Dynamic and Distributed Decision Making (MIE567S)

Course Description:

This course is to provide fundamental concepts and mathematical frameworks for sequential decision making of a team of decision makers in the presence of uncertainty. Topics include Markov decision processes, reinforcement learning, theory of games, multi-agent reinforcement learning and decentralized Markov decision processes. The course is technical by nature and for advanced students with strong mathematical background and programming skills.

Textbook:	No textbook
References:	Reinforcement Learning: An Introduction, Second Ed., R. Sutton and A. Barto, MIT Press, 2018
	Markov Decision Processes in Artificial Intelligence, edited by Sigaud and Buffet, Wiley, 2008
	Games of Strategy, Dixit and Skeath, Reiley, W.W. North & Company, 2014

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List of topics:

1. Markov decision processes
   a. Finite MDP (Ch 3 of Sutton and Barto)
   b. Algorithms (Ch 4 of Sutton and Barto)
2. Reinforcement Learning
   a. Sampling-based approach to MDP (Ch 5 of Sutton and Barto)
   b. Various RL algorithms (Ch 6, 7, 8 of Sutton and Barto)
3. Game theory and solution methods
   a. Basic concepts and theories (Dixit et al.)
   b. Stochastic games (Ch 8 of Sigaud and Buffet)
   c. Multi-agent reinforcement learning algorithms

Learning Objectives:

By successfully completing the course, each student will be able to

- Formulate team decision problem as a Markov decision process
- Understand fundamental concepts and theories in multi-agent reinforcement learning
- Implement the standard and refined algorithms for multi-agent learning and decision problems

| **Lecture Hours:** | Monday | 11:00 – 12:00 | (BA1220) |
| | Wednesday | 10:00 – 12:00 | (BA1220) |

Course Web: Quercus (MIE567) at q.utoronto.ca

Bulletin Board: Please post your course related questions in the "discussion board (Q&A)" of our course web.
Email questions won't be answered.

Office Hours: In BA8110 or outside of BA1220 after lecture on Wednesday

Tutorial Hours: Tuesday   13:00 - 15:00   (HA403)

First tutorial   Jan/14 (Tue).

A TA will be available to answer questions related to course materials and any other course related issues.

Evaluation: 35* %   Final Examination

45* %   3 Projects (15% each)

20* %   Mid-term exam

* To be finally confirmed later

Important Dates: Exam   March/4/2019 (Wed)

10:20 to 11:50

TBA

Final Exam: TBA

Policies

1. Complaints regarding marks will have to be submitted to the grading TA via email using the following subject line within a week from the distribution of graded works.

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    Subject line: MIE567 Grading Issues from (your student #)
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2. Academic integrity

    Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations on Academic Integrity, students are reminded that plagiarism or any other form of cheating in examinations, term tests, assignments, projects, or laboratory reports is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating by another student is also subject to serious academic penalty.