Biostatistics 602: Biostatistical Inference

Winter 2009

Instructor
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GSI
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W 4:00-6:00 pm

Administrative information

Class Time(s): T/Th, 11:30-1:00 pm; F, 1:00-2:00 pm
Class Location: 1690 SPH1A

Prerequisites

Biostatistics 601 or equivalent, knowledge of basic calculus and matrix algebra. In particular, the student is expected to have knowledge of the following: random variables, independence, characteristic and moment generating functions, common discrete and continuous distributions, expectations and higher order moments, random sampling. (approximately chapters 1-5.5 of Casella and Berger.)

Textbooks

- *Statistical Inference*, 2nd Edition, by G. Cassella and R. L. Berger. (Required)
- *Statistical Inference*, by Garthwaite, Jollilffe and Jones. (Recommended)
- *Mathematical Statistics: Basics Ideas and Selected Topics*, by Bickel and Doksum. (Recommended)

Grading

Homework assignments will be given out at approximately 1.5 week intervals. Late homework assignments will not be accepted unless the student obtains the permission of the instructor. You are encouraged to discuss homework problems with fellow students; however, you must write up the assignment on your own. Plagiarism will not be tolerated.

- Homework: 15%
- Midterm 1 (11:30-1:00 pm, Tuesday, February 12): 25%
- Midterm 2 (11:30-1:00 pm, Tuesday, March 17): 25%
- Final (10:30-12:30 pm, Thursday, April 30): 35%

Topics

This course covers fundamental concepts and results of statistical inference. We will be primarily focusing on Chapter 6-10 of Callesa and Berger. Statistical inference methods instruct us how to use data to address substantive questions. In this course, we will study statistical point and interval estimation, hypothesis testing and basic asymptotic theory. We will focus on frequentist school of inference, and if time allows, we will brief touch some basics of Bayesian inference. In particular, we will be covering the following topics:

- **Data Reduction**
  Sufficiency principle (6.2): sufficient statistics, complete statisics, ancillary statistics, and the exponential family of distributions; Likelihood principle (6.3)
- **Point Estimation**
  Estimator construction (7.2): moment estimator, maximum likelihood estimator, Bayes estimator, and computational issues; Evaluate estimators (7.3): unbiasedness, sufficiency; Asymptotic properties (10.1): consistency and efficiency

- **Hypothesis Testing**
  Tests construction (8.2): null and alternative hypotheses, composite hypotheses, likelihood ratio test; Evaluate tests (8.3): Neyman-Pearson lemma; Asymptotic properties (10.3)

- **Interval Estimation**
  Interval construction (9.2); Evaluate intervals (9.3); Asymptotic properties (10.4)