Syllabus: CS7637: Knowledge-Based AI: Summer & Fall 2026

This is the official syllabus for the online section of CS7637: Knowledge-Based AI, offered as CS7637-O01, CS7637-OAN, CS7637-OAN, and others. Note that there are no required readings or external materials outside of what is provided directly by the class. There is no attendance requirement.

Course Description

Structured knowledge representation; knowledge-based methods of reasoning and learning; problem-solving, modeling and design.

This is a core course in artificial intelligence. It is designed to be a challenging course, involving significant independent work, readings, assignments, and projects. It covers structured knowledge representations, as well as knowledge-based methods of problem solving, planning, decision-making, and learning.

Readiness Questions

This course requires substantial programming as well as significant writing. To succeed in this course, you should be able to answer 'Yes' to the following questions:

- Are you confident with computer programming in Python?
- Are you strongly familiar with basic concepts of data structures and object-oriented programming, such as inheritance and polymorphism?
- Are you strongly familiar with basic concepts of algorithm design, such as algorithms for sorting, searching, and matching?
- Are you comfortable with writing essays, totaling almost 20,000 words throughout the semester?
- Are you willing to deeply engage with your classmates through discussions on the forum, peer feedback, and sharing of exemplary assignments?
- Are you willing to work independently on challenging design, programming and reflection projects all on your own?
- Are you able to read papers on your own that go beyond the video lessons?
- Are you able to meet fixed deadlines for assignments with no possibility of any extension?
- Are you willing and able to spend significant amounts of time and energy on a regular basis to this course?
- Are you ready to adhere to the Georgia Tech code of academic conduct?

If your answer is not a strong "Yes" to all of these questions, this course may not be appropriate for you. If your answer is "No" to any of these questions, this course likely is not appropriate for you.

Learning Goals

The class is organized around three primary learning goals. First, this class teaches the concepts, methods, and prominent issues in knowledge-based artificial intelligence. Second, it teaches the specific skills and abilities needed to apply those concepts to the design of knowledge-based AI agents. Third, it teaches the relationship between knowledge-based artificial intelligence and the study of human cognition.

Learning Strategies

This structure of this course is driven by several pedagogical motivations:

- Learning by example: Each topic is taught through examples of the way in which humans and artificial intelligence agents approach certain problems, often building from human thought toward AI agents and subsequently referring back to human cognition.
- Learning by doing: you will participate in the reasoning within each particular lesson, and subsequently tie the topic back to a broader problem.
- Project-Based Learning: This class has three projects, each of which build on the previous one, and the overall goals and motivations of KBAI are presented through these projects.
- Personalization: Individualized feedback will be given on your performance on the exercises, assignments, projects, and tests. Additionally, you are welcome and encouraged to proceed at your own pace throughout the lessons, including viewing them outside of the designed order to better align with your interests.
- Collaborative Learning: We encourage collaboration and the development of communities of practice surrounding the course material and projects. We are excited to see you borrow one another's ideas and build on them, as well as spin off your own study groups.
- Peer-to-Peer Learning: During this class you will give your peers feedback on their work on the same assignments you complete. This lets you see additional approaches to the problems, provides you extra feedback, and puts you in the position of a teacher, which **has been shown to be a pedagogically useful (http://link.springer.com/article/10.1007%2Fs11251-011-9177-2)** role reversal.
- Self-Reflection: At the conclusion of each lesson, we ask each student to reflect on what they learned in the class. Each design project requires the writing of a project reflection that explains and critiques, and reflects on the student's work on the project.
- Authenticity: The project that you will explore in this class is an open research question in the AI and Cognitive Systems research communities. Two students from our lab have completed dissertations working on these questions in the past two years, and we have had papers published on these topics within the past several months.

Learning Outcomes

At the conclusion of this class, you will be able to accomplish three primary tasks. First, you will be able to design and implement a knowledge-based artificial intelligence agent that can address a complex task using the methods discussed in the course. Second, you will be able to use this agent to reflect on the process of human cognition. Third, you will be able to use both these practices to address practical problems in multiple domains. The journal article mentioned earlier provides a more detailed account of learning goals, strategies and outcomes of this course.

