CS 3130/ECE 3530: Probability and Statistics for Engineers

Administrative Details and Syllabus
Fall 2014

Course Web Page: http://www.cs.utah.edu/~jeffp/teaching/cs3130.html

Description. An introduction to probability theory and statistics, with an emphasis on solving problems in computer science and engineering. Probability and statistics is an important foundation for computer science fields such as machine learning, artificial intelligence, computer graphics, randomized algorithms, image processing, and scientific simulations.

Topics in probability include discrete and continuous random variables, probability distributions, sums and functions of random variables, the law of large numbers, and the central limit theorem. Topics in statistics include sample mean and variance, estimating distributions, correlation, regression, and hypothesis testing. Beyond the fundamentals, this course will also focus on modern computational methods such as simulation and the bootstrap. Students will learn statistical computing using the freely available R statistics software: http://www.r-project.org/.

Instructor. Jeff M. Phillips. *Office:* 3442 MEB. *Email:* jeffp@cs.utah.edu.

Class Meetings. Tuesdays and Thursdays, 3:40 – 5:00pm, WEB 2230.

Getting Help. Take advantage of the instructor and TA office hours. We will work hard to be accessible to students. Please send us email if you need to meet outside of office hours. Don't be shy if you don't understand something: come to office hours, send email, or speak up in class!

Students are encouraged to use a discussion group for additional questions outside of class and office hours. The class will rely on the Canvas discussion group. Feel free to post questions regarding any questions related to class: homeworks, schedule, material covered in class. Also feel free to answer questions, the instructors and TAs will also actively be answering questions. But, **do not post potential homework answers**. Such posts will be immediately removed, and not answered.

All important announcements will be made through the discussion group, there is otherwise no class mailing list.

Textbook. *A Modern Introduction to Probability and Statistics: Understanding Why and How* by Dekking, Kraaikamp, Lopuhaa, and Meester

An electronic version of this book is freely available through the University! The website is here:

http://www.springerlink.com/content/978-1-85233-896-1

To access the book you must be visiting this website from the campus network. Or if you are off campus, you can access it using VPN: https://vpnaccess.utah.edu/.

Grading Policy. The final course grade is based on the homework assignments (40% total), quizzes (35%), and the final exam (25%). Letter grades are assigned as follows:

		87-89	B+	77-79	C+	67-69	D+		
93-100	A	83-86	B	73-76	C	63-66	D	0-59	E
90-92	A-	80-82	B-	70-72	C-	60-62	D-		

Homework assignments will consist of writing R code to solve problems as well as written questions. We will use the open-source statistical software R, which is here: http://www.r-project.org/

Homeworks are due by the start of class on the due date. Students can turn in hard copies in class, or electronic copies through Canvas. Late assignments will receive a 10% deduction during the first 24 hours they are late, and a 20% deduction if they are 24-48 hours late. Assignments will not be accepted beyond 48 hours late.

If you believe there is an error in grading (homeworks or quizzes), you may request a regrading within **one week** of receiving your grade. Requests must be made in writing, explaining clearly why you think your solution is correct.

Working Together. You are welcome to discuss the concepts in a homework assignment with your fellow classmates. However, you must develop and write up your own solutions. Do not read another person's answers or code, and do not show your answers or code to anyone else. *Presenting someone else's solutions as your own will be considered cheating.* Also, it is important that you first try to solve problems on your own, and discuss them only when you are stuck or to reassure yourself about your answer.

Posting homework questions on internet forums is **not** allowed and is considered cheating. This is cheating regardless of whether or not you use any of the posted answers.

Posting potential answers to the class discussion forum is not allowed.

Of course, there must be no collaboration during in-class quizzes or the final exam. If a student is caught cheating on a homework or quiz, they will receive a failing grade for the course. For a detailed description of the university policy on cheating, please see the University of Utah Student Code: http://www.regulations.utah.edu/academics/6-400.html.

School of Computing Cheating Policy. The School of Computing has instituted a "two strikes and you're out" cheating policy, meaning if you get caught cheating twice in any SoC classes, you will be unable to take any future SoC courses.

Students with Disabilities. The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.

Syllabus. The following topics will be covered. See the course web page for a detailed schedule.

- *Foundations of Probability.* Sample spaces, probabilities and distributions, discrete and continuous random variables, expectation, joint probabilities and independence.

- *Limit Theorems.* Law of large numbers, central limit theorem.

- *Basic Statistics.* Mean, variance, covariance, correlation.

- *Regression.* Linear models, least squares estimation.

- *Hypothesis Testing.* Null hypothesis, test statistics, type I and II errors, *t*-tests.

- *Computational Methods.* Simulation, bootstrapping.

Course Outcomes. At the conclusion of CS 3130/ECE 3530, students should:

- Understand basic concepts in probability including combinatorics, independence, conditional probability and Bayes' rule.

- Solve basic problems arising in engineering that involve discrete and continuous probability distributions.

- Use statistical concepts such as means, variances and various types of graphs to analyze datasets using computational software such as R.

- Understand confidence intervals and perform statistical inference such as hypothesis testing and regression.