CSCI-561 Foundations of Artificial Intelligence – Spring 2013 Syllabus and Schedule

Week	Date	Topic	Reading	Misc
1	Jan 14	Welcome – Introduction. Why study AI? What is AI? The Turing test. Rationality. Branches of AI. Research disciplines connected to and at the foundation of AI. Brief history of AI. Challenges for the future.	AIMA 1	
	Jan 16	Intelligent Agents - What is an intelligent agent? Examples. Doing the right thing (rational action). Performance measure. Autonomy. Environment and agent design. Structure of agents. Agent types. Reflex agents. Reactive agents. Reflex agents with state. Goal-based agents. Utility-based agents. Mobile agents. Information agents.	AIMA 2	
2	Jan 21	MLK day – no class		
	Jan 23	Problem Solving & Search - Example: measuring problem. Types of problems. More example problems. Basic idea behind search algorithms. Complexity. Combinatorial explosion and NP completeness. Polynomial hierarchy.	AIMA 3	
3	Jan 28	Uninformed Search - Depth-first. Breadth-first. Uniform-cost. Depth-limited. Iterative deepening. Examples. Properties.	AIMA 3	HW1 out
	Jan 30	Continue uninformed search.	AIMA 3	
4	Feb 4	Informed search – Best-first. A* search. Heuristics. Hill climbing. Problem of local extrema. Simulated annealing	AIMA 4	
	Feb 6	Continue Informed search.	AIMA 4	
5	Feb 11	Game Playing - The minimax algorithm. Resource limitations. Alpha-beta pruning. Chance and non-deterministic games.	AIMA 5	
	Feb 13	Continue Game Playing.	AIMA 5	HW1 due
6	Feb 18	President's day – no class		
	Feb 20	Agents that reason logically 1 – Knowledge - based agents. Logic and representation. Propositional (boolean) logic.	AIMA 7	HW2 out
7	Feb 25	Agents that reason logically 2 – Inference in propositional logic. Syntax. Semantics. Examples.	AIMA 7	
	Feb 27	First-order logic 1 – Syntax. Semantics. Atomic sentences. Complex sentences. Quantifiers. Examples. FOL knowledge base. Situation calculus.	AIMA 8	
8	Mar 4	First-order logic 2 – Describing actions. Planning. Action sequences.	AIMA 8	

	Mar 6	Building a knowledge base – Knowledge bases. Vocabulary and rules. Ontologies. Organizing knowledge.	AIMA 12	
9	Mar 11	Inference in first-order logic – Proofs. Unification. Generalized modus ponens. Forward and backward chaining.	AIMA 9	HW2 due
	Mar 13	Continue Inference in first-order logic.	AIMA9	
10	Mar 18	Spring break – no class		
	Mar 20	Spring break – no class		
11	Mar 25	Continue Inference in first-order logic.	AIMA 9	
	Mar 27	Midterm exam – in class		HW3 out
12	Apr 1	Logical reasoning systems – Indexing, retrieval and unification. The Prolog language. Theorem provers. Frame systems and semantic networks.	AIMA 9	
	Apr 3	Planning – Definition and goals. Basic representations for planning. Situation space and plan space. Examples.	AIMA 10	
13	Apr 8	Fuzzy logic – concepts, fuzzy inference, aggregation, defuzzyfication	Handout	
	Apr 10	Continue Fuzzy Logic	Handout	HW3 due
14	Apr 15	Neural Networks – Introduction to perceptrons, Hopfield networks, self-organizing feature maps. How to size a network? What can neural networks achieve?	Handout	HW4 out
	Apr 17	Genetic Algorithms – Introduction to genetic algorithms and their use in optimization problems.	Handout / AIMA 18	
15	Apr 22	Reasoning under uncertainty – probabilities, conditional independence, Markov blanket, Bayes nets	AIMA 14	
	Apr 24	Continue Reasoning under uncertainty	AIMA 14	
16	Apr 29	Challenges in perception, particularly vision	Handout	
	May 1	Towards intelligent machines - The challenge of robots: with what we have learned, what hard problems remain to be solved? Different types of robots. Tasks that robots are for. Parts of robots. Architectures. Configuration spaces. Navigation and motion planning. Towards highly-capable robots.	AIMA 26, 27	HW4 due

Final exam: Monday May 13, 2-4pm, room TBD (follows University schedule for final exams)