This is a masters honors level, introductory course in mathematical statistics.

Course goals: This course covers basic **statistical theory** for students seeking to build a foundation for further studies in the field of statistics.

The aim of the course is to describe the two aspects of statistics –– **estimation and inference** –- in some detail. The topics will include classical parametric theory — maximum likelihood estimation, Bayesian inference, hypothesis testing, confidence intervals — and the theory of linear regression, and introduction to bootstrap and nonparametric methods. Practical aspects of data analysis, however, will not be covered. Along the way, students will also obtain a foundation sufficient for STAT GR5205 (Linear Regression Models), and STAT GR5291 (Advanced Data Analysis), etc.

Note: The course covers the material of one full course in half semester. The pace, therefore, is fast, and hence more effort is required from the student to keep up with the pace of the lectures. Furthermore, the material is cumulative, that is, almost every lecture builds on previously discussed concepts. Students who doubt their preparation or who are concerned that they will not be able to consistently devote time to the course would be well advised to consider taking the full semester version of this course.

Day/Time: Tue/Thu 3:10pm-5:55pm; Location: 703 Hamilton Hall
Professor: *Bodhisattva Sen*
Email: b.sen@columbia.edu

Office Hours: Tue 1:30 pm-2:30 pm; Thu 11:00 am-12:00 pm ET. Office hours will be held in Room # 1004 SSW (School of Social Work building); 1255 Amsterdam

Textbook: Probability and Statistics, 4th Ed., by DeGroot and Schervish (ISBN-10: **0321500466**).

Teaching assistants: *Fangyi Chen* (fc2630@columbia.edu)
OH: Mon / Wed 10:00 am-11:30 am ET. Office hours will be held at **Watson Library Ground Floor Study Room G10** (in the **Uris building**).

Prerequisite: A good working knowledge of single-variable calculus is necessary: differentiation, integration, infinite sums, Taylor expansions, limits. You should also have some experience with linear algebra --- matrices, eigenvectors, quadratic forms. No previous experience with statistics is necessary.

Evaluation: There will be a homework (HW) problem set due (almost) every week with the exception of the first week and the midterm week (**Nov. 13**). The midterm exam will be an in-class test. Exam problems will be similar to those given in the problem sets and worked out in the lectures. The exams will be closed-book and closed-note; a one page (A4 sized paper) cheat sheet, where you can write on either side of the paper, will be allowed for midterm exam [where you can write important formulas and results by your own hand].
Class participation and discussion is highly encouraged. The following weights will be used in assigning the final grade:

HW – 10% (one HW with lowest score will be dropped)
Midterm (November 13) – 35%
Final (TBD) – 50%
Class participation and quizzes – 5%

Note: No makeup midterm or final will be given. HW will be due before the beginning of the class. No late HW will be accepted. Students can work together on the homework assignments but should write up solutions on their own. Of course, all work on the exams absolutely must be each student's alone. Solutions to the homework assignments will be posted on Courseworks each week.

Help with questions: Here is the link for students to sign up for this class on **Piazza**:https://piazza.com/columbia/fall2025/statgr5504_2025
Students just need to use their columbia.edu emails to sign up for this class. Fangyi (our TA) has provided some instructional resources on Piazza to assist students in posting questions and answering questions from their fellow students. Here are also some helpful video links from Piazza:
1. [Post your first note] https://www.youtube.com/watch?v=1a6ppFFqhnE&list=PLEOX0FOixqJ4gJEWOeIsBJBQ1mD05ZUKC
2. [Intro for students]. https://www.youtube.com/watch?v=tqGummy1Be4&list=PLEOX0FOixqJ4gJEWOeIsBJBQ1mD05ZUKC

Academic Integrity: Any form of cheating, assistance from unauthorized sources will not be tolerated. Students failing to meet these responsibilities should anticipate being asked to leave Columbia. This includes your home-works and exams.