STAT 450
Statistical Theory

Fall 2010
Day Course

Students requiring accommodations as a result of disability, must contact the Centre for Students with Disabilities 778-782-3112 or csdo@sfu.ca

Instructor: Dr. Jinko Graham

Prerequisite:

STAT 330

Textbook:

Statistical Inference 2nd Edition by Casella and Berger, publisher Duxbury/Thompson Learning, c.2002

Calendar Description:

Distribution theory, methods for constructing tests, estimators, and confidence intervals with special attention to likelihood methods. Properties of the procedures including large sample theory. **Quantitative**

Outline:

Students entering this course are responsible for having a solid understanding of the concepts of joint, marginal and conditional distributions; independence and conditional independence; expected values of random variables including variances, covariances and correlations; distributions of functions of discrete bivariate random vectors; and common families of distributions (chapters 1-4 of text). Based on this foundation, we will cover topics from among the following, at times through student presentations to the rest of the class:

1. Review of distributions of functions of continuous bivariate random vectors (sections 2.1 and 4.3 of text).

2. Estimation in finite samples
    a) simple likelihood estimators
    b) judging quality of estimators
        i. low-MSE estimators
        ii. unbiased estimators: Cramer-Rao lower bound, sufficient statistics and Rao-Blackwellization of estimators

3. Testing in finite samples:
    a) Constructing likelihood ratio tests (LRTs)
    b) Optimality of LRTs for point null and alternative hypotheses: the Neyman-Pearson lemma

4. Interval estimation in finite samples
    a) Inverting test statistics
    b) Pivotal quantities

5. Convergence concepts for estimators in large samples
    a) Central limit theorem
    b) Weak Law of Large Numbers (convergence in probability)
    c) Slutsky's theorem
    d) Delta-method for obtaining asymptotic distributions of functions of estimators

6. Large sample approximations to distributions of estimators
    a) normal approximations
    b) bootstrapping

7. Testing in large samples
    a) likelihood ratio tests and large-sample approximations to their distributions
    b) score tests and large-sample approximations to their distributions

8. Interval estimation in large samples

Grading Scheme:

Assignments: 10%
Project: 25%
Participation: 20%
Final Exam: 45%
The grading is subject to change.

Students should be aware that they have certain rights to confidentiality concerning the return of course papers and the posting of marks. Please pay careful attention to the options discussed in class at the beginning of the semester. Students are reminded that Academic Honesty is a cornerstone of the acquisition of knowledge. Scholarly integrity is required of all members of the University. Please consult the General Guidelines of the calendar for more details.

Revised July 2010