Course Assessments

Your grade in this class is generally made of five components: labs, exams, the main ARC-AGI project, and class participation.

- Labs: 5 labs, 7% each. Guided investigations of AI tools with reflections.
- Project: 35%. One semester-long project with several intermediate milestones.
- Exams: 20%. Two timed, digitally proctored exams.
- Participation: 10%. Regular participation activities via the forum, peer review, etc.

Course Policies

The following policies are binding for this course.

Official Course Communication

You are responsible for knowing the following information:

1. Anything posted to this syllabus (including the pages linked from here, such as the **general course landing page (https://gatech.instructure.com/courses/498210/pages/general-course-description)**).
2. Anything emailed directly to you by the teaching team (including announcements via the course forum or Canvas), 24 hours after receiving such an email.

Generally speaking, we will post announcements via Canvas and cross-post their content to the course forum; you should thus ensure that your Canvas settings are such that you receive these announcements promptly, ideally via email (in addition to other mechanisms if you'd like). Georgia Tech generally recommends students to check their Georgia Tech email once every 24 hours. So, if an announcement or message is time sensitive, you will not be responsible for the contents of the announcement until 24 hours after it has been sent.

Note that this means you won't be responsible for knowing information communicated in several other methods we'll be using. You aren't responsible for knowing anything posted to the course forum that isn't linked from an official announcement. You aren't responsible for anything said in Slack or other third-party sites we may sometimes use to communicate with students. You don't need to worry about missing critical information so long as you keep up with your email and

understand the documents on this web site. This also applies in reverse: we do not monitor message boxes in Canvas, and we may not respond to direct emails. If you need to get in touch with the course staff, please post privately to the course forum (either to all Instructors or to an instructor individually).

Communicating with Instructors and TAs

Communication with the course teaching team should be handled via the discussion forum. If your question is relevant to the entire class, you should ask it publicly; if your question is specific to you, such as a question about your specific grade or submission, you should ask it privately.

Our workflow is to regularly filter the forum for Unresolved posts, which includes top-level threads with no answer accepted by the original poster, as well as mega-threads with unresolved follow-ups. If your question requires an official answer or follow-up from an instructor or teaching assistant, make sure that it is posted as either a Question or as a follow-up to a mega-thread, and that it is marked Unresolved. Once an instructor or TA has answered your question, it will automatically be marked as Resolved; if you require further assistance, you are welcome to add a follow-up, but make sure to unmark the question as Resolved in order to make sure that it is seen by a member of the teaching team.

Similarly, in order to keep the forum organized, please post as a Post or Note instead of a Question if your question does not require an official response from the teaching team. For example, if you are interested in getting multiple perspective from classmates, getting feedback on your ideas, or having a discussion that does not have a single answer, please use Post or Note instead of Question. Please reserve Question threads for questions that will likely have a single official response. TAs and instructors will regularly convert Questions to Posts or Notes that do not need a single official answer, but it will save time and allow them to focus their attention on other students if you correctly categorize your post in the first place.

Late Work

Running such a large class involves a detailed workflow for assigning assignments to graders, grading those assignments, and returning those grades. As such, work that does not enter into that workflow presents a major delay. We have taken steps to limit as much as possible the need to ever submit work late: we have made the descriptions of all assignments available on the first day of class so that if there are expected interruptions (such as like weddings, business trips, and conferences), you can complete the work ahead of time. If you have technical difficulties submitting the assignment to Canvas by the deadline, post privately to the course forum **immediately** and attach your submission. Then, submit it to Canvas as soon as you can thereafter.

If due to a personal emergency, health emergency, family emergency, or other unforeseeable life event you find you are unable to complete an assignment on time, please post privately to the

course forum with information regarding the emergency. Depending on your unique situation, we will share guidance on how to proceed; if the emergency is projected to delay a significant quantity of the work required for the class, we may recommend withdrawing and reattempting the class at a later date. If the emergency will likely only impact a small amount of the course, we may be able to accept the work late as a one-time exception. If the emergency takes place once you have already completed a significant fraction (at least 70%) of the coursework, we may offer an Incomplete grade to allow you to finish the class after the semester is over.

