Overview

This course will study the formulation and solution of decision making problems by automated agents. Topics covered include Markov decision processes (MDPs), automated classical and probabilistic planning, reinforcement learning (RL), hierarchical planning and RL, partially observable MDPs, Bayesian RL, collaborative multi-agent systems. Guest lectures will explore the application of these concepts to robotics and their neural correlates in the human brain.

Grading

Evaluation: 3 written homeworks, 3 programming assignments, 2 paper discussion sessions, course project
Written Assignments and Paper Discussion: 35%
Programming Assignments: 40%
Course Project: 20%
Class Participation: 5%

* Written assignments are due by midnight on the due date, either in class or on Blackboard. Programming assignments are due by midnight on the due date in Blackboard.
* Assignments submitted late are penalized @ 10% for each extra day after the due date. If you have a very good reason, such an illness, please see me.

* Collaboration policy:
  You can submit all assignments in pairs. You do not have to pair up with the same person for all assignments.

  Each assignment must contain the names of both persons and the statement **"We certify that we have contributed equally towards this assignment."**

  You are welcome to discuss assignments with each other and with me, but do not copy solutions from any source, including the web. Any assignment with your name on it must be substantially your work.

Case Academic Integrity Policy
<http://studentaffairs.case.edu/groups/aiboard/policy.html>

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Topics
1. Propositional Logic Ch 7 (R&N)
2. STRIPS and State-space planning Ch 2.3, 2.5, 4 (Ghallab), Ch 10 (R&N)
3. Partial Order Planning Ch 5 (Ghallab), 10.4 (R&N)
4. Graphplan Ch 6 (Ghallab), 10.3 (R&N)
5. SATplan Ch 7 (Ghallab), 10.4 (R&N)
6. Hierarchical Planning Ch 11 (R&N)
7. Planning with Time and Resources
8. Planning case studies
9. Bayesian Networks, Exact Inference in Bayesian Networks Ch 14, R&N
10. Approximate Inference, MCMC, Dynamic Bayesian Networks Ch 14 & 15, R&N
11. Markov Decision Processes, Bandit Problems Ch 3, Sutton/Barto
12. Value and Policy Iteration Ch 4, Sutton/Barto
13. Model-free Reinforcement Learning Ch 5 and 6, Sutton/Barto
14. Function Approximation Ch 8, Sutton/Barto
15. Policy Gradient Methods
16. Multiagent Reinforcement Learning (paper)
17. Hierarchical Reinforcement Learning (paper)
18. Bayesian Reinforcement Learning (paper)
19. Apprenticeship Learning (paper)
20. Partially Observable MDPs (paper)
21. Knowledge transfer in RL (paper)
22. Learning representations for function approximation (paper)
23. Guest lectures: planning in robotics, neuroscience of reinforcement learning