BIOS 550: Basic Elements of Probability and Statistical Inference I

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Fall 2013
Instructor: Young Truong, Professor of Biostatistics
Lectures: Monday, Wednesday 08:30-09:45, MC1304
Lab: Monday 1300-1350 MC2308

Course Objectives

To provide an introduction to the mathematical foundations of statistical inference and to set out the principles of hypothesis testing and confidence intervals.

Course Description

This course covers an introduction to set theory and basic probability, population, sample, random variables, discrete distributions, continuous distributions, moments, bivariate and multivariate distributions, independence, covariance, distributions of functions of random variables. Will cover the essential features of one sample and two sample inference for discrete and continuous response data, with an emphasis on parametric methods.

Prerequisites

Multivariate (especially two-variable) differential and integral calculus.

Required textbooks


Topics to be covered

- **Introduction to probability** -- Review of set theory, Venn diagrams, permutations and counting. Probabilities of events, conditional probability, additive, multiplicative laws, law of total probability, Bayes rule.
- **Estimation** -- Point estimation, unbiasedness, MSE. Confidence intervals, large sample CI. Relative efficiency, consistency, sufficiency, Rao-Blackwell theorem, MVUE.
- **Methods of estimation and hypothesis testing** -- Method of moments. Likelihood and MLE. CIs for MLES. Likelihood ratios, hypothesis testing, P-values, goodness of fit-tests.
- **Special topics (if time permits)** -- Simple linear regression, categorical data, nonparametric tests, Markov chains, Bayesian statistics.

Course requirements/Assessment

- Midterm exams: 30%
- Final exam: 30%
- Class Participation: 10%
- Weekly homework assignments: 30%

**Grading scale**


**Attendance Policy**

The course is designed so that students should be successful with active participation and regular, punctual attendance. It is understandable that students may miss class; however, it is the student’s responsibility to determine what assignments were missed and what material was covered. Students missing 5 or more class periods (excused or unexcused) will receive an I for the course.

**Late Work**

Only students with university excused absences or circumstances which the instructor finds a reasonable cause for non-attendance will be allowed to submit late work without penalty. Late work is defined as any work handed in after the scheduled due date and time. It is the student’s responsibility to make arrangements for determining and handing in missed work, preferably in advance, but no later than one week after the absence. In all other cases, late work will be penalized 15% for each day late, and assignments will not be accepted more than one week late.

**Office hours**

My office is MC3105A, phone is 6-7270. Office hours: MW 1000-1100. Questions by e-mail are most welcome.

**TA and Grader:**