ISYE6740: Computational Data Analysis / Machine Learning I

Syllabus - Fall 2026 (Section C)

H. Milton Stewart School of Industrial and Systems Engineering
Georgia Institute of Technology

Instructor Contact Information

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Course time and location

George Tower Scheller Tower 0220
T/Th 11:00am-12:15pm

Prerequisites

These items are considered pre-requisites for the course and will receive very little, if any, coverage in regular course materials.

- Undergraduate level Probability & Statistics, Linear Algebra, and Calculus
- Python Programming (Basics, Numpy, Matplotlib, intro OOP)

Course Description

Machine learning is a field of computer science that gives computers the ability to learn without being explicitly programmed. The course is designed to answer the most fundamental questions about machine learning: What are the most important methods to know about, and why? How can we answer questions such as "is this method better than that one"? What can we say about the errors our method will make on future data? What's the "right" objective function? How to tune parameters? What does it mean to be statistically rigorous?

This course is designed to give graduate students a thorough grounding in the methods, theory, mathematics and algorithms needed to do research and applications in machine learning. The course covers topics from machine learning, classical statistics, and data mining. Students entering the class with a pre-existing working knowledge of probability, statistics and algorithms will be at an advantage, but the class has been designed so that anyone with a strong numerate background can catch up and fully participate. Some experience with coding in Python is expected.

Learning Objectives

After taking this course, students should be able to:

- Demonstrate a thorough understanding of the methods, theory, mathematics, and algorithms needed to do research and applications in machine learning.
- Implement and apply both supervised and unsupervised machine learning algorithms to real-world data.
- Evaluate and select models using principled statistical techniques.
- Communicate findings and methodology clearly through written reports and an independent research project.

Textbooks and References

Required: Course material will be based on lectures and slides provided on Canvas.

Supplemental Material:

- *Pattern Recognition and Machine Learning* by Christopher M. Bishop (PRML)
- *The Elements of Statistical Learning* (2nd ed.) by Hastie, Tibshirani, and Friedman (ESL)
- *Foundations of Machine Learning* (2nd ed.) by Mehryar Mohri, Afshin Rostamizadeh, and Ameet Talwalkar (FML)
- *Introduction to Applied Linear Algebra – Vectors, Matrices, and Least Squares* by Stephen Boyd and Lieven Vandenberghe
- *The Matrix Cookbook* by Kaare Brandt Petersen and Michael Syskind Pedersen

Course Communication

Instructor Communication

All communication from your instructor will take place on Canvas. You are expected to check Canvas annoucement every day for important course-related information. However, by following the course instructions, you can also ensure that you do not miss important details, announcements, etc. by adjusting your account settings to receive important information directly to your email account.

Content Questions and Help

Because an answer to an individual's question can often help others, please do not email your questions directly to the instructor. Instead, course and content questions will be addressed on **Ed Discussion**. Feel free to make a private post (**sent to all instructors**, so the professor and TAs will see your question) if your question involves private material such as your derivation work for a homework problem.

Ed Discussion Post Protocols

Please be courteous when posting on Ed Discussion and treat fellow students, the TAs, and professor with respect. In any public posts, please do not show any of your answers related to the homework problems, such as code snippets, mathematical derivations/proofs, etc. If you would like to show any plots (which do not disclose any explicit answer to the questions) from your implementation in the discussion, please either make them private (only share with instructors) and/or add watermarks to those images/results. Please make your questions specific, **do not ask, for example, for instructors to verify your results, or debug your code.**
When asking questions on Ed Discussion, please be specific. In principle, instructors are not responsible for debugging programs and will not comment on purely coding questions. For example, please do not send a code file to a TA or post a question asking why a section of code "doesn't work".

Student Expectations

Students are expected to devote 8-10 hours per week to complete the course requirements. This guideline encompasses all class activities, including reading the textbook and supplementary resources, watching lesson videos, participating in office hours and forum discussions, completing homework assignments and projects. Of course, students can spend as much time as necessary, but it is important to be careful not to fall behind.

