STAT 7200: Introduction to Advanced Probability
Fall 2015

Instructor: Chao DU  
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Class Schedule: TuTh 9:30AM - 10:45AM  
Location: Maury Hall 110  
Office Hour: Wednesday 3:00PM-5:00PM  
Grader: Yin Zhang (yz4an@virginia.edu)

Course Description:

This course is designed to introduce advanced, mathematical rigorous probability theory for graduate students in statistics. Topics covered in this course include: mathematical foundation for advanced probability, probability triple, construction of probability measure, independence, limit event, expectation, random variable, different types of distribution, different types of convergence, the law of large number, central limit theorem, characteristic function, conditional probability and expectation, stochastic processes and Markov chain. More topics (for instance, martingale) may be included if schedule permits.

Prerequisites:

You are expected to have completed Stat 6190 and Stat 7110 to be enrolled in this class. A college-level class in real analysis is highly recommended for this course. However, relevant knowledge will be extensively reviewed throughout the semester.

Course Objectives:

1. Examine the intuition and rationality behind probability theory.
2. Establish a precise mathematical understanding on the foundation of probability theory.
3. Master the advanced mathematic technique commonly used in advanced probability and statistics theory.
4. Integrate the knowledge learned in this class to solve theoretical problems.
5. Develop skills of understanding and analyzing texts written in rigorous mathematical language.
6. Develop skills of formulating theoretical questions and constructing coherent arguments in a clear and professional manner.

Course Assessments:

The final numerical grades will be calculated based on the major factors described bellow. The letter grades will be assigned based on the overall distribution of numerical grades. No fixed threshold will be set in advance.
1. Class participation (10%). You are expected to attend all lectures. The in-class discussion will help you to master the tools learnt from this class, as well as obtain an intuitive understanding of the theoretical matter beyond mathematical derivations.

2. Assignment (25%). There will be around 6 written assignments. Each assignment will be weighted equally towards the final grades. The grading will be generous but it is strongly advised that you should independently work on the problems before discussing with fellow students.

3. Scribing using LaTex (15%). Each student are expected to submit two short papers written in LaTex. The first paper should be a fully and clearly written solution to one of the assignment. And the second paper should be a well organized scribed note of one lecture. This task is designed to help you to learn to present theoretical knowledge in a clear and organized manner.

4. Exams (50%). Both mid-term (20%) and final (30%) exams aim to test your mastery on the knowledge learned from class and your ability of applying such knowledge to solve theoretical questions. Mid-term is an in-class exam focusing on the basic understanding of course materials. Final exam is a taken home exam that tests your ability to integrate different knowledge of this class to understand and solve theoretical problems.

Textbook:


Be sure to check the appendix of this books, in which the necessary mathematical backgrounds are reviewed and many useful references are listed.

Useful References:

Advanced textbooks on probability theory (with rigorous math)


You can find more extensive and in-depth discussion on probability theory in this classic textbook.

Resources on Latex

Distributions:

For Mac: *MacTeX* [https://tug.org/mactex/](https://tug.org/mactex/)
For Windows: *MiKTeX* [http://miktex.org](http://miktex.org)

Free tutorials and beginner books:
Online tutorials on LATEX:
\LaTeX\ Tutorials - A Primer
http://www.tug.org/twg/mactex/tutorials/ltxprimer-1.0.pdf (from the ltxprimer project)
\LaTeX/Absolute Beginners
http://en.wikibooks.org/wiki/LaTeX/Absolute_Beginners (by Wikibooks, the open-content textbooks collection)
Getting to grips with Latex
http://www.andy-roberts.net/misc/latex/index.html (by Andrew Roberts.)

Class Policies:

Class Participation
You are expected to attend all lectures and participate actively in class discussion.

Homework
In order to be graded and counted towards the final grade, each assignment must be submitted on time. Extensions on assignment deadline will be granted only in the most exceptional circumstances. Any extension request must be made to the course instructor at least 24 hours before the due date.

Exams
Mid-term are closed-booked but you will be allowed to bring in two double-sided A4 sheets with written (NO PHOTOCOPY & NO PRINTING) notes. Final exam will be a 3-days taken home exam. During final exam, you may consult any existing external resource, but may not request and receive any assistance from any people (such as seeking assistance in person or posting questions online). The date of mid-term exam is Oct 29th, 9:30am-10:45am. And the date of final exam is from December 14th 9:00am to December 16th 5:00pm.

Honor Policy:
As the only true way to acquire knowledge is through your own hard work, it is of the uttermost importance that all the submitted works, such as homework assignments and exam papers, must reflect your independent efforts made during the learning process. Hence, the following honor policy will be enforced throughout the semester. Any breach to the policy will be reported directly to the UVa Honor Committee.

Although you may discuss homework assignments in small groups, you must complete your assignments independently based on your own understanding. Copying others’ works will not be tolerated. You must not consult any external resource other than the allowed sheets of written notes during mid-term. You must finish the final exam on your own, without requesting and receiving assistance from other people.