UNIVERSITY of SOUTH FLORIDA

CAI 4520

Introduction to Agentic AI

CRN xxx, Section xx, 3 Credit Hours

COURSE SYLLABUS

Semester: Spring 2027
Class Meeting Days: M, W
Class Meeting Time: 6:30 – 7:45 pm
Class Meeting Location: TBA
Instructor: Guangjing Wang
Office Location: BEH 311
Office Hours: Tuesday 2:00pm – 5:00pm
Email: guangjingwang@usf.edu

I. Welcome!

In this course, we will explore the foundations, architectures, and real-world applications of agentic AI systems capable of autonomous reasoning, planning, and action. You will learn how modern AI Agents go beyond single prompts: they think and plan, use tools and data, act in the world, and learn from feedback. You will dive into the core principles that empower AI to act with purpose, adapt to complex environments, and collaborate with humans in meaningful ways. Along the way, you will gain insights into how agentic AI operates under the hood: from perception and planning to learning and decision-making.

By the end of this course, you will understand the core Agentic AI design patterns and how to evaluate them with metrics and error analysis. You will sharpen your problem-solving abilities by addressing real-world challenges with agentic AI. You will also enhance your communication skills as you learn to convey complex technical ideas to diverse audiences. As we stand in a new era of AI, the need for AI agents that can act autonomously, make context-aware decisions, and collaborate effectively has never been more essential.

II. University Course Description

This course aims to bridge the gap between foundational AI models and the design of autonomous agentic systems. Students will engage in the design, deployment, and evaluation of agentic AI systems with reliability, safety, and human-in-the-loop governance.

III. Course Prerequisites

Required Prerequisites: COP 4530 (min grade C) OR COP 4538 (min grade C)

IV. Course Purpose

This course is designed as an upper-level elective for students in computer science, artificial intelligence, or related disciplines. It plays a key role in the AI curriculum by equipping students with both the theoretical foundations and practical skills needed to design agentic AI systems capable of autonomous decision-making and purposeful action. This course introduces a new way of building software that leverages AI models to operate adaptively, interact with humans, and pursue long-term goals. It complements core AI and machine learning courses by emphasizing agentic AI architectures, planning, perception, and multi-agent coordination, preparing students to build the next generation of responsive and responsible AI systems.

V. Course Format

- Lectures: Each class will typically begin with a brief lecture that introduces key concepts, theories, and techniques related to the topic of the day. These lectures are designed to provide students with the foundational knowledge to engage in deeper discussions and activities.

- Discussion: Following the lecture, we will move into class discussions. These will be a significant part of our sessions, as they allow us to deconstruct business processes into agentic workflows and identify where human-like iterations and tool interaction can automate complex tasks.

- Collaborative Learning: Many sessions will include group work or collaborative projects. You will work with your classmates to solve problems, analyze case studies, or develop components of your capstone project. This collaborative approach mirrors the real-world settings where you will often work as part of a team to develop agentic AI systems.

- Hands-On Activities: Practical, hands-on activities will be incorporated into our sessions to reinforce the technical aspects of the course. These may involve coding exercises, model evaluation tasks, or AI agent development assignments. These activities are designed to help you apply the theoretical knowledge gained from lectures and discussions.

The structure of our sessions is designed to balance theory and practice. By combining lectures with discussions, collaborative learning, and hands-on activities, students will develop both a deep understanding of the concepts and the ability to apply them in practical contexts. Discussions and collaborative work are central to this course because the subject matter—agentic AI—benefits from diverse perspectives and critical thinking. By engaging actively, students will not only enhance their own understanding but also contribute to the learning experience of their peers.

VI. Course Objectives

This course has the following objectives:

- Understand the foundational principles of agentic AI systems. Students will explore theoretical concepts such as reflection, planning, and decision-making that empower AI agents to act independently in complex environments.

- Leverage large language models (LLMs) and external tools to extend agent capabilities. Students will learn how to utilize LLMs for interaction and decision-making tasks, while gaining hands-on experience in context engineering and real-world application development.

- Design and implement AI Agents that plan, learn, and adapt in dynamic environments. Students will apply methods from classical control theory and reinforcement learning to build agentic AI systems that optimize behaviors over time.

