Claremont Graduate University

Center for Information Systems & Technology (CISAT)
IST 345: Building Generative AI Applications

Course Schedule: Mondays 1:00pm – 3:50pm PST

Course Location: ACB 208

Instructor: Dr. Yan Li
Office Location: CISAT, ABC 225
Office Hours: Mondays 12:00pm - 1:00pm
Wednesdays 12:00pm - 1:00pm Or by appointment
Email: yan.li@cgu.edu;

Instructor Feedback and Communication: The best way to get in touch with the instructor is by email. I will respond to email messages within two business days.

Textbook

- Alto, V. (2024). *Building LLM Powered Applications: Create intelligent apps and agents with large language models*. Published by Packt Publishing Ltd. (Free e-book is available here) This book is referred as Alto 2024.
- Huyen, C. (2025). *AI Engineering: Building Applications with Foundation Models.* O'Reilly Media, Inc. (Free e-book is available here) This book is referred as Huyen 2025.
- Aiffarth, B. (2023). Generative AI with LangChain. Published by Packt Publishing Ltd. (Free e-book is available here.) This optional book is referred as Aiffarth 2023.

This class will cover selected chapters from these textbooks. You need to use your library account to access them. Students are expected to check module resources on canvas. Other selected articles and resources will be posted to Canvas by the professor.

Course Description

This course provides an in-depth exploration of building generative AI (GenAI) applications, focusing on the practical implementation of state-of-the-art techniques and frameworks. Students will learn how foundational generative models are trained and deployed, including proprietary and open-source models, and learn to use modern AI frameworks for practical application development. Topics include foundational model architectures, prompt engineering, retrieval-augmented generation (RAG), agent architecture, fine-tuning, and AI system evaluation. Through a balance of readings and labs, students will gain theoretical knowledge and hands-on experience. The course concludes with a final project where students will design and develop a functional GenAI application tailored to a specific use case. This course is ideal for CISAT students who want to leverage GenAI for real-world applications.

Background Preparations (Prerequisites)

Prerequires include IST 303 or equivalent programming experience. Students should have intermediate Python programming skills and experience with web development fundamentals, including working with APIs, database operations, and Git version control. While IST332 (NLP) is recommended, students should at minimal understand the fundamentals of neural networks, text

preprocessing, and word embeddings. Students may refer to online resources to refresh these concepts if needed.

Student Learning Outcomes

By the end of this course, you will be able to:

- LO1: Understand the foundational concepts behind GenAI and large language models (LLMs).
- LO2: Choose and apply appropriate pre-trained models for specific applications.
- LO3: Apply techniques such as prompt engineering and agentic RAG to build robust systems.
- LO4: Evaluate generative AI applications and mitigate issues like hallucinations and bias.
- LO5: Develop a scalable and responsible GenAI application.

Upon completion of this course, students will:	Graduates are prepared to be leaders in the IS field	Graduates have core IS knowledge	Graduates can integrate IS & business foundations	Graduates have perspectives on business and real world	Graduates have communication, interpersonal, and team skills	Graduates can think analytically and creatively	Graduates have required career-specific skills
LO1	X	X		X			X
LO2				X	X	X	
LO3	X						
LO4	X	X	X	X		X	X
LO5			X		X		X

Class Tentative Schedule

- The class meets once a week for 2 hours and 50 minutes. Contact time will be met by a combination of synchronous activities and class time (online office hours, guided student discussion, mediated student workgroups and labs) and offline asynchronous learning.
- The course will be taught based on the flipped classroom design. This design is based on research that learning is enhanced when working actively as opposed to listening passively as in a lecture.
- To make as much time as possible for active learning in class sessions, you are expected to complete all required readings and tasks before attending the class.

Date	Module	Topic	Activities
01/20 – 01/26	0	Welcome	Module 0 Introduction
01/27 – 02/02	1	Foundations of generative AI	Lab 0: Set up environment
02/03 – 02/09	2	Understanding foundation models	Lab 1: Foundation model integration
02/10 – 02/16	3	Choosing pre-trained models	Lab 2: Evaluating LLMs.
02/17 – 02/23	4	Prompt engineering	Lab 3: Crafting effective prompts
02/24 – 03/02	5	Building conversational applications	Lab 4: Building a basic Chatbot

03/03 – 03/09	6	Review week.	Lab 5: Preparing data for RAG
03/10 – 03/16	7	Retrieval-augmented generation (RAG)	Lab 6: Enhancing Chatbot with RAG
Spring break, no class 03/17 – 03/22			
03/24 – 03/30	8	Agent and Agentic RAG	Lab 7: Developing Multi-agent Chatbot
03/31 – 04/06	9	Evaluating GenAI applications	Lab 8: Chatbot evaluation
03/31 – 04/06	10	Responsible AI development	Exam review; final project proposal
04/14 – 04/20	11	Exam	Proctored exam
04/21 – 04/27	12	Finalize project proposal	Submit project proposal and plan
04/28 – 05/04	13	Final project implementation	Working on the project
05/05 – 05/11	13		
05/12– 05/17	14	Final project presentation	Report and presentation

Assignments and Assessment

Lab Assignments:

Throughout the course, you will complete 8 hands-on lab assignments that reinforce the concepts covered in the related module. Each lab consists of specific tasks related to that module's topic, allowing you to gain practical experience with generative AI technologies. You will document your work in a short report following the provided guidelines and submit it through Canvas.

