units, but instead will be woven tightly throughout the rest of the semester's material.

Prerequisites

The formal university prerequisites for this course are: Business Administration 324 or 324H; Management Information Systems 301 or 310; Mathematics 408D, 408L, or 408M; and Statistics 309 or 309H. Calculus is a pre-requisite, and knowing it will certainly enrich your understanding of the course material, but you won't need it at a particularly advanced level. Here's a simple diagnostic: can you differentiate the function $f(x) = \ln x$ with respect to x? If you can, then you know enough calculus to succeed in this course. If you needed to look up the answer on Wikipedia to remind yourself, but you get the gist of it, then you're probably OK. If you don't understand what the question is asking, then you need a math refresher before you take this course.

You will be at an advantage if you know any linear algebra, or at least are familiar with matrices and matrix notation. But this is not a formal prerequisite, and I will not assume that you have this background.

Materials

No textbook or printed course packet is required. I will post handouts for each lecture on Blackboard, and I suggest that you read the material at least twice: once before class, and once after class, but before doing the homework. Research shows that this pattern—read, listen, read again, then practice—is far more likely to help you learn the material than merely listening to lectures.

Exams and Grading

Grading
Homework: 40%
Quizzes: 10%
Mid-term: 20%
Final: 30%

Grades will be determined by one in-class midterm exam; one open-book, take-home final exam; two in-class quizzes; and regular homework assignments.

Homework will count for 40% of your final grade, and will be assigned regularly. The assignments will typically be posted on Tuesday and due on the Thursday of the following week, giving you nine days to complete the work.

You may work on the homework problems in groups if you wish, although each student must turn in his or her own write-up, that he or she alone has prepared. All homework must be turned in at the beginning of class on the day it is due. No late homework will be accepted. But your lowest two homework grades of the semester will be dropped, thereby allowing for the occassional illness or other difficulty with finishing the assignments. To receive full credit, you must show your work and/or explain your reasoning.

Mid-term Week of March 7–11, 2011

The mid-term is worth 20% of your final grade, and will take place during the last week of class before Spring Break (March 7–11, 2011). You will be allowed to bring a calculator, but it is not necessary to have one. The exam will be graded such that, if you set up all calculations in the appropriate way, you will get full credit even if it is not possible to get the final answer without a calculator.

If you must miss the exam for the observance of a religious holy day, inform me as far in advance of the day as possible, so that alternative arrangements can be made in conjunction with the Dean and the relevant university offices. If you miss the mid-term for any other reason not approved by the Dean, then you will receive a zero.

The final is a take-home exam, and will count for 30% of your grade. The final will be available online at 5:00 P.M. on Friday, May 6, 2011 (the last class day of the semester), and is due one week later at 5:00 P.M. on Friday, May 13, 2011. There will be extra office hours during the final week of class to answer questions in advance of the final.

Final
Distributed: May 6, 2011 (5 pm)
Due: May 13, 2011 (5 pm)

Finally, there will be two in-class quizzes, at roughly the one-quarter and three-quarter points in the semester. Each quiz will last half an hour; will take place at the beginning of class; and will be announced one week ahead of time. Each quiz is worth 5% of your final grade, and is treated on par with a single homework assignment with respect to drops. Thus if you miss a quiz, you will get a zero, which will count as one of your homework drops. If you miss both quizzes, you will get a zero for each one, each of which will count as one of your homework drops.

Re-grade requests

On occasion you may notice a simple clerical error in the recording of a grade, which I am happy to correct without hassle. Other regrading requests must be submitted in writing within 7 days of the marked paper being returned. Keep in mind that the entire paper will then be subject to re-grading, and that your grade may go up or down as a result.

Attendance

On exams, you are responsible for all material covered in every lecture, regardless of whether it is in the online notes. Beyond the obvious correlation between coming to class and doing well on the exams, attendance does not play a role in course grading.

Curving grades

The raw percentage scores to the right will guarantee you *at least* the corresponding grade.

