Online Master of Science in Analytics (OMSA)
ISYE6740: Computational Data Analysis / Machine Learning I
Syllabus - Summer 2026

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

Instructor Contact Information

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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 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. For more details, log into Canvas, enter the course, and see the section entitled "Before You Begin: Instructions for Getting Started."

Communication with TAs

Each student will be assigned to one TA, who will be responsible for grading your homework, and answering specific questions and requests. After the first week of the semester, we will make these assignments and provide guidance on how to find your assigned TA on Canvas. **For all your administrative requests, such as questions about grading/regrading homework, please email your assigned TA and cc the head TA. Do not message your TA on Canvas, we cannot guarantee a response there.**
Your assigned TA will handle all regrading requests.

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 all the TAs will see your question) if your question involves private material such as your derivation work for a homework problem. Every day, there will be at least one TA on duty, to answer all that day's questions on Ed. Please allow some time for TAs to respond, especially over the weekend.

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".

Office Hours

Live office hours will be conducted every week via Zoom. Each TA will host their own office hours session, and where possible, the professor will do so as well. These sessions will be both an opportunity for the instructor to discuss course logistics and content and an opportunity for you to ask questions. While it is strongly suggested that you participate in these meetings, all sessions that contain important general course information will be recorded and archived if you are unable to attend or wish to reference them later. For the meeting schedule, links, and archives, please see the corresponding pinned Ed posts. You may

attend any of the office hours that fit into your schedule. **There will be no office hours on official Georgia Tech institutional holidays.**

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: 70%
- Project: 30%
  - Project Proposal: 5%
  - Project Report: 20%
  - Proposal Peer Review: 1.5%
  - Final Project Peer Review: 3.5%

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.

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

This is an asynchronous online course; there are no required synchronous sessions. Lecture material is released weekly on Canvas according to the course schedule, and students are expected to keep pace with releases. While office hours and Ed Discussion are available for support, attendance at these sessions is encouraged but not required or graded.

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 should be submitted to Canvas by **11:59 pm EST on the date it is due**. No submission will be accepted through email. We strongly encourage the use of LaTeX for your submission. Assignments will include both exercises and programming problems; the programming problems will ask you to carry out statistical analysis using statistical software. Keep in mind that you should NOT hand in raw program output. **Conclusions and interpretation of results are more important than code printouts**.

Computing output without proper explanation will not receive full grades. That said, notebook style submissions, including Jupyter Notebooks (.ipynb), with code and explanation blocks, are acceptable if they are clearly organized and submitted as your single PDF report. This course requires the use of Python for homework programming.

Please ensure your homework submission is complete with all your answers, code, and data before submission. You have unlimited submissions before the deadline, anything submitted after will have an appropriate penalty applied to it.

Homework Submission Requirements

Please make sure you read through the below guide for homework submission and strictly follow the instructions. Failure to follow all submission instructions will result in a 10-point penalty on your assignment.

For each assignment, two files need to be submitted through Canvas before the deadline: Submit the following two files through Canvas prior to the deadline:

1. PDF Report: You must submit a single PDF file named using the format GTUsername HWx report.pdf (e.g., mpatrick43 _HW1 report.pdf). This report should include all responses to the homework questions, such as analytical explanations, result summaries, and any relevant program outputs (e.g., tables, figures, or images). Do not include source code in the PDF unless you are using a Jupyter Notebook—in that case, you may export the notebook, including both code and outputs, directly to PDF. Ensure this export is clean and organized. All responses must be typed using a tool that supports mathematical formatting, such as LaTeX, Jupyter Notebook, or a markdown-compatible editor. Math equations must be reasonably readable (Similar to format of equations in lecture material) else there will be a 5 point penalty. Handwritten submissions will be considered noncompliant with the submission guidelines and will result in a full improper submission penalty.

2. A zip file with name "GTUsername HWx.zip": In this zip file, you need to have a folder with the same name: 'GTUsername HWx', which should include all your program files, including all source data and all files needed to run your code.

Note on Gradescope: Specific questions in some assignments may have a Gradescope component. These questions must be submitted to Gradescope to receive points, and your code should also be included in your zip file canvas submission. These questions will be specifically marked in the assignment if they require gradescope submission.

Failure to follow submission requirements will result in a 10-point improper submission penalty on your assignment grade. Where gradescope is used, it is worth 50% of the points of that question, Failure to complete gradescope will forfeit these points. Please make sure you strictly follow the above file format requirements to avoid unnecessary loss of points. In addition, for programming problems, you should be using Python (3.X). When you submit code, please also include the data in your folder. Your TA will not be allowed to modify your code, so please make sure your code doesn't have directory dependence

on your computer. In other words, avoid the use of absolute paths. **If your code is not executable for any reason, including pathing issues, that entire problem will receive no credit.**
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:

- You can have up to 10 days of homework extension without penalty. You do not need to make an extension request for individual homework assignments. 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.

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/instituteapproved-absence-form-for-students

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).
- 5% on Project Peer Evaluations, Split between Proposal and Final Project Peer Reviews 1.5%/3.5%. As part of the learning process (similar to a machine learning conference), we will require a peer evaluation of the project proposals and final project. Each student will be randomly assigned 3 projects to evaluate and grade based on the rubrics provided; each project will be graded by multiple peer reviewers and 1 TA. Reviews that do not contain both the rubric and quality commentary will not receive full points.

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, 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.