Class discussions:

Active participation in class discussions is essential for creating a dynamic learning environment. Students are encouraged to ask questions, share insights, and engage with their peers' perspectives to enrich the learning experience for everyone. To foster broad engagement, the instructor will facilitate discussions by calling on students throughout the class. Each module includes a discussion guide with specific questions. Students should review these questions and prepare their thoughts before class. When called upon, students are expected to provide credible and thoughtful contributions to the questions. Grades will reflect the quality and preparation of responses, with unprepared or superficial responses receiving up to a 50% reduction in the discussion grade for that session.

Exams:

A proctored exam will be given in person, and you have 3 hours to finish the proctored exam. The exam is open book and open note, but you are not allowed to use internet.

Final projects:

You will do a final project that involves building a fully functional, domain-specific chatbot, integrating techniques like RAG, agent, and prompt engineering. You will work in a team of three (3) and four (4) students.

The final project includes three grading components.

- A group project report that describes the experiments and analysis of the results.
- An individual project report that describes individual contributions and what you have learned.

- An in-class team presentation that presents your application and findings to the class.

Grading Plan

Grading rubrics for each assignment will be shared on the Canvas to create a shared understanding of the expectations.

Class Element	Due in Module	Number	Points Each	Total Points
Class discussions	1-10	10	10	100
Lab assignments	2-9	8	50	400
Proctored exam	11	1	250	250
Final project report (team)	14	1	200	200
Final project report (individual)	14	1	5	5
Final project presentation	14	1	45	45
Total Points				**1000**

- The professor will make every effort to grade each assignment with feedback within one week.
- All assignments are due on the due date indicated on the Canvas assignment page.

Expectations and Logistics

Assignment Submission Guidelines

- All assignments must be submitted (uploaded on Canvas) by the due date/time. Any assignments submitted after this date/ time will be considered late and 10% of the assignment grade points will be deducted from all late assignments.
- You are expected to review and understand the grading rubric for each assignment before submission.
- Assignments more than **Seven** days late will not be accepted and will receive zero points.
- The instructor will make every effort to return to you each assignment with feedback within seven business days.

Writing and Presentation Guidelines

All reading and lab assignments, reports, and presentations should:

- Follow rules of grammar, spelling, and punctuation.
- Clearly state major points - supported by specific details, examples, or analysis,
- Be organized logically, and contain sentences that are complete, clear, and concise.
- Assignments that do not meet these guidelines will have points deducted.

If you have concerns regarding language or writing skills, please visit the CGU Writing Center.

Final Grades

Your grade will be calculated using the following scale. Grades with plus or minus designations are at the professor's discretion.

Low%	High%	Grade	GP	Description	LO
>=97	100	A+	4.0	Truly exceptional performance (rarely given)	Insightful
>=93.5	<=96.9	A	4.0	Excellent performance	
>=90	<=93.4	A-	3.7	Very good performance	Proficient

>=87	<=89.9	B+	3.3	Good performance	
>=83	<=86.9	B	3.0	Acceptable performance	Developing
>=80	<=82.9	B-	2.7	Marginally acceptable performance	
>=77	<=79.9	C+	2.3	Passing, but below expectations for graduate work	Ineffective
>=73	<=76.9	C	2.0		
>=70	<=72.9	C-	1.7		
0	<70	U	0.0	Unsatisfactory work	

In exceptional circumstances (e.g., illness) that prevent a student from completing assigned coursework, and provided that the student's work to date is satisfactory, the instructor may assign an I (Incomplete) grade along with a date for successful submission of course assignments and requirements.

Continual matriculation at CGU requires a minimum grade point average (GPA) of 3.0 in all coursework taken at CGU. Students may not have more than two incompletes at one time.

CGU policies on grades, including incomplete grades, registration and enrollment can be found on the Registrar's webpage: http://www.cgu.edu/registrar.

Appendix A: General Information

Course Policies

The CGU institutional policies apply to each course offered at CGU. A few are detailed in the space below. Students are encouraged to review the student handbook for the program as well as the policy documentation within the bulletin and on the Registrar's pages. The protocols defined by the CGU's Student Conduct Code must be upheld in all classes. For more information, please visit for CGU's Basic Code of Conduct.

Credit Hour

Credit hour refers to the units or credits earned by a student for the successful completion of a course at CGU. These are the units recorded on transcripts and the units that are counted toward degree requirements. For CGU courses, a single unit or credit is determined by 10.5 hours of instructional activity per semester. Instructional activity includes direct instructor contact in a physical or virtual classroom as well as asynchronous instructional content for online or hybrid courses. See the full policy here.

Attendance

Students are expected to attend all classes. Students who are unable to attend class must seek permission for an excused absence from the course director or teaching assistant. Unapproved absences or late attendance for three or more classes may result in a lower grade or an "incomplete" for the course. If a student must miss a class, he or she should arrange to get notes from a fellow student and is strongly encouraged to obtain the missed material. Missed quizzes will not be available for re-taking.