Note that depending on the nature and significance of the request, we may require documentation from the Dean of Students office that the emergency is sufficient to justify offering an incomplete grade or accepting late work. Note also that regardless of the reason, we also cannot promise any particular turnaround time for grading work that was approved to be submitted late; it may be that grades and feedback will not be returned before the end of the term, and it may be that a temporary grade of Incomplete must be entered to leave time to grade work that was accepted late.

If you are not comfortable sharing with us the nature of an emergency, or if you need more comprehensive advocacy, we ask you to go through the Dean of Students' office regarding class absences. The Dean of Students is equipped to address emergencies that we lack the resources to address. Additionally, the Dean of Students office can coordinate with you and alert all your classes together instead of requiring you to contact each professor individually. The Dean of Students is there to be an advocate and partner for you when you're in a crisis; we wholeheartedly recommend taking advantage of this resource if you are in need. You may find information on contacting the Dean of Students with regard to personal emergencies here: **https://studentlife.gatech.edu/request-assistance (https://studentlife.gatech.edu/request-assistance)**

Academic Honesty

All students in the class are expected to know and abide by the Georgia Tech **Academic Honor Code (Links to an external site.) (https://policylibrary.gatech.edu/student-affairs/academic-honor-code)** . Specifically for us, the following academic honesty policies are binding for this class:

First, for essays, journals, and reports:

- In written essays, all sources are expected to be cited according to APA style. When directly quoting another source, **both in-line quotation marks, an in-line citation, and a reference at the end of the document** are required. When directly summarizing another source in your own words, quotation marks are not needed, but **an in-line citation and reference at the end of your document** are still required. You should consult the **Purdue OWL Research and Citation Resources (https://owl.purdue.edu/owl/research_and_citation/resources.html)** for proper citation practices, especially the following pages: **Quoting, Paraphrasing, and Summarizing (https://owl.purdue.edu/owl/research_and_citation/using_research/**

quoting_paraphrasing_and_summarizing/index.html) , **Paraphrasing** (https://owl.purdue.edu/owl/research_and_citation/using_research/quoting_paraphrasing_and_summarizing/paraphrasing.html) , **Avoiding Plagiarism Overview** (https://owl.purdue.edu/owl/resources/preventing_plagiarism/avoiding_plagiarism/index.html) , **Is It Plagiarism?** (https://owl.purdue.edu/owl/avoiding_plagiarism/plagiarism_faq.html) , and **Safe Practices** (https://owl.purdue.edu/owl/avoiding_plagiarism/best_practices.html) . You should also consult our dedicated pages (from another course) on **how to use citations** (http://omscs6460.gatech.edu/research-guide/how-to-use-citations-in-a-paper/) and **how to avoid plagiarism** (http://omscs6460.gatech.edu/research-guide/how-to-avoid-plagiarism/) .

- Any non-original figures must similarly be cited. If you borrow an existing figure and modify it, you must still cite the original figure. It must be obvious what portion of your submission is your own creation.
- In written essays, you may not copy any content from any current or previous student in this class, regardless of whether you cite it or not.
- There is one exception to these policies: unless you are quoting the course videos directly, you are not required to cite content borrowed from the course itself (such as figures in videos, topics in the video, etc.). The assumption is that the reader knows what you write is based on your participation in this class, thus references to course material are not inferred to be claiming credit for the course content itself.

Second, for code on course projects:

- You may not under any circumstances copy any code from any current or former student in the class, or from any public project addressing the same content as the course projects, such as the ARC-AGI project or a Block World agent.
- The only code segments you are permitted to borrow are **isolated project-agnostic functions**, meaning functions which serve a purpose that makes sense outside the context of our projects (such as, for example, inverting colors in an image). Include a link to the original source of the code and clearly note where the copied code begins and ends (for example, with `/* BEGIN CODE FROM (source link) */` before and `/* END CODE FROM (source link) */` after the copied code). This is partially to emphasize what your unique project and deliverable is, and partially to protect against instances where you and a classmate both borrowed a function from the same external repository. Note that annotating and attributing code is far easier than asking a TA if you need to attribute—if you need to ask, attribute it.

