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SYLLABUS

Syllabus and Schedule for CS7637: Knowledge-Based AI: Cognitive Systems

Course Syllabus
CS7637-O: Knowledge-Based AI: Cognitive Systems (OMS)
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Course Description:
This is a core course in artificial intelligence. It is designed to be a challenging c
and projects. It covers structured knowledge representations, as well as knowle
learning.

Competency:
To succeed in this course, you should be able to answer 'Yes' to the following fc

1. Are you comfortable with computer programming?
2. Are you familiar with concepts of data structures and object-oriented pro
3. Are you familiar with concepts of algorithms, such as sorting and searchi
4. Are you confident with either Java or Python?

Learning Goals:
The class is organized around three primary learning goals. First, this class teac
artificial intelligence. Second, it teaches the specific skills and abilities needed t
Third, it teaches the relationship between knowledge-based artificial intelligenc

Learning Strategies:
This structure of this course is determined by several pedagogical motivations:

- First, this class is taught through learning by example. Each topic is taugl
intelligence agents approach certain problems, often building from huma
cognition.
- Second, each topic is also taught through learning by doing; you will part
tie the topic back to a broader problem.
- Third, the learning in this class is project-based. This class has four proje
lessons to the design of KBAI agents is directed through these projects.
- The fourth pedagogical motivation in this course is personalization. Indiv
assignments, projects, and tests. Additionally, you are welcome and enco
viewing them outside of the designed order to better align with your inter
- The fifth pedagogical motivation is collaboration. We will form small "st
projects and the assignments in the course require individual work, we w
course (including discussions about the projects and the exercises).
- Finally, we will encourage reflection. At the conclusion of each lesson, w
design project requires the writing of a design report that explains and cri

Learning Outcomes:
At the conclusion of this class, you will be able to accomplish three primary tas
artificial intelligence agent that can address a complex task using the methods d
reflect on the process of human cognition. Third, you will be able to use both th

Structure of the Course:
The course is broken into 26 lessons. Although the length of individual lessons
lessons per week. The times in parentheses below reflect the estimated amount
exercises. Suggested dates are listed with the official course calendar.

1. Introduction to the Course (0:45)
2. Introduction to Knowledge-Based Artificial Intelligence (1:00)
3. Semantic Networks (1:00)
4. Generate & Test (0:30)
5. Means-Ends Analysis & Problem Reduction (1:00)
6. Production Systems (1:00)
7. Frames (0:45)
8. Learning by Recording Cases (0:30)
9. Case-Based Reasoning (1:00)
10. Incremental Concept Learning (1:00)
11. Classification (0:45)
12. Logic (1:30)
13. Planning (1:15)
14. Understanding (0:30)
15. Commonsense Reasoning (1:00)
16. Scripts (0:30)
17. Explanation-Based Learning (0:45)
18. Analogical Reasoning (1:00)
19. Version Spaces (1:00)
20. Constraint Propagation (0:45)
21. Configuration (0:45)
22. Diagnosis (0:45)
23. Learning by Correcting Mistakes (0:45)
24. Meta-Reasoning (0:30)
25. Advanced Topics (1:00)
26. Course Wrap-Up (0:30)

You will notice that the times given here add up to approximately 22 hours of n
semester. This means that approximately one-third of the time spent in the in-pe
should expect to spend at least an hour a week interacting on the forums with y

Course Schedule:
Below is the recommended course schedule for CS7637. Although you are free
recommended pace for moving through the lessons. The times given in parenth
recommend allotting to completing those lessons. Note additionally that for the
the lesson on Planning. For the final exam, you will be responsible for all mater

Assignments are due each week on Sunday. The 'Assignment' column here give
column gives the date on which that assignment is due. All assignments are due

Week	**Week of...**	**Lessons**
Week 1	August 18	Introduction to Knowledge-Based AI (0:45), Introd CS7637 (1:00)
Week 2	August 25	Semantic Networks (1:00), Generate & Test (0:30)
Week 3	September 01	Means-Ends Analysis (1:00), Production Systems (
Week 4	September 08	Frames (0:45)
Week 5	September 15	Learning by Recording Cases (0:30), Case-Based R (1:00)

Week 6	September 22	Incremental Concept Learning (1:00), Classificatio
Week 7	September 29	Logic (1:30)
Week 8	October 06	Planning (1:15), Understanding (0:30)
Week 9	October 13	Common Sense Reasoning (1:00), Scripts (0:30)
Week 10	October 20	Explanation-Based Learning (0:45), Analogical Re
Week 11	October 27	Version Spaces (1:00)
Week 12	November 03	Constraint Propagation (0:45), Configuration (0:45
Week 13	November 10	Diagnosis (0:45), Learning by Correcting Mistakes
Week 14	November 17	Meta-Reasoning (0:30)
Week 15	November 24	Advanced Topics (1:00), Wrap-Up (0:30)
Week 16	December 01	

Office Hours:
In general, if you have a question about the course contents, the projects, the as
so that everyone in the class can see the questions and the answers.

