APPM/STAT/MATH 4520/5520 Mathematical Statistics

Instructor:
Office:
Office Hrs:
                    or
Email: _____

> X."—User603, stats stack exchange

Course Description

Welcome to a first course in Mathematical Statistics! Unlike many other statistics courses, this is not a data oriented course. Instead, it is a course about the probability and statistical thinking needed in order to do statistics. As such, the course will focus on theoretical results—and often, proofs of those results. Consequently, a basic probability course (e.g., APPM 3570 Applied Probability) is an important prerequisite. After a brief review of some notation and definitions from basic probability, we will cover a number of topics, including different methods for deriving and assessing statistical estimators (both point and interval estimators), theoretical results relevant to hypothesis testing, and other important tools for statistical inference. All that to say, we will be statisticians of type (3) this semester (as defined above by User603 on Stats Stack Exchange!). The ultimate goal for many of us will be to become statisticians of type (1)—few people are employed to be *mathematical* statisticians; however, a type (1) statistician who knows how to "work with X" will be much better for it. That is the overarching goal of this course—to learn the mathematics, probability, and statistical theory to make us all better statisticians and data scientists.

Learning Goals

By the end of this course, students should be able to:

1. Compute the distribution of a transformation of random variables (univariate, bivariate, and multivariate), minima, and maxima.

2. Define a moment generating function, and use it to compute moments (e.g., the mean and variance), and to derive other theoretical results.

3. Define, derive, and interpret estimators of different quantities of interest (e.g., maximum likelihood estimator, method of moments estimator).

4. State, prove, and apply important results related to the quality of an estimator (e.g., is the estimator *unbiased*?).

5. Define, derive, interpret, and evaluate interval estimates (both frequentist and Bayesian) for means, differences of means, proportions, and variances.

6.

Exams (20% each)

There will be two evening

courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran"status, political affiliation or political philosophy. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on classroom behavior and the Student Code of Conduct.

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

The University of Colorado Boulder is committed to fostering a positive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct (including sexual assault, exploitation, harassment, dating or domestic violence, and stalking), discrimination, and harassment by members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or cureport@colorado.edu. Information about the OIEC, university policies, anonymous reporting, and the campus resources can be found on the OIEC website.

Honor Code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to"the Honor Code."Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu);