CIS 530 / 730: (Principles of) Artificial Intelligence
Fall 2007

Hours: 3 hours, additional 3-hour project options available (CIS 690, CIS 798, or CIS 890)
Prerequisite: **CIS 300**, Data Structures and Algorithms, **CIS 501**, Software Architecture
Textbook: Russell, S. J., & Norvig, P. (2004) *Artificial Intelligence: A Modern Approach,* 2nd edition,. Englewood Cliffs, NJ: Prentice-Hall, 2004. ISBN: 0137903952
Venue: MWF 13:30 – 14:20, Room 127 Nichols Hall
Instructor: William H. Hsu, Department of Computing and Information Sciences
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Office hours: Mon before class; Mon/Wed after class (15:30 – 16:30), N127, Tue 12:10 – 15:10, N213, Fri 09:30 – 11:30; other times by appointment
Course web group / Tegrity lectures: K-State Online (KSOL) http://snipurl.com/v9v3
Course repository: http://www.kddresearch.org/Courses/Fall-2007/CIS730/

Course Description

This course provides fundamental background in intelligent systems for graduate and advanced undergraduate students. Topics to be covered include intelligent agents, problem-solving, uninformed and informed (heuristic) search, logical and probabilistic knowledge representation, logical and probabilistic inference, foundations of classical and universal planning, essentials of machine learning, neural networks, and genetic and evolutionary computation. A survey of computer vision and natural language processing (NLP) problems and techniqes is also presented. Applications to practical design and development of intelligent systems will be emphasized, leading to individual projects on current topics and applications in AI.

Course Requirements

Component	Components	Grade Value	Total Value
Exams and quizzes	Midterm exam	20%	53%
	1 final exam	30%	
	Quizzes	3%	
Homework and class participation	4 of 5 written problem sets 4 of 5 machine problems	8% (2% each) 8% (2% each)	16%
Term project (one of three implementations)	Project plan writeup Intermediate interview Merit (orig. / func. /effort / compl.) Report Presentation	2% 2% 16% (4% each) 4% 2%	26%
Class participation	Attendance Answering questions Discussion	3% 1% 1%	5%

Selected reading (on reserve in K-State CIS Library):

- Luger, G. F. (2005). *Artificial Intelligence: Structures and Strategies for Complex Problem Solving, 5th ed.* Reading, MA: Addison-Wesley.
- Negnevitsky, M. (2005). *Artificial Intelligence: A Guide to Intelligent Systems, 2nd ed.* Reading, MA: Addison-Wesley.
- Rich, E., & Knight, K. (1990). *Artificial Intelligence, 2nd ed.* McGraw-Hill, 1990.

Additional bibliography (excerpted in course notes and handouts):

- Ginsberg, M. (1993). *Essentials of Artificial Intelligence*. San Mateo, CA: Morgan-Kaufman.
- Nilsson, N. J. & Genesereth, M. R. *Logical Foundations of Artificial Intelligence*. San Mateo, CA: Morgan-Kaufmann, 1987.

Course Calendar

Lecture	Date	Topic	(Primary) Source
0	21 Aug 2007	Course overview: artificial intelligence	R&N 2e preface
1	23 Aug 2007	Intelligent agent framework	1.1 – 1.3
2	25 Aug 2007	Intelligent agents and problem solving	1.3 – 1.5, 2.1 – 2.2
3	28 Aug 2007	Search problems	2.3 – 2.5, 3.1
4	30 Aug 2007	Uninformed search: DFS, BFS, B&B, IDA	3.2 – 3.4
5	01 Sep 2007	Informed search: A*, heuristics	3.5 – 3.7; 4.1; project sel'ns
6	06 Sep 2007	Informed search: hill-climing, beam	4.2 – 4.3
7	08 Sep 2007	**C**onstraint **S**atisfaction **P**roblems	5.1 – 5.3; plan drafts due
8	11 Sep 2007	CSP concluded; game tree search	5.4; 6.1 – 6.3; plan interviews
9	13 Sep 2007	Eval funcs, expectiminimax; **AI apps 1 of 3**	6.4 – 6.8
10	15 Sep 2007	Logical agents, propositional logic in AI	7.1 – 7.4; plan revisions due
11	18 Sep 2007	Resolution, forward/backward chaining	7.5 – 7.7
12	20 Sep 2007	First-order logic: syntax and semantics	8.1 – 8.2
13	22 Sep 2007	First-order logic: KE and theorem proving	8.3 – 8.4, 9.1
14	25 Sep 2007	First-order logic: unification, inference, CLP	9.2 – 9.4
15	27 Sep 2007	First-order logic: resolution; **AI apps 2 of 3**	9.5
16	29 Sep 2007	Logic programming	9
17	04 Oct 2007	Knowledge representation (KR): ontologies	10.1 - 10.2
18	**06 Oct 2007**	**KR: sit. calculus, frame probs; review**	**10.3**
19	09 Oct 2007	Temporal reas., semantic nets, desc. logics	10.4 – 10.6
20	11 Oct 2007	Defeasible reasoning; **AI apps 3 of 3**	10.7 – 10.9; interim reports
21	13 Oct 2007	The planning problem; planning via search	11.1 – 11.2
22	**16 Oct 2007**	**Midterm Exam (Closed-Book)**	**1 – 10, except 4.4 – 4.5**
23	**18 Oct 2007**	**Partial-order planning; post-exam review**	**11.3; interim interviews**
24	20 Oct 2007	Graph planning	11.4 – 11.7
25	23 Oct 2007	Scheduling, HTN planning, conditional	12.1 – 12.4
26	25 Oct 2007	Planning: monitoring, cont., multi-agent	12.5 – 12.8
27	27 Oct 2007	Uncertainty: probability review	13
28	30 Oct 2007	Intro to graphical models, Part I	14.1 – 14.2
29	01 Nov 2007	Intro to graphical models, Part II	14.3 – 14.5
30	03 Nov 2007	Inference and software tools, Part I	14.1 – 14.2
31	06 Nov 2007	Inference and software tools, Part II	14.3 – 14.5
32	08 Nov 2007	Uncertainty: adv. topics, other approaches	14.6 – 14.8, survey of 15
33	10 Nov 2007	Machine learning: overview	18.1 – 18.2
34	13 Nov 2007	Decision trees	18.3
35	15 Nov 2007	Statistical learning	20.1
36	17 Nov 2007	Artificial neural networks	20.5
37	20 Nov 2007	Artificial neural networks and GEC	20.5; 4.3; draft reports due
38	27 Nov 2007	Genetic programming	Koza GP I video
39	29 Nov 2007	NLP survey	22.1, 22.6 – 7, final reports
40	01 Dec 2007	NLP survey, philosophical issues survey	Knight 2004, Cohen 2001, 27
41	04 Dec 2007	Robotics and vision survey	survey of 24 – 26; interviews
42	**06 Dec 2007**	**Review; Project highlights 1 of 2**	**1 – 10, 11 – 14, 18, 20**
43	08 Dec 2007	Project highlights 2 of 2	
44	**14 Dec 2007**	**Final exam,**	**1 – 10, 11 – 14, 18, 20, 22**

Lightly-shaded entries denote the due date of a written problem set.
Heavily-shaded entries denote the due date of a machine problem (programming assignment).
Green-shaded entries denote project milestones.
Blue shaded entries denote interview dates.
Projects are due on Mon 20 Nov 2007, with final interviews starting on Wed 29 Nov 2007.