CIS 530: Introduction to Artificial Intelligence
CIS 730: Artificial Intelligence
Fall 2018

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 (or equivalent programming background)
Textbook: Russell, S. J., & Norvig, P. (2010) *Artificial Intelligence: A Modern Approach,* 3rd edition. Englewood Cliffs, NJ: Prentice-Hall. ISBN-13: 978-0136042594. See: http://aima.cs.berkeley.edu
Venue: MWF 09:30 – 10:20 U.S. Central Time, 109 Justin Hall (CIS 530 A: Reference #10809; CIS 730 A: Reference #10822) & online via Global Campus (CIS 730 ZA: Reference #17844; CIS 730 ZB for Data Analytics certificate: Reference #17845)
Instructor: William H. Hsu, Department of Computer Science
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TA: Aditya Vijay Narkar, 2224 DUE Instructional alias: CIS730TA-L@listserv.ksu.edu
URL: http://bit.ly/hsu-calendar-color E-mail: bhsu@ksu.edu
Office hours: 10:30 – 11:30, 15:30 – 16:30 Mon, Wed; 08:00 – 09:00 Fri; 09:00 – 10:00 Tue; 18:30 Tue for distance students; by appointment
K-State Canvas page redirector: http://bit.ly/kstate-ai-class
Public mirror web page: http://kdd.cs.ksu.edu/Courses/CIS530/ (http://bit.ly/kstate-cis530-ai)
MediaSite lectures: Linked from K-State Canvas

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 techniques 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 (no proctor required)	Midterm exam	20%	50%
	1 final exam	30%	
Homework and class participation	Highest 7 scores of 5 problem sets, 5 machine problems	14% (2% each)	19%
	5 of 6 Canvas quizzes / labs	5% (1% each)	
Term project (one of five topics)	Plan writeup / intermediate interview Merit (orig. / func. /effort / compl.) Report Presentation & recording	4% (2% each) 16% (4% each) 3% 2%	25%
Class participation	Attendance / **using Global Campus** Discussions **(TopHat / Global Campus)** Quiz questions **(TopHat / Global Campus)**	1% 2% 3%	6%

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

- Poole, D. & Mackworth, A. (2017). *Artificial Intelligence: Foundations of Computational Agents, 2nd edition.* Cambridge, UK: Cambridge University Press.
- Luger, G. F (2009). *Artificial Intelligence: Structures and Strategies for Complex Problem Solving, 6th ed.* Reading, MA: Addison-Wesley.
- Rich, E., & Knight, K. (1990). *Artificial Intelligence, 2nd ed.* New York, NY: McGraw-Hill, 1990.

Additional bibliography (excerpted in course notes and handouts):

- Goodfellow, I., Bengio, Y., Courville, A., & Bach, F., (2016). *Deep Learning*. Cambridge, MA: MIT Press.
- Nilsson, N. J. & Genesereth, M. R. (1987). *Logical Foundations of Artificial Intelligence*. San Mateo, CA: Morgan-Kaufmann.