Scientific and Professional Ethics

The work you do in this course must be your own. Feel free to build on, react to, criticize, and analyze the ideas of others but, when you do, make it known whose ideas you are working with. You must explicitly acknowledge when your work builds on someone else's ideas, including the ideas of classmates, professors, and authors you read. If you ever have questions about drawing the line between others' work and your own, ask for guidance from the course instructor. Exams must be completed independently. Any collaboration on answers to exams, unless expressly permitted, may result in an automatic failing grade and possible expulsion from the Program. Additional information on CGU academic honesty is available on the Student Services webpage.

Plagiarism and Academic Honesty

Plagiarism is a serious violation of academic ethical standards. For this reason, you must know what it is and how it can be avoided. You must explicitly acknowledge when your work -- whether it comes from a published paper, an unpublished paper or assignment, or any other source -- builds on someone else's ideas, including ideas of classmates, professors, and authors you read. Obtain permission from the holders of rights to any intellectual property you use, including text, code, images, etc. Provide a full reference for each work used. The instructor may employ the use of plagiarism detection software such as Turnitin (http://www.turnitin.com). The minimum penalty for plagiarism is a zero for the assignment where it occurred; more severe penalties can include failure in the course and expulsion from the program. To avoid plagiarism, do not take credit for the work of others.

Additional information on CGU academic honesty can be found here. In addition, Honnold Mudd Library has some resources on academic honesty and integrity, including the following online tutorial.

Electronic Devices

During class time, electronic devices (laptops, tablets, smartphones) may be used for purposes directly related to class activities, such as working on exercises, taking notes, or referencing information that is relevant to the class. All other uses of electronic devices (phone calls, texting, games, social media, email, web browsing for other than class activities) are prohibited.

Other Resources

Accommodations for Students with Disabilities
CGU is committed to creating courses that are inclusive and accessible. If you would like to request academic accommodations due to temporary or permanent disability, contact the CGU Dean of Students and Coordinator for Student Disability Services at DisabilityServices@cgu.edu or (909) 607-9448. Reasonable accommodations are considered after you have conferred with the Office of Disability Services (ODS) and presented the required documentation of your disability to the ODS. Planning is essential, so please communicate to the ODS as soon as possible.

Mental Health Resources
Graduate school is a context where mental health struggles can arise or be exacerbated. If you ever find yourself struggling, please ask for help. If you wish to seek out campus resources, here is some basic information: services.claremont.edu/mcaps/
Monsour Counseling and Psychological Services (MCAPS) is committed to promoting psychological wellness for all students at The Claremont Colleges. Professional and well-trained psychologists, psychiatrists, and post-doctoral and intern therapists offer support for a range of psychological issues in a confidential and safe environment.

Phone (909) 621-8202
After hours emergency (909) 607-2000
Tranquada Student Services Center, 1st floor
757 College Way
Claremont, CA 91711

Title IX

One of my responsibilities as an instructor is to help create a safe learning environment. I am a mandatory reporter. Thus, if I learn of any potential violation of CGU's gender-based misconduct policy (e.g., rape, sexual assault, dating violence, domestic violence, or stalking) by any means, I am required to notify the CGU Title IX Coordinator at Deanof.Students@cgu.edu or (909) 607-9448. Students can request confidentiality from the institution, which I will communicate to the Title IX Coordinator. If students want to speak with someone confidentially, the following resources are available on and off campus: EmPOWER Center (909) 607-2689, Monsour Counseling and Psychological Services (909) 621-8202, and The Chaplains of The Claremont Colleges (909) 621-8685. Speaking with a confidential resource does not preclude students from making a formal report to the Title IX Coordinator if and when they are ready. Confidential resources can walk students through all of their reporting options. They can also provide students with information and assistance in accessing academic, medical, and other support services they may need.

Campus Security
Campus security can be reached 24 hours/day at (909) 607-2000. Please download the CGU Safety Resource Card to your phone's contacts.

Office of Information Technology (OIT)
The Office of Information Technology has a helpdesk to support you with CGU wireless access and email issues. They also have good documentation you can use to learn to connect and use online resources. Website: https://mycampus.cgu.edu/web/it

Center for Writing and Rhetoric (CWR)
CGU has a graduate studies-focused Center for Writing and Rhetoric that works with you no matter where you are in the writing process. The CWR is not just for remediation of your writing, but for all writers to provide partnership and consultation to improve your academic work at all levels. The CWR can work with you in planning, outlining, drafting, and final review of documents and presentations for class work, conferences, and publications. Website: https://mycampus.cgu.edu/web/writing-rhetoric

The Claremont Colleges Library
The Claremont Colleges Library has a wealth of resources, including subject specialist librarians, to support your academic work. Use the library for class work and research to access and use data-bases for articles, books, and data sets, to understand how to conduct effective searches and evaluate sources, use digital tools, and much more. The library offers workshops and 1-1 consultations with students as well. Website: https://library.claremont.edu/