ISyE 6416 Computational Statistics – Fall 2026

Course Information

Instructor: Moïse Blanchard (mblanchard41@gatech.edu)
Course Prefix and Number: ISYE 6416
Term: Fall 2026

Course Description

Computational statistics is the interface between statistics and computing. We will cover algorithms for solving statistical problems for model fitting, prediction/generalization, and uncertainty quantification. We will talk about how to use optimization and other modern computational techniques to develop algorithms for various types of data.

Prerequisites

- Undergraduate level probability, linear algebra, and statistics
- Basic programming using Python, R, or Matlab

Course Learning Outcomes

This course equips students with the ability to develop and analyze computational methods for statistical problems, including model fitting, prediction, generalization, and uncertainty quantification. Students will learn how optimization techniques and modern computational tools can be used to design algorithms for a wide range of data-driven applications. By the end of the course, students will be able to implement and evaluate statistical algorithms, understand their theoretical foundations, and apply them to problems such as density estimation, mixture models, hidden Markov models, Monte Carlo methods, and machine learning techniques.

Required Course Materials

The course material will be based on lectures and slides posted on Canvas.

References*:*

- *Computational Statistics.* James E. Gentle. 2009.
- *Numerical linear algebra*, Lloyd N. Trefethen and David Bau III.
- *The elements of Statistical Learning: Data Mining, Inference, and Predictions*, 2nd edition, Trevor Hastie, Robert Tibshirani, and Jerome Friedman.

- *Machine learning: A probabilistic perspective*, K. P. Murphy.
- *Foundations of Machine Learning,* M. Mohri, A. Rostamizadeh, A. Talwalkar.
- *An introduction to statistical learning: with applications in R,* G. James, D. Witten, T. Hastie, R. Tibshirani.

Grading Policy

Your course grade will be based upon my assessment of your understanding of the material covered throughout the semester. The weights used for grade assignment will be:

Homework:	50%
Midterm 1	15%
Midterm 2	15%
Project:	20%
- Project proposal	5%
- Project presentation	5%
- Report	10%

Thresholds for letter grade assignment are as follows.

A:	90% ≤ total grade ≤ 100%
B:	80%≤ total grade <90%
C:	70%≤ total grade <80%
D:	60%≤ total grade <70%
F:	0%≤ total grade <60%

Homework

There will be a homework assignment roughly every 2 weeks. Assignments will include both theoretical and computational problems. For computational problems, keep in mind that conclusions and interpretation of results are more important than good printouts. Compute output without proper explanation will not receive full grades. You are allowed to work together with other students on homework, as long as you turn in your own solutions and indicate the names of students you worked with.

Exams

There will be 2 midterms throughout the semester. Midterms are graded for correctness, with partial credit awarded for partial answers or to account for minor errors. There is no final, however, the course includes a project.

Attendance Policy

Attendance is highly recommended but will not be formally checked.

Academic and Research Honesty/Integrity Statement

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 the Student Code of Conduct and the Academic Honor Code, especially Appendix A: Graduate Addendum to the Academic Honor Code.

Students are expected to perform research in an ethical and responsible manner. All Doctoral and Master's Thesis students are required to take the Responsible Conduct of Research training, and it is expected that students abide by the principles taught in that training while performing research for this thesis course.

Allegations of scientific or scholarly misconduct are handled in accordance with the procedures outlined by the Policy for Responding to Allegations of Scientific or Other Scholarly Misconduct.

Core IMPACTS

Core IMPACTS is the University System of Georgia's General Education curriculum. If you are teaching a course that counts towards Core IMPACTS, you should include a syllabus statement about the Core area and associated career competencies. This resource developed by the Center for Excellence in Teaching and Learning and Online Education at Georgia State University includes template syllabus statements for each of the Core IMPACTS areas that you may adapt for your course.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services 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.

Expectations of Advisors and Advisees

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 Expectations of Advisors and Advisees articulates 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.