

Large Language Models, Artificial Intelligence and Data Science

Syllabus: CS211 Section 302 Fall 2026

Info

3 Credits

Wed 12:00pm - 3:00pm

Room C307

Instructor Information

calvin_williamson@fitnyc.edu

office: B831 Science and Math

office hours: M 1-3, W 11-12, R 12-1, or appointment

Description

This course provides an introduction to large language models and their capabilities in artificial intelligence and data science. Through theory and hands-on labs, students will gain literacy in model architecture, training techniques, applications in programming, content creation, and more. No prior programming experience is required to take this course. Prerequisite(s): Math Proficiency

Outcomes

1. Explain the evolution, capabilities, and limitations of large language models.
2. Analyze the core components of LLMs including model architecture, parameters, and training techniques.
3. Assess strategies like prompt engineering and fine-tuning to optimize LLM performance.
4. Explore mathematical foundations of vector databases and storage including semantic similarity
5. Apply LLMs to natural language tasks like classification, summarization, and question answering.
6. Utilize LLMs to assist with programming, data science, content creation, and other domains.
7. Examine ethical implications of LLMs including bias, misinformation, and legal issues.

Course Materials

We will be using many different LLM tools for the work in this course. But there is nothing required for the course besides a web browser.

Topics

Introduction to Large Language Models

- LLM Examples
- Applications: NotebookLM
- NanoBanana (multimodal models)
- Vibe Coding
- AI Studio

Prompt Engineering Techniques

- Prompt Editor
- System Prompts
- Prompt Structure
- Roles and Personas
- Chain of Thought
- Reasoning Models
- Few-shot and Zero-shot Learning

Modern AI Applications

- Chat Conversations
- Artifacts
- Tools
- Model Context Protocol
- Agents

Agents

- Github
- Codespaces
- Terminals
- OpenCode, Claude Code, Codex
- Agentic Software Development

Agents and Databases

- Relational Databases

- SQL
- Dolt Databases
- Agentic Data Science

Introduction to Python for Artificial Intelligence

- Google Colab Notebook
- Calculations
- Variables
- DataTypes
- Strings
- Lists
- Dictionaries
- Functions
- Dataframes

Evaluation

Your grade will come from these parts:

- Quizzes (88%)
- In Class/Homework Credits (12%)

Each of these parts is described in more detail below

Quizzes

Your quiz grade will come from 5 quizzes, roughly covering 2 or 3 weeks of material each. The quizzes are 30 minutes each and are usually 5 or 6 questions each. These quizzes are with no notes, no internet, no phone, no software, no AI tools. Pen and paper and calculator only. They are some multiple choice, some short answer, some true false.

In Class/Homework Credits (1-3 per class)

These are credits you obtain for demonstrating you have completed assigned problems.

Some of these will come from homework assignments that you show me at the beginning of the class, some of these will come from in class assignments that are done during class and you show as you complete them. You will earn a single credit for each successful assignment completion. You must be in attendance to earn these problem credits. I decide if the work is complete enough to receive credit for.

The In Class/Homework can only be turned in by showing it to me. There is not a way to turn these assignments by emailing them to me or submitting in Brightspace, or any other digital way of submitting them.

You show them to me and I mark it as complete when you are in class.

You may miss up to 2 classes and you can still show me the assignments from those classes when you are in class again. But you may not do this more than 2 weeks worth.

Some homeworks will be counted for a grade, but not always.

Midterm, Final Exam

There is NO MIDTERM and NO FINAL EXAM in this course.

AI Policy

Your use of AI in this course is not restricted. Generally all assignments use AI in some form, and you are free to use AI tools in whatever way you find helpful on them.

For some assignments though the AI is meant to be used in a particular way, with a specific tool, prompt, or technique, and working that way is part of what the assignment is teaching. When an assignment calls for that, please try to adhere to it.

The quizzes are the exception. Those are pen and paper with no notes, no internet, no phone, no software, and no AI tools, so use the AI to help you learn the material rather than in place of learning it.