If your question is about a private issue, such as a grade on an examination, yo
and/or the TA (david.joyner@gatech.edu). Please remember, however, that the p
students in addition to the in-person class and other responsibilities, so please b
questions on the forum first.

The professor and the TA will also hold regular office hours via Google Hangou
semester based on responses to the start-of-course survey. Once scheduled, offi
of Piazza.

In addition to office hours, you may also request via email a brief time for a pri

If the Google Hangout becomes an unsustainable way of running live office hou
as much as possible.

Grading Scheme:
Grades will be based on four types of assessments according to the following pe

- Four Projects: 12.5% each (50% total)
- Eight Assignments: 2.5% each (20% total)
- Midterm Examination: 10%
- Final Examination: 20%

Grades will be normalized at the conclusion of the class. When grading individu
traditional percentage scores. A 3 out of 4 on a written assignment, for example
room for the identification of improvement, mastery, and excellence even after
importance of grades, we encourage you to focus first on doing the best you car

Course Readings:
No textbook is required for this class. Specific readings will be suggested for ea
Artificial Intelligence. Patrick Winston. Third Edition. MIT Press 1993.
(available online at http://courses.csail.mit.edu/6.034f/ai3/rest.pdf)

Knowledge Systems. Mark Stefik. Morgan-Kaufmann. 1995.

Artificial Intelligence. Stuart Russell and Peter Novig. Third Edition. Prentice-H

Where applicable, readings will be uploaded to T-Square.

Projects:
This course will consist of four design and programming projects, each of whic
and implement an artificial intelligence agent that solves problems on a human
each project, and the results of each will be directly applicable to the next. Age

The projects are due at midnight US Pacific Daylight Time on the following du

- Project 1: September 14th
- Project 2: October 5th
- Project 3: November 2nd
- Project 4: November 23rd

At the conclusion of each project, the five best projects will be selected and, wi
the five "best" will be made in large part based on how many problems each stu
evaluation of the program design and documentation by the graders. If a particu
especially deep design report, for example, it may be selected as an exemplary

Please note that projects are due on Sundays because past reports have indicate
moved projects to being due at the end of the weekend instead of on Fridays. H
available to answer questions on the weekends, so we urge you to work ahead a
deadline.

Assignments:
To complement these design and programming projects, all students will also c
consist of conceptually designing an artificial intelligence agent to address the t
Networks or Production Systems). These assignments will give you the opportu
agents, as well as help connect the lesson material with the project.

More than eight written assignments will be provided; you may choose which e
order. Two assignments must be turned in for every project, following these due

- Assignment 1: August 31st
- Assignment 2: September 7th
- Assignment 3: September 21st
- Assignment 4: September 28th
- Assignment 5: October 19th
- Assignment 6: October 26th
- Assignment 7: November 9th
- Assignment 8: November 16th

Assignments are due at midnight Pacific time for the dates given. Again, you m
must have completed one assignment by August 31st, two by September 7th, et
the professor, TAs, and graders will typically not be as available on the weeken

Examinations:
Two take-home examinations will be given, a midterm and a final exam. Both e
approximately five days to complete each. The midterm and final examination
to the projects; these topics will be more explicitly articulated closer to the exa

The midterm will be provided on October 6th, and is due on October 12th. The
7th.

Late Work:
Because of the size of this class, we are unfortunately unable to accept any late
you have technical difficulties submitting the assignment to T-Square, email the

If you have an emergency and cannot submit an assignment by the posted deadl
class absences. The Dean of Students is equipped to address emergencies that w
office can coordinate with you and alert all your classes together instead of requ
information on contacting the Dean of Students with regard to personal emerge

Collaboration:
Generally, collaboration is encouraged in this class. You are encouraged to disc
projects with your classmates, both before and after assignments and projects ar
so you may learn from the success of others' designs.

However, in collaborating, we draw the line at the following:

- You may **not** copy any code directly from anyone else. Again, you may u
your own work.
- You may **not** directly copy any text from anyone else's written assignmer
ideas to inform your own writing, but your assignments must be your ow
- You may **not** collaborate at all on the midterm or final. Do not discuss the
due.

Any instances of violation of this policy will be referred to the Dean of Student
acceptable, please ask first, preferably on Piazza. The Georgia Tech honor code

Study Groups:
At the beginning of the semester, all students will be randomly assigned to stud
are intended to give you a small, captive audience for questions and discussion.
group's private area on Piazza. Second, as part of your written assignments, you
assignments. This will be coordinated within your study groups as well.

Feedback:
This is the first time we are delivering this course as part of the Georgia Tech O
and as such, there are bound to be things we can (and will) improve. First, we a
wrong; we promise that we, too, will be fair and understanding, especially with
Second, we ask you to give us feedback on anything that we could be doing bet
may take advantage of the suggestion box on Piazza (or email the Professor and