Introduction to Mathematical Statistics
Scuola Matematica Interuniversitaria, Italy
Summer 2014 (July 28 – August 29)

Instructor: Professor Sandy Zabell, Department of Mathematics, Northwestern University

Program

Week 1: Statistical models, parametric families of distributions. Normal, gamma and beta distributions. Multivariate distributions.

Week 2: Distribution of a sum and ratio of independent random variables. Normal distribution theory: the chi-squared, t, and F distributions. Different forms of convergence, generating a random sample.

Week 3: Methods of estimation: method of moments, maximum likelihood, and least squares. Criteria for evaluating point estimators: unbiased estimation, the information inequality.

Week 4: Confidence intervals: one and two-sample estimation. Asymptotic theory of estimators: consistency, asymptotic normality of the MLE. Hypothesis testing, the Neyman-Pearson lemma.

Week 5: Linear regression and the general linear model, analysis of variance.

Lectures in English

Text: The majority of the course will be drawn from the text: *Statistical Inference* (2^{nd} ed.) by Casella and Berger; Duxbury Press, 2002.

Prerequisites: Knowledge of two years of calculus (including linear algebra) and the basics of calculus-level probability theory will be assumed: properties of a probability function, discrete and continuous random variables, independence, expectation and variance. It would also be helpful if students were familiar with the law of large numbers and the central limit theorem.