Grading

Grades will be assigned on the following basis:

- Homework: 60%
- (in-class) Midterm Exam: 10%
- Attendance: 5%
- Project: 25%
  - Project Proposal: 5%
  - Project Report: 20%

Important: Make sure the scores in Canvas are consistent with the feedback you receive. We will not make any change in grading if asked more than 2 weeks after releasing grades. **We cannot accept any homework regrade requests after the final project report's due date. There is no regrade for the final project report.** If you have any questions about your grade/feedback, **please do not respond/discuss through the Canvas Grade pages**, instead, please send an email directly to your grading TA with your questions, as well as the regrade request, and copy the Head TA in line with the regrade policy below.

The following grading scale will be used in the course, based on the final grade in Canvas:

- A: 90-100%
- B: 80-89%
- C: 70-79%
- D: 60-69%
- F: Below 60%

Attendance Policy

Class attendance is required. We may have pop-up quizzes in class, which keeps track of attendance.

Lessons

Video lessons for this class can be found on Canvas, under Media Gallery. The lecture material will be opened according to the Course Schedule to keep all students at the same pace.

Homework

Due Dates and Submissions

Homework must be submitted through **Canvas by 11:59 PM Eastern Time on the due date**. Email submissions will not be accepted.
Homework assignments will consist of both written exercises and programming problems. Programming problems require statistical analysis using **Python 3.x**. Your submission should emphasize the interpretation of results rather than raw program output. **Homework will be graded primarily on the quality of your analysis and conclusions; computing output without explanation will not receive full credit.**
We strongly encourage the use of LaTeX (e.g., Overleaf) when preparing your report. Well-organized Jupyter Notebooks are also acceptable, provided they are exported as a single PDF containing both code and explanatory text.
Before submitting, verify that your submission includes all required answers, source code, and supporting data files. You may submit your homework an unlimited number of times before the deadline; only your most recent submission will be graded. Late submissions are subject to the course late policy.
You can work together with other students on homework, as long as your write-up and solutions represent your own work. You are also allowed (and encouraged) to ask the instruction team questions, but keep in mind that a good faith effort to work through the material beforehand will often help you form good questions. Any academic misconduct will be submitted to the Office of Student Integrity and penalized accordingly.

Homework Accommodations

We have the following policies to help with emergent situations:

- Students have a bank of 10 extension days that can be used throughout the semester without making extension requests. Your assigned TA will keep track of your total extension usage, and each submission will have an API generated comment noting how many days have currently been used. If you resubmit your assignment after the initial due date, please notify your grading TA via email to ensure the proper version is graded. **Note that you may only use 7 extension days on any single assignment. No extension can be used for any final project deliverable.**
- In a situation where you use more than 7 days on a single assignment, or more than your 10 day bank in total, a 25% per day penalty will apply. This is calculated as: one day late the grade will be discounted by 25% of your total, two days late the grade will discount by 50% of your total, three days late the grade will discount by 75% of your total. Past three days, your homework will not be accepted, and you will receive no credit. Usage of additional penalty days does not deduct from your 10 day bank.
- You may request a regrade of your assignment within 2 weeks of the grade release date by formally emailing your TA. Regrade requests above simple grading errors will consist of a complete second review of your assignment by an independent TA and may result in either an increase or decrease in the assignment score. These will cover the entire assignment, not only specific questions. After the regrade result is presented to you, you may choose which score to keep.

Formal excuses

Officially, there are 2 channels via which a student can get formal excuses.

- A student can request a formal exemption from the Dean's office for illness or other personal issues by filling out a form at https://studentlife.gatech.edu/request-assistance
- A student may also make requests to the registrar for an institute absence, such as attending conference, religious observances (within the first 2 weeks of the course) https://registrar.gatech.edu/info/institute-approved-absence-form-for-students

Midterm Exam

There will be one in class Midterm Exam in this course, open book and open notes, but no electronic devices are allowed. The exam may potentially contain content from any course material up to the exam date, Questions on the exam will be structured similarly to homework questions, scoped in a form that can be reasonably solved during a single-session exam.

