

IST 488: Building Human-Centered AI Applications

Course Syllabus

Instructor: Chris Dunham; cndunham@syr.edu

Class Meetings: Hinds 010; M/W 12:45 - 2:05 PM

Office Hours: Hinds 309; Th 12:00 - 1:00 PM and by appointment via email.

Communications. I prioritize communication by email. Please do not use Teams or messages within Blackboard because I am not likely to see them in a timely manner. When communicating by email, the subject line should read IST 488: Brief description of question/issue. Note that I generally do not correspond outside of standard working hours, including weekends, so please plan accordingly.

Course Description: Learn to build Generative AI applications leveraging large language models. Through hands-on projects, students will use libraries and APIs to create conversational agents, Q&A bots, and goal-oriented assistants. Topics covered include prompt engineering, AI conversational memory, output evaluation, and responsible AI practices. Additional work required of graduate students.

Additional Course Description: This hands-on course teaches techniques for developing and deploying intelligent applications powered by large language models. Students will gain technical skills in prompt engineering, knowledge enhancement, conversational interface design, and evaluating model outputs. Responsible AI development practices related to ethics, bias mitigation, and accessibility will be woven throughout. No prior AI experience required. Final projects provide an opportunity to apply concepts to build an AI system.

Course Prerequisites: Knowledge of Python programming.

Credits: 3

Course Fees and/or Costs: Students may incur fees related to API usage.

Learning Objectives: After taking this course, students will be able to:

1. Explain concepts of large language models.
2. Engineer effective prompts by applying techniques for tone, formatting, conditional logic, and mitigating risks.
3. Develop applications leveraging large language model APIs and libraries.
4. Implement memory and knowledge techniques such as retrieval augmentation to enhance application capabilities.
5. Describe how applications can integrate LLMs (Large Language Models) with actions (such as sending an email) and external data stores (databases, data services).
6. Build ethical AI systems by considering potential biases, harms, and real-world impacts.

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Required Texts / Supplies: There is no required textbook. However, the following resources will be helpful:

1. OpenAI: <https://platform.openai.com/docs/overview>
2. OpenAI Cookbook: <https://github.com/openai/openai-python>
3. Streamlit: <https://docs.streamlit.io/get-started>
4. Langchain: <https://python.langchain.com/v0.2/docs/introduction/>

Course Requirements and Expectations:

Assessment	Notes	Percent of Grade
9 lab assignments	Done in class; usually due Thursday nights (see Blackboard for details); no late submissions	9% (1% each)
7 homework assignments	Due Sunday night, the week they are assigned; late submissions are discounted 25% per day late ; one-hour grace period	20% (2-4% each)
Team topic presentation	Half presentation, half lab assignment preparation; topics are assigned and structured	15%
Team project	Groups of 2-3; details provided later in the semester	25%
Exam	Paper-based; no book/notes	25%
Class participation	Be an active participant in class (active listening and offering thoughts as appropriate)	6%

Grading: Below is the formula for number-to-letter grade conversion.

Grade	Points	Grade	Points	Grade	Points	Grade	Points
A	93-100	B+	87-89	C+	77-79	D	60-69
A-	90-92	B	83-86	C	73-76	F	0-59
		B-	80-82	C-	70-72		

Note: Graduate students may not receive a grade of D (0-69: F)

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Preliminary Course Schedule (subject to change):

Week/Dates	Topic	Assignment
01 Jan 12, 14	Introduction to Large Language Models (LLMs) Using the OpenAI API and streamlit	Lab 1
02 Jan 21	Basic applications	HW 1
03 Jan 26, 28	More streamlit, other LLMs	Lab 2, HW 2
04 Feb 2, 4	Basic conversational agents (using OpenAI; streamlit; short-term memory); Prompt engineering	Lab 3, HW 3
05 Feb 9, 11	Retrieval-Augmented Generation (RAG)	Lab 4, HW 4
06 Feb 16, 18	Using functions within LLMs Overview of student presentations	Lab 5, HW 5 Select topics and groups
07 Feb 23, 25	AI in the real world	HW 6
08 Mar 2, 4	Present HW 6 Responsible and ethical AI	HW 7
Spring break – no classes		
09 Mar 16, 18	Study for exam (Monday) Exam (Wednesday)	Work on presentations
10 Mar 23, 25	Student presentations: 1. Higher-level APIs: OpenAI response API 2. Higher-level APIs: langchain	Lab 6
11 Mar 30, Apr 1	Student presentations: 1. Running a (smaller) model locally 2. Model fine-tuning	Lab 7 Project proposal due
12 Apr 6, 8	Student presentations: 1. Audio/images (e.g., talking to chatbots) 2. RAG and ReRanking	Lab 8 Project approach & milestones
13 Apr 13, 15	Student presentations: 1. Long-term memory 2. Multi-agent systems	Lab 9
14 Apr 20, 22	Project work / project presentations	Final project
15 Apr 27	Project presentations	Final project