Objective

This course will cover the fundamentals of theoretical statistics. Topics include: VC theory, convergence, point and interval estimation, hypothesis testing, data reduction, Bayesian inference, nonparametric statistics and bootstrap resampling. We will cover Chapters 1 – 12 from the text plus some supplementary material. This course is excellent preparation for advanced work in Statistics and Machine Learning.


Background

I assume that you are familiar with basic probability and mathematical statistics. You should already know the following concepts: probability, distribution functions, density functions, moments, transformation of variables, and moments generating functions.

Is This The Right Course For You? 36-705 versus 36-700

We have created another course, 36-700, that covers similar material but assumes less background. In 705 I assume you are already familiar with basic probability. The course moves very fast. If you want a course that requires less background, you should take 36-700 instead.

Other Recommended Texts


Grading
20% : Test I (Wednesday Sept. 23) on the material of Chapters 1–4
20% : Test II (Friday October 16)
20% : Test III (Friday November 13)
20% : Final Exam (Date set by the University)
20% : Homework

Exams
All exams are closed book. **Do NOT buy a plane ticket until the final exam has been scheduled.**

Homework
Homework assignments will be posted on the web. Hand in homework to Mari Alice Mcshane, Baker Hall 228, by **3 pm Thursday.** **No late homework.** If you need an extension due to illness, email me BEFORE the homework deadline.

Reading and Class Notes
Class notes will be posted on the web regularly. **Bring a copy to class.** The notes are not meant to be a substitute for the book and hence are generally quite terse. Read both the notes and the text before lecture. Sometimes I will cover topics from other sources.

Group Work
You are encouraged to work with others on the homework. But write-up your final solutions on your own.

Course Outline

1. Quick Review of basic probability.
2. Inequalities
3. Vapnik-Chervonenkis Theory
4. Convergence
5. Sufficiency
6. Likelihood
7. Point Estimation
8. Minimax Theory
9. Asymptotics
10. Robustness
11. Hypothesis Testing
12. Confidence Intervals
13. Nonparametric Inference
14. Prediction and Classification
15. The Bootstrap
16. Bayesian Inference
17. Model Selection
18. Causation