Third, for proctored assessments:

- During all proctored assessments, you are prohibited from interacting directly with any other person on the topic of the exam material. This includes posting on forums, sending emails or text messages, talking in person or on the phone, or any other mechanism that would allow you to receive live input from another person.

- During all proctored assessments, you may only use the device on which you are completing the assessment; you may not use other devices, even during open-book, open-note assessments as it is not possible to know whether secondary devices are being used to consult resources or to interact with others. This means that the result of using any keyboard and mouse should be observable in the session recording.
- Finally, you may not take any content contained on proctored assessments out of the proctored assessment, such as writing down exam questions, taking screenshots, or sharing information with classmates. Any attempt to retain a copy of exam content, or to obtain or consult exam content retained by someone else, will be treated as academic misconduct. Note that while open-book tests allow you to interact with other tools, you may not copy or transcribe actual exam content into any tool that will let you retain access to that content after the exam has ended.

These policies, including the rules on all pages linked in this section, are binding for the class. Any violations of this policy will be subject to the institute's Academic Integrity procedures, which may include a 0 grade on assignments found to contain violations; additional grade penalties; and academic probation or dismissal.

Finally, note that you may not post the work that you submit for this class publicly either during or after the semester is concluded. We understand that the work you submit for this class may be valuable for job opportunities, personal web sites, etc.; you are welcome to write *about* what you did for this class, and to provide the actual work privately when requested, but we ask that you do not make your actual submissions or code publicly available; this is to reduce the likelihood of future students plagiarizing your work. Similarly, unless you notify us otherwise, by participating in this class you authorize us to pursue the removal of your content if it is discovered on any public assignment repositories, especially if it is clearly contributed there by someone else.

Note that if you are accused of academic misconduct, you are **not** permitted to withdraw from the class until the accusation is resolved; if you are found to have participated in misconduct, you will not be allowed to withdraw for the duration of the semester, nor will you be eligible for grade replacement for this class. If you withdraw anyway, you will be forcibly re-enrolled without any opportunity to make up work you may have missed while illegally withdrawn.

AI Collaboration Policy

Recent advancements in artificial intelligence—Copilot, ChatGPT, etc.—can be great resources for improving your learning in the course, but it is important to ensure that their benefits are targeted at your *learning* rather than solely at your *deliverables*. Toward that end, the same academic integrity policy above applies to AI assistance: you are welcome to consult with AI agents just as you would consult with classmates, discuss ideas with friends, and seek feedback from colleagues. However, just as you would not hand your device to someone else to directly fix or improve your classwork, so also you may not copy anything directly from an AI agent into your

document, nor let an AI agent directly generate content for your submission. This rule means you should disable any AI assistance more advanced than a grammar checker inside your word processors and IDEs. Note that any concrete evidence of direct plagiarism of content from AI without proper citation may be grounds for deductions that go beyond just the area of the assignment where the plagiarism took place; for example, if your response to one of five questions on a particular assignment contains clear indicators of plagiarism from AI, the penalty assigned may go beyond the weight of that question alone. This is representative of the cost of overreliance on AI in the real world: if your colleagues notice you are outsourcing your work to AI without adequate oversight in the real world, it calls into question the reliability of *all* work you deliver, not just the work on which you are caught plagiarizing.

Although you are prohibited from having these tools directly integrated into your workspace or from copying content from these assistants directly into your work, you are nonetheless permitted to use them more generally. The important consideration is to ensure that you are using the AI agent as a learning assistant rather than as a homework assistant: so long as your submission solely reflects your own understanding of the content, you are encouraged to let AI assistants aid in developing your understanding.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, **contact the Office of Disability Services (https://disabilityservices.gatech.edu/)** as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter.

Student Conduct Expectations

Students are expected to engage respectfully and actively in the academic environment: completing assignments, participating meaningfully in course forums and discussions, and acting with integrity in accordance with the Georgia Tech Student Honor Code and Code of Conduct. Students are expected to adhere to the course's late work policy and to use the course forum as the designated space for academic questions and concerns.