Course Calendar

Lecture	Date	Topic	Reading in R&N 3e
0	Mon 20 Aug 2018	Course overview: AI, intelligent agents	Preface, Chapter 1
1	Wed 22 Aug 2018	Problem solving, rationality, search intro	2.1 – 2.5, 3.1
2	Fri 24 Aug 2018	Uninformed search: DFS, BFS, DLS, B&B	3.2 – 3.4
3	Mon 27 Aug 2018	IDDFS, SMB; Informed search: A/A*	3.5.1 – 3.5.2
4	Wed 29 Aug 2018	Informed: A*, IDA/SMA, heuristics, SA, GA	3.5.2 – 3.5.7, proj. topics
5	Fri 31 Aug 2018	Informed: hill-climbing, beam, greedy	4 (esp. 4.1 – 4.2)
6	Wed 05 Sep 2018	Adversarial search; minimax, alpha-beta	5.1 – 5.3
7	Fri 07 Sep 2018	Evaluation functions, expectiminimax	5.3 – 5.4; plan drafts due
8	Mon 10 Sep 2018	Constraint satisfaction search	6.1 – 6.2; plans
9	Wed 12 Sep 2018	Backtracking CSP; **AI apps 1 of 3**	6.3 – 6.6
10	Fri 14 Sep 2018	Logical agents, propositional logic in AI	7.1 – 7.4; plan revs. due
11	Mon 17 Sep 2018	Fwd./backward chaining, resolution, Rete	7.5 – 7.8
12	Wed 19 Sep 2018	First-order logic: syntax, semantics	8.1 – 8.2
13	Fri 21 Sep 2018	First-order logic: KE & theorem proving	8.3 – 8.4, 9.1
14	Mon 24 Sep 2018	First-order logic: unification, inference, CLP	9.2 – 9.4
15	Wed 26 Sep 2018	First-order logic: resolution; **AI apps 2 of 3**	9.5
16	Fri 28 Sep 2018	Logic programming & expert systems	9
17	Mon 01 Oct 2018	Planning overview & classical planning	10
18	Wed 03 Oct 2018	Modern planning	11
19	**Fri 05 Oct 2018**	**Knowledge representation overview**	**12.1 – 12.2**
20	Mon 08 Oct 2018	NLP survey	22.1 – 22.3, 23.4 – 23.5
21	Wed 10 Oct 2018	KR: situation calculus, frame probs	12.3
	Fri 12 Oct 2018	**Midterm Exam (Online / Open-Textbook)**	**1 – 3, 4.1 – 4.3, 5 – 10.3**
22	**Mon 15 Oct 2018**	**Vision Survey 1; Review**	**24; interim reports**
23	Wed 17 Oct 2018	Semantic networks & ontologies	12.4 – 12.5; interviews
24	Fri 19 Oct 2018	Defeasible reasoning; **AI apps 3 of 3**	12.6; interviews
25	Mon 22 Oct 2018	Analogy and case-based reasoning 1	Analogy handout: Forbus
26	Wed 24 Oct 2018	Analogy and case-based reasoning 2	Analogy handout
27	Fri 26 Oct 2018	Probability review; formalisms	13, 14.7
28	Mon 29 Oct 2018	Reasoning under uncertainty	14.1 – 14.4, P&M 8
29	Wed 31 Oct 2018	Introduction to graphical models	14.4 – 14.6, P&M 8
30	Fri 02 Nov 2018	Machine learning: overview	18.1 – 18.2
31	Mon 05 Nov 2018	Machine learning: basics, classification	18.3 – 18.4, 18.6, 18.8
32	Wed 07 Nov 2018	Intro to artificial neural networks	18.7, 18.9
33	Fri 09 Nov 2018	Robotics survey	25
34	Mon 12 Nov 2018	Learning under uncertainty	20, P&M 10
35	Wed 14 Nov 2017	Deep learning basics 1	DL handout: GBCB
36	Fri 16 Nov 2018	Deep learning basics 2	DL handout
37	Mon 26 Nov 2018	Planning under uncertainty	16, P&M 9
38	Wed 28 Nov 2018	Decision process models	17, P&M 9
39	Fri 30 Nov 2018	Vision survey 2	24.4 – 24.6
40	Mon 03 Dec 2018	Philosophical issues survey	26, 27.3 – 27.4
41	**Wed 05 Dec 2018**	**Review; Project highlights 1 of 2**	**1-11, 12-14, 18, 22-27**
42	Fri 07 Dec 2018	Project highlights 2 of 2	
		FINAL (Online / 11:50 Mon 10 Dec 2018)	**1-11, 12-14, 18, 22-27**

Lightly-shaded entries denote due dates of written problem sets: 4, 11, 14, 25, 33
Aqua-shaded entries denote lab days (usually every other Wednesday): 1, 6, 12, 17, 29, 35
Heavily-shaded entries denote due dates of machine problems (programming HW): 7, 19, 28, 31, 36
Green-highlighted entries denote project milestones. Yellow-highlighted entries denote interview dates.

The above due dates are for on-campus students. Global Campus (distance) student due dates for homeworks and projects are 48 hours later, by default.

Green font: exam review day; blue font: exam day; red font: post-exam / model solution release

Project reports are due on Fri 30 Nov 2018, with final interviews starting on Mon 03 Dec 2018.