Stat 150 Spring 2015 Syllabus

Available online at http://www.stat.berkeley.edu/~sly/Stat150Spring2015Syllabus.pdf

Instructor: Allan Sly

GSI: Jonathan Hermon

Course Webpage: http://www.stat.berkeley.edu/~sly/STAT150.html

Class Time: MWF 12:00 - 1:00 PM in room 150 Goldman School of Public Policy.

Office Hours: Tuesday 3:30-4:30 and Tuesday 10:30-11:30 Evans Hall 333.
GSI: Wednesday 5-7pm and Friday 3-5PM Evans Hall

Email: sly@stat (with the obvious ending)

Midterm: Wednesday February 25 and April 8 in class.

Exam: May 13, 3:00-6:00PM

Textbook: There isn't a textbook that fits perfectly with the course so I will be writing lecture notes as we go along. See also notes by Pitman http://www.stat.berkeley.edu/~pitman/s150s10/

It may be useful for you to further consult a textbook, each of the following could be suitable:

Stochastic Processes: Theory for Applications by R. Gallager
Adventures in Stochastic Processes by S. Resnick
A First Course in Stochastic Processes By S. Karlin and H. Taylor

Overview

Statistics 150, Stochastic Processes, is a meant as a second course in probability theory. Stochastic processes model a range of random phenomena over time and space. Topics include branching processes, Markov chains, martingales, renewal processes, Poisson processes and Brownian motion. These are the building blocks of many of the probabilistic models used in applications.

Prerequisites:

The prerequisite is Stat 134 (or equivalent) and we will assume a full knowledge of the material, particularly the more difficult later sections on conditional probability. Instructors in the past have found that students who did not get at least a B+ in stat 134 usually find this course very tough.

Homework

Homework is due each Friday in class and include your name and SID. No late homework will be accepted, barring major illness or the like but the lowest homework score will be dropped. The homework exercises are an **essential** part of the course, and are necessary for good understanding of the content. If you work in groups each of you should try the problems yourself first, write your own solutions and list at the front the members of your group.

Grading

Grades will be weighted according to 10% homework, midterm 25% each, 40% final exam. The lower midterm score may be replaced by the final.

Topics Covered Include

Markov chains

- Transience and recurrence.
- Convergence to stationarity.
- Reversibility and time reversal.
- MCMC for Bayesian computation and graph coloring.

Branching Processes

- Generating functions.
- Probability of extinction and long-time behavior.

Poisson Processes

- Inter-arrival times.
- Spatial and general Poisson processes.
- Coloring/marking, superposition, thinning, and mapping, conditioning on the number of points.

Continuous-time Markov chains

- Transition probabilities, forward and backward equations and generators.
- Hitting probabilities and mean hitting times.

Martingales

- Hitting probabilities.
- Optional stopping.

Brownian Motion

- Properties of Brownian motion.
- Hitting distributions and potentials.
- Brownian Bridge