

MATH 3740 Syllabus

Course Name: Probability and Statistics for Computing and Machine Learning

Credit hours: 3

Term: Spring 2027

Instructor Information

Instructor: Cheng Mao

Email: cheng.mao@math.gatech.edu

General Course Information

Description

This course introduces probability and statistics with applications to computing and machine learning for students in the Mathematics and Computing major. The course focuses on essential concepts in probability and statistics, such as conditional probability, Bayes' rule, moment-generating functions, covariance and correlation, linear regression, maximum likelihood estimation, and Bayesian statistics. The course also covers computational methods, including numerical simulations with Markov chain Monte Carlo.

Course Learning Outcomes

Upon successful completion of this course, you should be able to:

- Understand basic concepts such as probability, conditional probability, random variables, and distributions.
- Compute and interpret quantities such as expectations, variances, moments, covariance, and their conditional versions.
- Understand statistical models such as linear regression, and apply maximum likelihood and Bayesian methods to statistical estimation problems.
- Use a programming language for simulations and implementing computational methods based on Markov chain Monte Carlo.

Pre-Requisites

MATH 2550, 2551, or 2561. Specifically, prerequisites include multivariable calculus and linear algebra. Basic programming experience is helpful but not required.

Required Course Materials

Textbook: "Introduction to Probability" by J. Blitzstein and J. Hwang, 2nd edition (available at <http://probabilitybook.net>).

Grading Policy

The overall numerical grade is the higher of two schemes.

Scheme 1: 30% homework + 30% midterms + 40% final exam.

Scheme 2: 30% homework + 60% midterms + 10% final exam.

The final letter grade will be assigned according to the scale: A = [90%,100%]; B = [80%,90%]; C = [70%,80%]; D = [60%,70%]; F = [0%,60%).

Description of Graded Components

Homework: There are 10 homework assignments, all of which are posted and submitted on Canvas. In the semester, three late homework submissions are allowed, each by at most two days. The two lowest homework scores are dropped.

Midterms: There are three in-class, open-note midterms. The lowest midterm score is dropped.

Final exam: The final exam is comprehensive and open-note.

Course Policies

Attendance and/or Participation

Class attendance and participation in discussions are strongly encouraged. The midterms and the final must be completed in class or under supervision.

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

After three allowed late homework submissions (see above), the fourth and subsequent late submissions incur a 20% penalty each. Make-up exams may only be granted for exceptional circumstances in accordance with institute policy. Report the circumstances and notify the instructor as early as possible. Make-up exams are generally proctored in person during the same week as the original exam.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review [Georgia Tech's Honor Code](#) and the student [Code of Conduct](#).

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, [contact the Office of Disability Services](#) (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. [The Student-Faculty Expectations](#) articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Campus Resources for Students

Undergraduate Student Academic Success Resources:

Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit us online at success.gatech.edu/tutoring, email us at tutoring@gatech.edu, or come see us at Clough Undergraduate Learning Commons, Suite 283.

Graduate Student Academic and Professional Success Resources:

A list of resources for graduate students is given on the [Office of Graduate and Postdoctoral Education](#) website. Specific information for [current graduate students](#) includes

- Academic Resources such as the Communications Center, Language Institute, Library, Catalog, Registrar, resources for conducting research, Advocacy and Conflict Resolution resources, and how to manage unexpected situations that may impact your academic performance;
- Student Resources such as Campus Services, Child Care/Family programs, Health & Wellness, Career Services, and the Student Resource Guide; and
- Professional Development such as the programming from the Career Center and other professional development resources and events.

Student Well-Being:

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A comprehensive list of wellness related resources has been compiled and maintained by the Office of the Vice President for [Student Engagement and Well-being](#).