CMPUT 609 Reinforcement Learning II (Wi19)

Reinforcement Learning II Syllabus

General Information

Term: Winter, 2019 (Lecture B1)
Date and Time: Tu/Th 3:30-4:50pm starting January 8 and ending April 9
Location: CSC B2

Lab time, as needed, will follow each lecture and run until 6pm

Number of credits: 3

Overview

New in 2019 this course is an advanced treatment of the reinforcement learning approach to artificial intelligence, emphasizing the second and third parts of the second edition of the textbook *Reinforcement Learning: An Introduction*, by the instructor, Rich Sutton, and Andrew Barto. Students should have covered Part I of the textbook either in a previous course (such as CMPUT 366) or in extensive self study. Also required is comfort with the mathematics of probability distributions, expectations, linear algebra, and elementary calculus.

Reinforcement learning concerns the design of complete agents interacting with stochastic, incompletely-known environments, adapting ideas from machine learning, operations research, and control theory as well as from psychology and neuroscience to produce some strikingly successful engineering applications, such as AlphaGo. The focus is on algorithms for learning what actions to take, and when to take them, so as to optimize long-term performance. This may involve sacrificing immediate reward to obtain greater reward in the long-term or just to obtain more information about

the environment.

The course takes a deeper look at the foundations of Markov decision processes, temporal difference learning, multi-step learning, function approximation, off-policy training, eligibility traces, policy gradient methods, general value functions, planning, and the concept of state. The focus is on the development of intuition relating the mathematical theory of reinforcement learning to the ambitious goals of artificial intelligence.

Objectives

The student who understands the material in this course will thoroughly understand the foundations of the reinforcement learning approach to artificial intelligence and will be well prepared to conduct research in this area. They will be able to apply reinforcement learning ideas in novel ways and will be able to appreciate and critically assess claims made about reinforcement learning.

Pre-requisites

Students should have covered Part I of the textbook either in a previous course (such as CMPUT 366) or in extensive self study. Also required is comfort with the mathematics of probability distributions, expectations, linear algebra, and elementary calculus.

Course Work and Evaluation

Course work will be evaluated based on a written research diary, a final exam, and a final project. The relative weighting on each component will be approximately 1/3, 1/3, and 1/3 respectively (small adjustments may be made during the term).

Course Materials

We will be using the following textbook extensively:

Sutton and Barto,*Reinforcement Learning: An Introduction*, *second edition*, MIT Press. The book is available in the bookstore and at Amazon. It is also available online at http://www.incompleteideas.net/book/the-book.html.

Other materials will be from the literature.

Academic Integrity

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The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviourand avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University. (GFC 29 SEP 2003)

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