

## CSCI-561 Foundations of Artificial Intelligence (Section 30195) – Fall 2013 Syllabus and Schedule

Classes: Wednesday 3:30-6:10PM, Room SLH102

Office Hours: Wednesday 1:30-3:30PM, 6:10-7:10PM (SAL 216)

Text Books: (1) AIMA, (2) Autonomous Learning from the Environment (ALFE)

Week	Date	Topic	Reading	Homework	Project
1	Aug28	Welcome! Introduction and history of AI, Intelligent agents, systems, and robots. Class structures, lectures, readings, homework, projects, exams, grades	AIMA1 AIMA2 ALFE-1		Project-1 out: robot move!
2	Sep 4	Problem Solving, Search, and Optimization Problems Representations, goals, and various search algorithms Description of three projects. Project 1 handout	AIMA3 AIMA4 ALFE-2,6	HW1, Encode State Space	
3	Sep11	Game Playing and Constraint Satisfaction Representations and algorithms	AIMA5 AIMA6	HW2: Search	
4	Sep18	Logical Representations and Reasoning Propositional logic and inferences First-order logic and inferences, and systems	AIMA7 AIMA8 AIMA9	HW3: Logic	Project-1 due
5	Sep25	Intelligent Actions, Planning, and Robotics Planning and scheduling. General model of robotics, description and handout for Project 2	AIMA10 AIMA11 ALFE-3, 6.1	HW4: Planning	Project-2 out: robot search!
6	Oct 2	Knowledge representations and model representations Logics and probabilities. Knowledge bases, Expert systems, Action models.	AIMA 12 ALFE-4	HW5: Game playing	
7	Oct9	Uncertain Knowledge and Reasoning Uncertainty, Probabilistic Representation & Reasoning, <b>Bayesian Networks</b>	AIMA13-14 ALFE-4	HW6: Probability	
8	Oct16	Probabilistic Reasoning over time: Temporal models, <b>Hidden Markov Models</b> , Kalman filters, Dynamic Bayesian Networks, Automata theory	AIMA15 ALFE-5,10	HW7: BN HMM, FSA	
9	Oct23	Utility Theories, functions, decision networks Sequential decision making, Policies, <b>MDP, PO-MDP</b> , Multiagent decisions, <b>Review for midterm exam</b>	AIMA 16-17 ALFE 5	HW8: POMOP	Project-2 due
10	Oct30	<b>Midterm Close-book Exam (all materials above) – in class</b>			Project-3 out: Robot learns!
11	Nov 6	<b>Attribute-Based Learning:</b> Forms of learning, Model selection, Supervised Learning of <b>Decision Trees</b> , PAC learning, Decision Lists, Supervised learning: <b>Neural Networks</b> , Support Vector Machines, Ensemble and boost	AIMA18 ALFE 4.1-5	HW9: DT, NN, SVMs	
12	Nov13	<b>Relation-Based Learning:</b> Motivations, challenges, and algorithms. Inductive logic programming, Complementary Discrimination Learning	AIMA 19 ALFE 4.6-10	HW10: FOIL, CDL	
13	Nov20	<b>Probability-Based Learning:</b> Probabilistic Models, Naïve Bayes Models, EM algorithm, Reinforcement Learning	AIMA 20-21 ALFE-5.10	HW11: RL, NBM, EM	
14	Nov27	<b>Surprise-Based Learning</b> (guest lecture by Dr. Nadeesha Ranasinghe) Integrated Perception, Action, Problem Solving, and Learning. The challenge of vision and object/people/activity recognition, and robotic applications.	AIMA 24 ALFE-7-12	HW12: SBL	Final exam questions out
15	Dec 4	Introduction to Communication (Natural Language Processing), Collaboration, Self-organization, and Self-reconfiguration	AIMA22-23 Handout		
16	Dec11	Future intelligent systems - 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, motion planning, locomotion, manipulation, and reconfiguration.	AIMA 25 LAFE-13 Handout		Project3 due
17	Dec16	<b>2-4PM: Final Close-book Exam (materials of entire semester) – in class</b>			Final Exam

Project 1: Design and implement a simple robot Rx to move from point A to point B in an open environment.

Project 2: Give Rx intelligence so that it can search and navigate a path from point A to point B in a crowded environment.

Project 3: Make Rx learn from its own experience so that it can find a target in its environment.

Extra-Credit: Make Rx transform itself in order to solve problems in Project 2 and Project 3.

Grade Structure: Midterm: 25%, Final: 25%, Project-1: 10%, Project-2: 20%, Project-3: 20%.

Late Project Penalty: -30% of the project grade for each day that is late.

Class Website: <http://www.isi.edu/robots/CS561> (more information can be found here)