Project

Project Team

Projects will be done in groups of 1-3 students. Please plan for the project early; you need to form your own team (e.g., you can ask on Ed Discussion). You will also need to come up with the topic of your project. You can discuss with the professor or TAs if you need some suggestions to come up with a topic. If you decide to do a team project, each team member will receive the same grade. Also, your project grading will take into account the size of your team. You are responsible for the collaboration and work division inside your group. With this in mind, the instruction team will not provide judgment for any disputes among team members; such cases will be escalated to the Dean's office.

Project Submissions

In the middle of the semester, each team will need to submit a project proposal (see Course Schedule for the due date). By the end of the semester (see Course Schedule for the due date), each group needs to submit one project report. No data or code submission will be required (only proposal and report pdfs). Please see the Project Guidelines document on Canvas for additional details and format requirements.

Project Grading

- 5% Project Proposal (this is mainly a format and progress check; while you will receive no detailed feedback on the proposal, you are welcome to discuss topics and ideas with the TAs and professor).
- 20% on Project Final Report (5% on creativity and project scope; 5% on formulation; 5% on the rigor of implementation, 5% on report writing quality).

Project Due Dates

Please note that the final project due date is firm, and **there is no extension policy for any project deliverable**. In both cases, this is to ensure that we are able to provide feedback/grades in a timely manner, particularly for the final report, and to be respectful of other students that have peer reviews assigned. The final project report due date is close to the university registrar's due date for a letter grade, and we need the time to grade the final project and calculate final letter grades. If you foresee any situation that prevents you from submitting final project deliverables by the due date, please let us know as soon as possible. (For documented reasons, we may be able to assign your letter grade as "incomplete" without the final project report and update the letter grade in the next semester).

Academic Integrity

You are responsible for completing your own work. All OMS Analytics degree students are expected and required to abide by the letter and the spirit of the Georgia Tech Honor Code. The teaching assistants and I will also abide by the Honor Code. I am very serious about this expectation because ethical behavior is extremely important in all facets of life. Review Georgia Tech's Honor Code and the Student Code of Conduct. Any OMS Analytics degree student suspected of behavior in violation of the Georgia Tech Honor Code will be referred to Georgia Tech's Office of Student Integrity (OSI).

Plagiarism

Plagiarism is considered a serious offense. You are not allowed to copy and paste or submit materials created or published by others, as if you created the materials. All materials submitted and posted must be your own original work. This also includes self-plagiarism, I.e. You cannot submit the same final project to multiple courses.

AI Policy

We treat AI-based assistance, such as ChatGPT, Claude, Copilot, GrammarlyAI, etc. the same way we treat collaboration with other people: you are welcome to talk about your ideas and work with other people, both inside and outside the class, as well as with AI-based assistants. However, all work you submit must be your own. You should never include in your assignment anything that was not written directly by you without proper citation (including quotation marks and in-line citation for direct quotes). Including anything you did not write in your assignment without proper citation will be treated as an academic misconduct case. Any assignments suspected of such will be recommended to OSI for further investigation.
If you are unsure where the line is between collaborating with AI and copying AI, we recommend the following heuristics. Deviating from this will not automatically qualify as academic misconduct; however, following this ensures your AI collaboration does not cross the line.

- *Heuristic 1*: Never hit "Copy" within your conversation with an AI assistant. You can copy your own work into your own conversation, but do not copy anything from the conversation back into your assignment. Instead, use your interaction with the AI assistant as a learning experience, then let your assignment reflect your improved understanding.
- *Heuristic 2*: Do not have your assignment and the AI agent open at the same time. Similar to the above, use your conversation with the AI as a learning experience, then close the interaction down, open your assignment, and let your assignment reflect your revised knowledge. This heuristic includes avoiding using AI directly integrated into your composition environment: just as you should not let a classmate write content or code directly into your submission, so also you should avoid using tools that directly add content to your submission.

Accommodations

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 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, acknowledgment, 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.