- Simulate reasoning and decision-making processes in multi-agent and human-agent settings. Students will construct and evaluate multi-agent systems capable of effective collaboration, negotiation, and interaction with other agents and humans.

- Evaluate the safety, reliability, and ethical alignment of agentic systems. Students will identify potential risks in agent behaviors and implement mechanisms to ensure alignment with human values and responsible AI principles.

VII. Learning Outcomes

Upon completion of this course, students will be able to:

- Explain and apply key concepts of agentic AI such as reflection, planning, and decision-making, and evaluate their role in enabling independent agent behavior in complex settings.

- Demonstrate the ability to integrate LLMs and external tools in agent workflows, using context engineering techniques to enhance the performance of real-world applications.

- Design and develop adaptive AI agents using techniques from control theory and reinforcement learning and assess their ability to optimize behavior in dynamic environments.

- Construct and evaluate agentic AI that can reason, negotiate, and interact effectively in multi-agent and human-agent systems, demonstrating collaborative decision-making skills.

- Assess the safety, reliability, and ethical implications of agentic AI systems, and implement strategies to align agent behavior with human values and responsible AI standards.

VIII. Required Texts and/or Readings and Course Materials

None.
Suggested reading can be the book “Artificial Intelligence: A Modern Approach, 4th US ed. by Stuart Russell and Peter Norvig.” The research papers from top-tier conferences such as *ICML, NeurIPS, ICLR, IEEE Security and Privacy, ACM CCS, Usenix Security, and NDSS* in the last 5 years.

IX. How to Succeed in this Course

- Read and Reflect: The readings in this course will cover both technical papers and ethical discussions. Engage with these materials by taking notes and asking yourself how the concepts apply to real-world scenarios.

- Participate in Discussions: The topics in this course, particularly those around business processes, benefit greatly from diverse perspectives. Participate actively in class discussions, sharing your views and considering others' viewpoints.

- Case Studies and Real-World Examples: Pay special attention to the case studies discussed in class. Analyzing real-world failures and successes will help you understand the importance of building agentic AI.

- Hands-On Practice: The technical assignments will often require you to apply concepts such as context engineering or agent tool usage. Treat these assignments as opportunities to deepen your understanding, not just as tasks to complete.

- Group Projects: Collaboration is key in this course, especially for group projects. Learn to communicate effectively with your peers, leveraging each other's strengths. Share resources, discuss different approaches, and learn from the diverse skills within your group.

- Documentation: Keep a well-organized record of your code, notes, and reflections. Proper documentation will not only help you during this course but also serve as a valuable resource in your future work.

- Office Hours and Forums: Take advantage of office hours and discussion forums. Whether you are struggling with a concept or just want to delve deeper into a topic, these are opportunities to get personalized guidance.

- Online Resources: If you find yourself struggling with a particular topic, there are numerous online resources available. Websites such as Stack Overflow and Kaggle can provide immediate help with coding issues, while ArXiv is a great place to find academic papers on AI Agent.

X. Academic Continuity

In the event that the university needs to transition to remote instruction due to unforeseen circumstances, such as a pandemic or natural disaster, our course will seamlessly continue with adjustments to ensure that you can continue your learning without interruption. We will hold live, synchronous sessions during our regular class times using Microsoft Teams. Attendance will be required, as these sessions will replace in-person lectures and discussions. If we switch online and if you are unable to attend a live session due to time zone differences or other legitimate reasons, the online resources will be made available on Canvas. Please inform me in advance if you will not be able to attend a live session.

XI. Communication

- Canvas Mail: The primary mode of communication will be through Canvas Mail. Please check your Canvas inbox regularly for course-related updates, feedback on assignments, and other important information.

- Direct Email: For more urgent matters or personal issues, you can reach me directly via email at [guangjingwang@usf.edu]. Please use your university email address and *include [CIS 4930] in the*

Email Subject when contacting me to ensure that your message is recognized and receives a prompt response.

- Class Announcements: All major course updates, reminders, and important information will be posted in the "Announcements" section on Canvas. Please make sure to enable notifications for announcements so you do not miss any critical updates.

