

=====

CS 4635/CS 7637
Knowledge-Based AI
Fall 2013
Ashok K. Goel

MWF, 9:05-9:55 am
Klaus Building 2456

Basic Course Description:

Structured knowledge representations. Knowledge-based methods of problem solving, planning, decision making, and learning.

CS 4635 and CS 7637 are the undergraduate and graduate sections, respectively, of the same class. In either case, this is a "core" course. It is also a challenging course, involving significant amount of independent work including both readings and projects.

Outline of the Course:

Unit 1: Structured Knowledge Representations - ~5-6 weeks

Semantic Networks
Production Rules
Frames
Scripts
Constraints
Logic

Unit 2: Knowledge-Based Reasoning and Learning - ~4-5 weeks

Planning
Learning
Classification
Diagnosis
Configuration

Unit 3: Advanced Topics - ~3-4 weeks

Case-Based Reasoning
Analogical Reasoning
Visual Reasoning
Meta-Reasoning
Semantic Web

Instructor will post day-by-day class schedule on the class site.

Readings:

There is no textbook; instructor will provide handouts from:

Artificial Intelligence, Patrick Winston, 3rd edition.

Knowledge Systems, Mark Stefik.

Artificial Intelligence, Stuart Russell & Peter Norvig, 3rd edition

Recent review and research papers on selected topics.

Class Format (please read this carefully):

We will use the format of a flipped class in which students read the readings in advance of each class and the classes are used for quizzes, exercises, discussions and short lectures (see http://en.wikipedia.org/wiki/Flip_teaching).

We will assign readings for each class well in advance of the class, and we will expect each student to have read the assigned readings before the class.

Most classes will begin with a short video related to knowledge-based AI. The video will be followed by a short quiz on the assigned readings for the class. The quiz will be followed by a short lecture or a group exercise or a class discussion (or some combination of these).

The quizzes will not be graded. However, they will count towards class attendance and participation. We expect about 45 classes and about 35 quizzes during the term. We will expect all students to take at least 30 quizzes in this class.

Class Notes:

Graduate students will take turns taking notes in the class and posting class notes to the class site(s) on T-square. Each graduate student may need to take notes for up to three classes.

Projects:

There will be a series of five (design/programming) projects, with later projects building on earlier ones. Each project will be about two to three weeks long. Students may program in any "standard" programming language (such as C++ or Java).

For each project, we will expect each student to turn in a design report in addition to the program and the output for the project. The design report will describe the software architecture, the knowledge representations, the reasoning methods, and experiments with the programs. For each project, we will post the best few programs and reports on the class site on T-square.

For each student, we will count the best four projects towards the grade. Please note that the projects become progressively harder; indeed, the fifth project is quite challenging. Thus, the best course for most students

would be to do the first four projects well.

Examinations:

There will be a mid-term examination in early October and a final examination in mid December.

Grading:

All grades will be normalized (i.e., "curved"); the undergraduates and graduate students will be graded on different scales.

For undergraduate students:

Mid-Term Examination: 15% of grade

Final Examinations: 35% of grade

Each project: 12.5% of grade

Class attendance/participation: 10%

For graduate students:

Mid-Term Examination: 12.5% of grade

Final Examination: 30% of grade

Each project: 12.5% of grade

Class attendance/participation: 10%

Class notes: 7.5% of grade

(I know the totals exceed 100. Good for you!)

Instructor: Ashok K. Goel

Office: TSRB 219

Phone: 404-894-4994

Email: goel@cc.gatech.edu (best way to contact me)

Office Hours: MWF, 10:10-10:55 am

The best way to contact me is by email.

Ashok Goel
August 16, 2013

=====

=====

CS 4635/CS 7637
Knowledge-Based AI
Fall 2013
Ashok K. Goel & Joshua K. Jones

This is a preliminary, partial day-by-day class schedule.
We will update it periodically.

There is no textbook. We will post electronic versions
of various chapters and papers on the T square site for the
class.

Date	Topic	Readings
8/19	Introduction to KBAI Introduction to the course	Russell & Norvig Ch. 1 Section 1.1
8/21	Semantic Networks 1	Winston Chapter 2 pp. 15-33
8/23	Semantic Networks 2 (Last day to make schedule changes)	Winston Chapter 2 pp. 33-45
8/26	Means-Ends Analysis Introspection Project 1 is assigned	Winston Chapter 3
8/28	Production Rules 1	Winston Chapter 7 pp. 119-132
8/30	Production Rules 2	Winston Chapter 7 pp. 132-137
9/2	No class	
9/4	Production Systems Knowledge Acquisition Explanation	Winston Chapter 8
9/6	Review Project 1 is due	
9/9	Concepts, Frames 1 Project 2 is assigned	Winston Chapter 9 pp. 179-190
9/11	Concepts, Frames 2	Winston Chapter 9 pp. 197-206

9/13	Frames 1 Commonsense Reasoning Scripts	Winston Chapter 10 pp. 209-221
9/16	Frames 2 Commonsense Reasoning Scripts	Winston Chapter 10 pp. 221-229
9/18	Constraint Propagation Understanding	Winston Chapter 12 pp. 249-266
9/20	Logic 1 Deduction, Resolution Project 2 is due	Winston Chapter 13 pp. 283-293
9/23	Logic 2 Deduction, Resolution Project 3 is assigned	Winston Chapter 13 pp. 293-303
9/25	Planning 1	Winston Chapter 15 pp. 323-338
9/27	Planning 2	Russell & Norvig Section 11.3
9/30	Review	
10/2	Mid-Term Examination	
10/4	Learning by Analyzing Differences	Winston Chapter 16
10/7	Learning by Explaining Experience	Winston Chapter 17
10/9	Review Mid-Term Examination is returned	
10/11	Learning by Correcting Mistakes Project 3 is due (Last date for withdrawing from course)	Winston Chapter 18
10/14	No class	
10/16	Learning by Recording Cases Project 4 is assigned	Winston Chapter 19
10/18	Learning by Managing Models	Winston Chapter 20

10/21	Learning by Building Trees	Winston Chapter 21
10/23	Review	
10/25	Classification 1	Stefik pp. 543-556
10/28	Classification 2	Stefik pp. 588-596
10/30	Diagnosis 1	Stefik pp. 670-680
11/1	Diagnosis 2	Stefik pp. 680-690
11/4	Configuration Design 1 Project 4 is due	Stefik pp. 608-621
11/6	Configuration Design 2 Project 5 is assigned	Stefik pp. 656-666
11/8	Review	
11/11	Case-Based Reasoning -1 Case Retrieval	
11/13	Case-Based Reasoning -2 Case Adaptation	
11/15	Analogical Reasoning -1 Structure Mapping	
11/18	Analogical Reasoning -2 Generic Mechanisms	
11/20	Visuospatial Reasoning -1	Stefik pp. 432-442
11/22	Visuospatial Reasoning -1 Raven's test of intelligence	
11/25	Meta-Reasoning -1 Introspection, Strategy Selection	
11/27	Meta-Reasoning -2 Reflection, Self-Adaptation Project 5 is due	
11/29	No class	

12/2 Semantic Web -1

12/4 Semantic Web -2

12/6 AI Ethics

12/9 (Monday) 8:00 am -10:50 am Final Examination for the MWF 9:00 am class

12/11 (Wednesday) 2:50 pm - 5:40 pm Final Examination for the MWF 1:00 pm class

12/16 Grades assigned

12/17 Grades available

Ashok Goel and Josh Jones
August 16, 2013