CSCI-561 Foundations of Artificial Intelligence – Spring 2014 Syllabus and Schedule

Week	Date	Topic	Reading	Misc
1	Jan 13	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 15	Intelligent Agents – What is an intelligent agent? Doing the right thing (rational action). Performance measure. Autonomy. Environment and agent design. Structure of agents. Agent types.	AIMA 2	
2	Jan 20	MLK day – no class		
	Jan 22	Problem Solving & Search – Types of problems. More example problems. Basic idea behind search algorithms. Complexity. Combinatorial explosion and NP completeness. Polynomial hierarchy.	AIMA 3	
3	Jan 27	Uninformed Search - Depth-first. Breadth-first. Uniform-cost. Depth-limited. Iterative deepening. Examples. Properties.	AIMA 3	HW1 out
	Jan 29	Continue uninformed search.	AIMA 3	
4	Feb 3	Informed search – Best-first. A* search. Heuristics. Hill climbing. Problem of local extrema. Simulated annealing.	AIMA 4	
	Feb 5	Continue Informed search. Genetic Algorithms.	AIMA 4	
5	Feb 10	Game Playing - The minimax algorithm. Resource limitations. Alpha-beta pruning. Chance and non-deterministic games.	AIMA 5	
	Feb 12	Constraint satisfaction. Node, arc, path, and k-consistency. Backtracking search. Local search using min-conflicts.	AIMA 6	HW1 due
6	Feb 17	President's day – no class		
	Feb 19	Agents that reason logically 1 – Knowledge - based agents. Logic and representation. Propositional (boolean) logic.	AIMA 7	HW2 out
7	Feb 24	Agents that reason logically 2 – Inference in propositional logic. Syntax. Semantics. Examples.	AIMA 7	
	Feb 26	First-order logic 1 – Syntax. Semantics. Atomic sentences. Complex sentences. Quantifiers. Examples. FOL knowledge base. Situation calculus.	AIMA 8	
8	Mar 3	First-order logic 2 – Describing actions. Planning. Action sequences.	AIMA 8	

	Mar 5	Building a knowledge base – Knowledge bases. Vocabulary and rules. Ontologies. Organizing knowledge.	AIMA 12	
9	Mar 10	Inference in first-order logic – Proofs. Unification. Generalized modus ponens. Forward and backward chaining.	AIMA 9	HW2 due
	Mar 12	Continue Inference in first-order logic.	AIMA9	
10	Mar 17	Spring break – no class		
	Mar 19	Spring break – no class		
11	Mar 24	Continue Inference in first-order logic.	AIMA 9	
	Mar 26	Midterm exam – in class		HW3 out
12	Mar 31	Logical reasoning systems – Indexing, retrieval and unification. The Prolog language. Theorem provers. Frame systems and semantic networks.	AIMA 9	
	Apr 2	Planning – Definition and goals. Basic representations for planning. Situation space and plan space. Examples.	AIMA 10	
13	Apr 7	Fuzzy logic – concepts, fuzzy inference, aggregation, defuzzyfication.	Handout	
	Apr 9	Learning from examples – supervised learning, learning decision trees, support vector machines.	AIMA 18 + handout	HW3 due
14	Apr 14	Learning with neural networks – perceptrons, Hopfield networks, self-organizing feature maps. How to size a network? What can neural networks achieve?	Handout + AIMA 18	HW4 out
	Apr 16	Reasoning under uncertainty – probabilities, conditional independence, Markov blanket, Bayes nets.	AIMA 13, 14	
15	Apr 21	Continue Reasoning under uncertainty – Probabilistic reasoning in time. Hidden Markov Models, Kalman filters, dynamic Bayesian networks.	AIMA 14, 15	
	Apr 23	Probabilistic decision making – utility theory, decision networks, value iteration, policy iteration, Markov decision processes	AIMA 16, 17	
16	Apr 28	Challenges in perception, particularly vision	AIMA 24	
	Apr 30	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.	AIMA 26, 27	HW4 due

Final exam: Monday May 12, 2-4pm, room TBD (follows University schedule for final exams)