Percentage	Grade
93–100	A
90–92	A-
87–89	B+
83–86	B
80–82	B-
70–79	C
60–69	D

I reserve the right to curve grades up. But I will never curve them down. That means these grades are a floor, not a ceiling, on the final grade that someone with the corresponding raw score would receive. The precise details of any curve are at my sole discretion, and if I should choose to use a curve, I will detail the cutoffs used when course grades are submitted.

Other course policies

Classroom professionalism

Students are expected to act professionally and courteously in all respects. In particular:

- Laptops may not be used during lectures.[1] They can be very distracting to other students. Besides, you'll find that it's difficult to take math notes on a laptop, since there are some special symbols (Greek letters, etc.) that are tricky to type on the fly. Sometimes we will have software demos in class, where laptops will be allowed.
- Phones, iPods, and other electronic devices must be turned off.
- You are expected to arrive on time to class, since late arrivals disrupt things for all other students. In turn, I will make sure to finish on time so that students may reach their next lectures/hot dates.

[1] You won't need a laptop to follow along with the slides, since I will not use PowerPoint slides except to show pictures. In lieu of projected slides, I will provide lecture notes. You are encouraged to bring printouts of these notes to class. These are much higher-resolution than a computer screen, have a much higher information density than a projected PowerPoint slide, and can be readily augmented with your own notes.

Cheating, plagiarism, and such

Acts of academic dishonesty are ethically wrong; they harm the reputation of the school and demean the honest efforts of the majority of students. You know it; I know it; and no excuses will be accepted. Additionally, you should consider three things:

1. Cheaters are a tiny minority. The vast majority of students who preceded you did it the honest way. Follow their lead.
2. You play like you practice. The habits you form now will predict the headlines that people write about you, or your company, later in life. Try Googling "Jeff Skilling" or "Fabulous Fab" if you don't believe me.[2]
3. If you cheat, you're playing with fire. The minimum penalty will be a zero for that assignment or exam. You also risk failing the course and being dismissed from the University.

The bottom line when it comes to cheating is: just don't do it. You might fool me, if you're very lucky and very unscrupulous. But you are highly unlikely to fool the McKinsey interviewer you were hoping to impress with your knowledge of statistics. And you may find that the job market is far more ruthless than university judicial boards.

Now for the usual boilerplate. The responsibilities of both students and faculty with regard to scholastic dishonesty are described in detail in the Policy Statement on Scholastic Dishonesty for the McCombs School of Business. By enrolling in this class, you have agreed to observe all of the student responsibilities described in that document. By teaching this course, I have agreed to observe all of the faculty responsibilities described in that document.

[2] My first hit for "Fabulous Fab" is the *New York Daily News* from 27 April 2010, which wrote: "Fabrice Tourre, who calls himself Fabulous Fab, is not so much. Actually, the 31-year-old Frenchman of the racy e-mails came across like a weenie when he appeared before a Senate subcommittee to be grilled about Goldman Sachs' role in a deal the SEC says wasn't kosher." Cheat at your own risk, weenie.

Students with disabilities

The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. Services for Students with Disabilities (SSD) is housed in the Office of the Dean of Students, located on the fourth floor of the Student Services Building. Information on how to register, downloadable forms, including guidelines for documentation, accommodation request letters, and releases of information are available online at `deanofstudents.utexas.edu/ssd/index.php`. For more information, contact the Office of the Dean of Students at 471-6259, or 471-4641 TTY.

Student privacy

First of all, you should know that I am legally barred from discussing your course performance with anyone other than you and anyone that you explicitly designate. That includes your parents.

Second, a note on Blackboard. Blackboard is a password-protected web site, and is created automatically for all accredited courses taught at The University. I will post the syllabus, handouts, assignments and various other resources on Blackboard. Other site activities could include exchanging e-mail, engaging in class discussions and chats, and exchanging files. In addition, Blackboard include a class e-mail roster. Students who do not want their names included in such an electronic class rosters must restrict their directory information in the Office of the Registrar, Main Building, Room 1. For information on restricting directory information, see `www.utexas.edu/student/registrar/catalogs/gi02-03/app/appc09.html`.