

CS 8001 Syllabus

Language Models, Reasoning, and Agents
Fall 2026

Instructor Information

Instructor
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General Course Information

Description

Do large language models (“AI”) reason? How do we know? How do coding agents like Claude Code actually work? This seminar will investigate these questions, as we trace the history of machine learning from its origins to the state of the art today. We will discuss how large language models (LLMs) are trained, and how large reasoning models (LRMs) and coding agents are built from them.

Course Learning Outcomes

At the end of this course, students will be able to:

- articulate the difference between large language models and reasoning models.
- understand software pipelines that are used to induce LLMs to fulfill reasoning tasks.
- hold informed opinions on whether what large reasoning models (LRMs) do is “really” reasoning.

Required Course Materials

There is no textbook for this course. Readings will be assigned through Canvas. No paywalled sources will be used; everything will be free online.

Grading Policy:

This course is S/U (pass/fail). By design, it’s extremely difficult to fail as long as you turn in all the work. I expect everyone who does so to pass.

Description of Graded Components

This will be a reading-based course. There are no programming assignments.

You will be graded on the following:

- (27 points) Written assignments
- (33 points) Class participation — 11/13 sessions for full credit.
- (40 points) Term paper — 3 to 5 pages, due **December 14**.

There will be 11 written assignments, and your lowest two will be dropped. You need 70 points to pass the course.

USG Required Course Policies

Attendance and/or Participation

Discussion will be held **over Zoom at 8:00pm** for 75 minutes on Mondays from **August 31** to **November 30**, with the exception of September 7 (Labor Day). Sessions will be recorded. I prefer that everyone attend synchronously; however, students may watch videos for the sessions missed.

A “password” will be announced during each. On Canvas, you will be asked to submit proof that you attended class or watched the video. You can give the password, or (if you forget it) a couple sentences about what was discussed. The password isn’t special—it just automatically counts. Don’t share the password with anyone else.

Office Hours are by appointment. I usually respond to email within 24 hours.

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.

Additional Georgia Tech Required Policies

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.

Other Course Expectations, Policies, and Resources

Reading the Papers

When I assign a paper, I do NOT expect you to read as deeply as you'd need to do if you wanted to extend or implement the work. Instead, read the abstract, the introduction, the conclusions, and enough of the middle to understand the core concepts. You should be able to explain the claims the paper asserts, the scientific contribution of the work, and be able to articulate an initial opinion on whether it achieves what it says it does.

Please don't have an LLM ingest a paper until you've spent two hours with it. After this, feel free to use AI to aid in your understanding.

No paywalled sources will be used; all the papers will be available online.

Course Material

This is a survey course. It is not designed to make you an expert in any of the topics below; it will introduce you to the most important ideas.

Readings will be available at least one week before discussion. This is the first time the course is offered, and it's being designed as we go.

Unit 1: Machine Learning

Unit 2: What is a Language Model?

Unit 3: What is Reasoning?

Unit 4: Applications: Mathematics and Theorem Proving

Unit 5: Agentic AI

Unit 6: Alignment, Safety, and Ethics

Pre- &/or Co-Requisites

There are no prerequisites for this course.

Collaboration, Group Work, and Use of Generative AI

All written assignments must be done using your own words. Do not use generative tools like Sudowrite. The use of corrective tools like Grammarly is allowed.

You may collaborate with other students. However, the assignments should be your own thoughts, in your own words.

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

All due dates are 11:59pm Atlanta time, with a grace period of twelve hours. Late work beyond this window will not be accepted.

Exceptions are rare. They include natural disasters, unexpected military obligations, and serious illness—in all cases, they require written evidence.

Inclement Weather and Digital Learning Days

This course is online and I do not anticipate that it will be affected by inclement weather.

Additional Syllabus Components

This is the first time the course is being offered, so readings and direction will be determined as we go. If you have thoughts about the structure of the course or what is covered, let me know! If there's something you'd like to discuss in class, I'm open to suggestions.