XII. Grading Scale

Grading Scale (%)			
98 – 100	A+		
94 – 97	A	74 – 76	C
90 – 93	A-	70 – 73	C-
87 – 89	B+	67 – 69	D+
84 – 86	B	64 – 66	D
80 – 83	B-	60 – 63	D-
77 – 79	C+	0 – 59	F

XIII. Grade Categories and Weights

Graded Items	**Percent of Final Grade**
Homework	20%
Project-Final (Code)	20%
Project-Checkpoints	5%
Essay	20%
Two quizzes	20%
Project Presentation	15%

- **Open-book quiz**: each quiz will contain 25 single-selection (i.e., multi-choice with single answer) questions in 60 minutes with pen and paper. No electronic devices are allowed.
- **Project-Checkpoints**: three assignments with simple questions are used for group composition, midterm checkpoint and final checkpoint confirmation.
- Code should declare the source if not written by yourself. Directly copying from the existing code repository without a declaration will result in a 50 % reduction (original score*0.5).
- Missing Checkpoints, Presentations and Quizzes will receive a score of 0.
- Text generation tools such as ChatGPT are prohibited from being used in Essay and Quizzes.
- For late projects, homework and the essay, the following penalties will apply:
    - Submitted one day late: 20% reduction (original score * 0.8)
    - Submitted two days late: 50% reduction (original score * 0.5)
    - Submitted three days late or more: No credit will be given (original score * 0)

Final Project

- Objective: Build an agentic AI application to solve a complex problem that needs multiple agent collaboration.
- Two students will form a group, choose a project topic, and complete a project.
- Functionality: Have a functional API or user interface to demonstrate its capabilities. It should effectively showcase the role of multi-agent in problem-solving.

- Documentation: Include a README.md file with clear instructions on how to run your application and code comments, and the specific coding contribution of each member.
- Format: Each group will need to upload the source code to GitHub to track the progress, and directly uploading the source code file to Canvas is not accepted for grading. Students only need to submit the *code repository link* to Canvas.
- Grading: Projects will be graded based on technical contribution, functionality, user experience, and documentation. The grade will be in the category of [95, 90, 87, others], which is subject to revision based on the overall class performance.

Final Project Presentation

- During the presentation, you should include motivation, related work, challenges, contributions, and evaluation progress.
- The grade will be in the category of [95, 90, 87, others], which is subject to revision based on the overall class performance.

Essay

- Each group will need to write the project essay in at least 6 content pages (excluding references) strictly following **NeurIPS 2025 LaTeX style file.**
- The essay should follow the general structure of a research paper: Introduction, Related Work, System Design, Evaluation, Conclusion.
- Grading: The essay will be graded based on the writing, format, figures, technique clarity and individual contributions. The grade range is based on the overall class performance.

XIV. Course Schedule

Date	Work Due Before Class	Topics to be Discussed in Class
01/12	First day of class;	Overview of Agentic AI System
AI Agent		
01/14	No assignments are due	Attention and Transformer
01/19	**Holiday (No Class)**	**Dr. Martin Luther King, Jr. holiday**
01/21	No assignments are due	Large Language Modeling
01/26	**Group Members Checkpoint**	Foundation Model and Fine-tuning
01/28	No assignments are due	Hands-on Lecture and Homework 1
02/02	**Homework 1 Due**	Context Engineering
02/04	No assignments are due	AI Agent Application Basics
02/09	No assignments are due	AI Agent Tool Design
02/11	No assignments are due	Hands-on Lecture and Homework 2
02/16	**Homework 2 Due**	AI Agent Memory Design
02/18	No assignments are due	Project Kickoff Presentation
02/23	No assignments are due	Project Kickoff Presentation
02/25	No assignments are due	**Quiz 1**
03/02	No assignments are due	Reinforcement Learning Basics
03/04	No assignments are due	Hands-on Lecture and Homework 3
Agentic AI		
03/09	**Homework 3 Due**	Reinforcement Learning for LLM Agents

