CSC2542
Topics in KR&R:
AI Automated Planning

Sheila McIlraith
Department of Computer Science
Winter, 2019
General Information

**URL:**  http://www.cdf.toronto.edu/~csc2542h/winter/

**Lectures:**  Thursday 12:00 – 2:00 PM, BI 131 (100 College Street)

**Instructor:**  Sheila McIlraith

**Teaching Assistants:**  Leon Illanes and Alberto Camacho

**Email:**  csc2542prof@cs.toronto.edu

**Office:**  Pratt 398D  (6 King’s College Road, 3rd floor)

**Office Hours:**  Tuesday 10:00 – 11:00 AM

**Communication:**  We’ll be using Piazza for communication and discussion.

**Announcements:**  via piazza or occasionally via email
Course Description

Automated planning is a subfield of AI that concerns the generation of plans, policies, or strategies for execution by agents. It is central to sequential decision making and to the construction of intelligent agents and autonomous robots. In this course, we will investigate theory and algorithms for automated plan generation and execution with and without the existence of reliable models. We will do so in settings where actions are deterministic, non-deterministic, stochastic, or where outcomes are unknown; and where actions affect the state of the world, or an agent's state of knowledge. We will do so under settings of full or partial observability, and in the pursuit of objectives in the form of goals, preferences or rewards that may or may not be Markovian. The theory and algorithms we will be exploring in this course are applicable to a diversity of problems beyond the development of intelligent agents or cognitive robots, including activity and plan recognition, program synthesis, automated monitoring and diagnosis, and software and hardware verification.
Course Description (cont.)

Format: class lectures, research paper readings and presentations.

Prerequisites:
  - introductory AI course (CSC384 or comparable)
  - knowledge of logic and probability
  - knowledge of search algorithms

Breadth Area: M1/RA11

Each week we will have a lecture and/or selected readings. Watch the course Web page.
Learning Objectives

- Understand the theoretical and algorithmic foundations of a spectrum of planning techniques and algorithms.
- Understand fundamental concepts that underlie a spectrum of state-of-the-art planners, when they are applicable, their merits and shortcomings, and
- Understand the merits and shortcomings of model-based vs model-light or model-free planning and learning
- Obtain a level of proficiency to support reading (and understanding!) research papers and conducting research in the area.

... and have fun doing it!
Reference Material

There is no one good textbook for this course. We’ll point you to readings or other resources that we think will be interesting/helpful.

- **A Concise Introduction to Models and Methods for Automated Planning**
  Hector Geffner and Blai Bonet
  Online copy available free through Science Direct

- **Artificial Intelligence: A Modern Approach (3rd edition)**
  Stuart Russell and Peter Norvig
  (at least) on hold in the library
Reference Material (cont.)

There is no one good textbook for this course. We’ll point you to readings or other resources that we think will be interesting/helpful.

- **Heuristic Search: Theory and Applications**
  Stefan Edelkamp
  (electronic copy available in library)
  [http://search.library.utoronto.ca/details?8124175](http://search.library.utoronto.ca/details?8124175)

- **Automated Planning: Theory and Practice**
  Authors: Ghallab, Nau, Traverso
  (online copy available free through science direct)
Reference Material

There is no one good textbook for this course. We’ll point you to readings or other resources that we think will be interesting/helpful.

- Reinforcement Learning: An Introduction
  Richard S. Sutton and Andrew G. Barto
  2nd Edition (not the 1998 edition)
  (available online)
Grading

The grading breakdown is as follows:

- Written paper review & class participation: 10%
- Class paper presentation: 15%
- Assignment/Exercises: 20%
- Course project: 55%

There is no exam.
Caveat: Details may change

The class is larger than we anticipated. Depending on how many students stay enrolled in the course we may modify expectations slightly to accommodate finite resources. The grade distribution will stay the same. Changes that may occur: more than 1 person may be assigned to a paper presentation.
Getting to know each other

- What is your **home department**?
  - (CS, MIE, I-school, UTIAS, EE, ...)

- What is your **primary area of research** right now
  - (undecided, AI, DB, SE, networks, theory, ...)

- What **preparation** do you have for the course?
  - Previous AI/ML courses/experience?

- What interests you about the course?
  - Particular application in mind, interest in techniques?

- If you’re interested in a **particular aspect** of the course, what is it?
  - (e.g., search, planning, MDPs, reinforcement learning)

- If you’re interest in applying planning to a particular application, what is it?
  - (e.g., robots, software agents, advertising, ...
Logistics Poll

- Class time OK?
- Office hours?