Mathematics 771: Theory of Probability

Course Materials and Outline

By Eric Key

The purpose of this course is to provide the theoretical underpinnings for probability. For this reason it is presumed that students have some familiarity with abstract measure theory, including

- Abstract Integration
- The Monotone and Dominated Convergence Theorems
- The Radon-Nikodym Theorem

as well as some familiarity with probability theory, as would be encountered in a first undergraduate course in probability or in statistics.

Course Outline

We have four main goals in mind:

- Give an axiomatic development of probability theory, and use this to give a unified treatment of expected value.
- Discuss almost sure convergence and give a complete proof of the Strong Law of Large Numbers.
- Discuss convergence in distribution, and give a two different proofs of the Central Limit Theorem. One proof is based on characteristic functions, and the other on contraction operators.
- Give a unified development of conditional probability, including a discussion of martingales and related converge theorems.

Resources

Your best resource is coming to class and to my office hours. In addition, I will hand out lecture notes, and the following text will be on reserve at the library:

- Real Analysis and Probability by Robert Ash.

I have put the lecture notes on line. You can find the notes on the page in which you found this PDF.

Homework is central to your success in this course. There will be assignments due roughly every other week. These assignments will be primarily of a theoretical nature. Homework will determine about half of your grade. I expect you to work out these problems without consulting your classmates. You may consult reference materials, and these material need to be cited if used as part of your solution. The homework problems are accessed on the page in which you found this PDF.

I expect your solutions to be neat and well organized. Full credit will not be awarded for solutions which are disorganized and sloppy as well as for using the work of others without proper citation. I suggest you prepare rough drafts of your solutions and copy them over. If you are having trouble with the problems see me immediately. I am only too happy to give you a hand.

Problem Sets

- Problem Set 1 (accessed on the page in which you found this PDF)

Tests

There will be final examination which will be partially oral and partially in-class. It will count about thirty five percent of your grade. There will also be an in-class midterm exam in late october, and it will count about fifteen percent of your grade.

Contact information

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