Mathematical Statistics

With the advent of powerful computing and the availability of massive sets of data, statistics has become a valuable tool in many of the applied sciences. This course focuses on the basics of advanced mathematical statistics, both classical and modern.

The actual contents of the course will depend in part on the background, preparation, and interest of the students. The list of topics below is therefore somewhat flexible.

Instructors:

- Larry Goldstein, University of Southern California, Los Angeles, USA
- Yosef Rinott, Hebrew University, Jerusalem, Israel

Course Content:

- Parametric models, linear models, variable selection and the lasso
- Estimation, criteria and construction of estimators, maximum likelihood, asymptotics
- Non parametric models, empirical distribution function, bootstrap
- Hypothesis testing, multiple hypotheses testing, false discovery rate
- Density and regression estimation, smoothing
- Classification, VC dimension, discriminant analysis, support vector machines.

Course Prerequisite: Students should have at least one good course in probability, and some basic statistics. In particular, it will be assumed that students are familiar with the first five chapters of the course text, All of Statistics: A concise course in Statistical Inference, by Larry Wasserman. Please review these chapters and study any material in them which is new to you.

A short quiz on the material in the first five chapters will be given during the first week of class, and will count for 10% of the final grade. It is also strongly recommended that students read Chapter 6 of the textbook, which consists mostly of material that is covered in first year statistics courses (e.g., confidence intervals, testing hypotheses).

Evaluation;

- Week one quiz, 10%
- Midterm, 30%
- Final Exam, 40%
- Course participation, 20%

Course Text, and two additional references:

- All of Statistics: A concise course in Statistical Inference, by Larry Wasserman.
- Mathematical Statistics: Basic Ideas and Selected Topics, by Peter Bickel and Kjell Doksum
- A Course in Large Sample Theory, by Thomas Ferguson