03/11	No assignments are due	AI Agent Reasoning Basics
03/16	No assignments are due	**Spring Break; no classes**
03/18	No assignments are due	**Spring Break; no classes**
03/23	**Project Midterm Checkpoint**	AI Agent Planning Design
03/25	No assignments are due	Hands-on Lecture and Homework 4
03/30	**Homework 4 Due**	Multi-agent Design
04/01	No assignments are due	Agentic AI for Security
04/06	No assignments are due	Security of Agentic AI
04/08	No assignments are due	Agentic AI Evaluation
04/13	No assignments are due	**Quiz 2**
04/15	**Project Final Checkpoint**	Project Final Presentation
04/20	No assignments are due	Project Final Presentation
04/22	No assignments are due	Project Final Presentation
04/27	No assignments are due	Project Final Presentation
04/29	**Final Project Due**	Project Final Presentation
05/04	**Essay Due**	No Final Exam

* **Note: The Schedule is subject to revision**

XV. USF Core Syllabus Policies

USF has a set of central policies related to student recording class sessions, academic integrity and grievances, student accessibility services, academic disruption, religious observances, academic continuity, food insecurity, pregnancy and related conditions, and sexual harassment that **apply to all courses at USF**. Be sure to review these online: usf.edu/provost/faculty-success/resources-policies-forms/core-syllabus-policy-statements.aspx

XVI. Course Policies: Grades

Medical Excuses: Students should not attend class if they are ill, particularly if they have fever and/or gastrointestinal symptoms and/or respiratory symptoms such as a sneezing, runny nose, sore throat or coughing. Students experiencing any of these symptoms should contact immediately the Student Health Services (813-974-2331) on the Sarasota-Mantatee and Tampa campus or the Wellness Center (727-873-4422) on the St. Petersburg campus for appropriate medical guidance and to obtain a verification of care letter. Students may turn to other health providers as well. **To be approved for missed classes, late assignments or missed examinations, a verification of care letter must be presented by the student to the faculty member upon return to class.**

Extra Credit Policy: There is one extra credit opportunity: Participation and Engagement. The percentage of the extract credit is under the discrimination of the instructor based on the overall class performance. If extra credit is granted, additional points are added to the final course grade.

Participation and Engagement: Attendance will be recorded during randomly selected lectures. In addition, each student will have an opportunity to give presentations about the course project. Other students are expected to ask questions and provide feedback on the quality of the presentation. The participation and engagement will serve as a basis for the extra credits.

End of Semester Student Evaluations: All classes at USF make use of an online system for students to provide feedback to the University regarding the course. These surveys will be made available at the end of the semester, and the University will notify you by email when the response window opens. Your participation is highly encouraged and valued.

Campus Free Expression: *It is fundamental to the University of South Florida's mission to support an environment where divergent ideas and philosophies can be openly exchanged and critically evaluated. Consistent with these principles, this course may involve discussion of ideas that you find uncomfortable, disagreeable, or even offensive. In the instructional setting, ideas are intended to be presented in an objective manner and not as an endorsement of what you should personally believe. "Objective" means that the idea(s) presented can be tested by critical peer review and rigorous debate, and that the idea(s) is supported by credible research. In this course you may be asked to engage with complex ideas and to demonstrate an understanding of the ideas. Understanding and engaging with an idea does not require you to believe it or to agree with it.*

Make-up Exams Policy: If a student cannot be present for an examination for a valid reason (e.g., medical issues, validity to be determined by the instructor), a make-up exam will be given only if the student has notified the instructor in advance that s/he cannot be present for the exam. Make-up exams are given at the convenience of the instructor usually during office hours.

Group Work Policy: Everyone must take part in a group project. Once formed, groups cannot be altered or switched, except for reasons of extended hospitalization. Every group will provide the instructor with a suggested contribution percentage for each member of the group. The instructor will assign a grade that is informed by those suggestions based on workload and quality.

XVII. Course Policies: Student Expectations

Health and Wellness: Your health is a priority at the University of South Florida. We encourage members of our community to look out for each other and to reach out for help if someone is in need. If you or someone you know is in distress, please make a referral at www.usf.edu/sos so that the Student Outreach & Support can contact and provide helpful resources to the student in distress. A 24-hour licensed mental healthcare professional, offered through the counseling center, is available by phone at 813-974-2831, option 3. Please remember that asking for help is a sign of strength. In case of emergency, please dial 9-1-1.

