ISOM 5550
Statistical Methods for Business and Economics
Course Description and Schedule
Spring 2025

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Class meets: Feb 4 - May 8
Room: 1026, LSK Bldg
Tuesday and Thursday 3:00 – 5:50PM
Holidays: 5/1 (Thu)

Course Description

Statistics is the science of analyzing data. As such it plays a fundamental in all aspects of academic research, medical studies, government policy, business practices etc. It has taken on a more important role in the present information age where now there is an abundance of information. Furthermore, limitations on the types of data assumptions and statistical methods one can practically use has been ameliorated by advances in computer technology. While most use statistics as a tool in applications for understanding real world domain specific phenomena, it is important to understand how what statistical methods are available and the appropriateness of such methods in various scenarios. This course is designed to provide a basic foundation in theoretical statistics which when utilized correctly aids in a better understanding of the use of statistics in practical settings.

Course Materials

• Textbook:
  (i)   *Textbook Required: Mathematical Statistics and Data Analysis 2nd ed. By John A. Rice*

        "Statistical Inference" 2nd ed. by Casella and Berger; Duxbury, 2001 (optional)
  (ii) *Topics covered Chapter 6, 7, 8, 10, 11 (additional material) in Casella and Berger. Look for corresponding subjects in Rice.* I may use supplemental material not directly in textbook.

• Additional required reading assigned by me.

Grading
The grade you earn in ISOM2500 will be based on the following activities.
- Individual Class Participation, Students may be asked to give brief presentations 10%
- Homework 25%
- Mid-term (take home) 30%
- Final Exam 35%

Course Outline
The course is broadly divided into two topics:
• Part I. Parametric estimation and evaluation and
• Part II. Hypothesis Testing and Regression Models.
The mid-term exam will consist of material in Part I. A final exam will primarily focus on Part II but will based on all the course material.

- Part I. Parametric Estimation and evaluation
  - Chapter 6
    - Parametric families and Likelihoods
    - Principles of data reduction: Sufficient statistics, Completeness, Basu's theorem, Ancillary Statistics

  - Chapter 7 Point Estimation
    - Methods of estimation
    - Method of Moments, Maximum Likelihood (MLE), Bayesian Methods.
    - Evaluating estimators Part 1.
    - Finite sample methods: Mean Squared Error (MSE).
    - Techniques for finding estimators with smallest variance-UMVUE, Cramer Rao
    - Lower Bound, Rao Blackwell theorem, Connections to sufficiency and completeness, Lehmann- Scheffe Theorem. Special results for exponential families.
    - Miscellanea

  - Chapter 10 Asymptotic methods for evaluating estimators
    - Consistency, Asymptotic efficiency - Connection with Cramer Rao lower bound.
    - Miscellanea.

- Part II. Hypothesis Testing and Regression Models
  - Hypothesis Testing.
  - Concepts of Type I and Type II error, Neyman-Pearson Lemma, Most Powerful tests. Generalized Likelihood ratios.
  - Miscellanea

  - Regression, analysis of variance