Title IX Policy: Title IX provides federal protections for discrimination based on sex, which includes discrimination based on pregnancy, sexual harassment, and interpersonal violence. In an effort to provide support and equal access, USF has designated all faculty (TA, Adjunct, etc.) as Responsible Employees, who are required to report any disclosures of sexual harassment, sexual violence, relationship violence or stalking. The Title IX Office makes every effort, when safe to do so, to reach out and provide resources and accommodations, and to discuss possible options for resolution. Anyone wishing to make a Title IX report or seeking accommodations may do so online, in person, via phone, or email to the Title IX Office. For information about Title IX or for a full list of resources please visit: https://www.usf.edu/title-ix/gethelp/resources.aspx. If you are unsure what to do, please contact Victim Advocacy – a confidential resource that can review all your options – at 813-974-5756 or va@admin.usf.edu.

Turnitin.com: In this course, turnitin.com will be utilized. Turnitin is an automated system which instructors may use to quickly and easily compare each student's assignment with billions of web sites, as well as an enormous database of student papers that grows with each submission. Accordingly, you will be expected to submit all assignments in electronic format. After the assignment is processed, as instructor I receive a report from turnitin.com that states if and how another author's work was used in the assignment. For a more detailed look at this process visit http://www.turnitin.com. Essays are due at turnitin.com the same day as in class.

Netiquette Guidelines

1. Act professionally in the way you communicate. Treat your instructors and peers with respect, the same way you would do in a face-to-face environment. Respect other people's ideas and be constructive when explaining your views about points you may not agree with.
2. Be sensitive. Be respectful and sensitive when sharing your ideas and opinions. There will be people in your class with different linguistic backgrounds, political and religious beliefs or other general differences.
3. Proofread and check spelling. Doing this before sending an email or posting a thread on a discussion board will allow you to make sure your message is clear and thoughtful. Avoid the use of all capital letters, it can be perceived as if you are shouting, and it is more difficult to read.
4. Keep your communications focused and stay on topic. Complete your ideas before changing the subject. By keeping the message on focus you allow the readers to easily get your idea or answers they are looking for.
5. Be clear with your message. Avoid using humor or sarcasm. Since people can't see your expressions or hear your tone of voice, meaning can be misinterpreted.

XVIII. Learning Support and Campus Offices

Academic Accommodations
Students with disabilities are responsible for registering with Student Accessibility Services (SAS) in order to receive academic accommodations. For additional information about academic accommodations and resources, you can visit the SAS website.
SAS website for the Tampa and Sarasota-Manatee campuses.
SAS website for the St. Pete campus.

Academic Support Services
The USF Office of Student Success coordinates and promotes university-wide efforts to enhance undergraduate and graduate student success. For a comprehensive list of academic support services available to all USF students, please visit the Office of Student Success website.

Canvas Technical Support
If you have technical difficulties in Canvas, you can find access to the Canvas guides and video resources in the "Canvas Help" page on the homepage of your Canvas course. You can also contact the help desk by calling 813-974-1222 in Tampa or emailing help@usf.edu.
IT website for the Tampa campus.
IT website for the St. Pete campus.
IT website for the Sarasota-Manatee campus.

Center for Victim Advocacy

The Center for Victim Advocacy empowers survivors of crime, violence, or abuse by promoting the restoration of decision making, by advocating for their rights, and by offering support and resources. Contact information is available online.

Counseling Center

The Counseling Center promotes the wellbeing of the campus community by providing culturally sensitive counseling, consultation, prevention, and training that enhances student academic and personal success. Contact information is available online.
Counseling Center website for the Tampa campus.
Counseling Center website for the St. Pete campus.
Counseling Center website for the Sarasota-Manatee campus.

Writing Studio

The Writing Studio is a free resource for USF undergraduate and graduate students. At the Writing Studio, a trained writing consultant will work individually with you, at any point in the writing process from brainstorming to editing. Appointments are recommended, but not required. For more information or to make an appointment, email: writingstudio@usf.edu.
Writing studio website for the Tampa campus.
Writing studio website for the St. Pete campus.
Writing studio website for the Sarasota-Manatee campus.

XIX. Important Dates to Remember

All the dates and assignments are tentative and can be changed at the discretion of the professor. For important USF dates, see the Academic Calendar at http://www.usf.edu/registrar/calendars/