

COMP 4900C / 5900J

Introduction to Reinforcement Learning

Course Outline

Instructor: Junfeng Wen (junfeng.wen [AT] carleton.ca)

Winter 2023
School of Computer Science
Carleton University

Course Information

Instructor: Junfeng Wen

Contact: junfeng.wen [AT] carleton.ca

Classroom: Room location is posted on the public class schedule

Lectures: Mondays & Wednesdays 4:05 pm - 5:25 pm

Office Hours: By appointment

Brightspace access for University of Ottawa Students: please see information [here](#)

Course Description

This is an introductory course for reinforcement learning (RL), where a learning agent interacts with a complicated environment in order to perform certain task. This course will cover the fundamentals of reinforcement learning. Students will understand, design and program an RL agent to make sequential decisions.

Recommended Textbooks

- *Reinforcement Learning: An Introduction* (2nd edition), Richard S. Sutton and Andrew G. Barto [Available [online](#)]
- *Algorithms for Reinforcement Learning*, Csaba Szepesvari [Available [online](#)]
- *Markov Decision Processes: Discrete Stochastic Dynamic Programming*, Martin L. Puterman

Prerequisites

COMP 2402, COMP 2404, STAT 2507 and (MATH 1104 or MATH 1107). Students are expected to be familiar with linear algebra, calculus, basic statistics and Python programming.

Topics

- Multi-armed bandit
- Markov decision process
- Dynamic programming methods

- Monte-Carlo methods
- Temporal difference learning
- Planning and learning
- Prediction and control with function approximation
- Policy gradient methods
- Deep reinforcement learning methods

Evaluation

- Three assignments 60% (20% each)
- Group project 40% (presentation and final report)

Late Policy

- For assignments, you have 3 excused days **throughout the term** (rounded up to the nearest day) to account for any unforeseeable difficulties. After that no late submission will be accepted.
- All submissions are handled electronically (i.e., through Brightspace). Technical problems do not exempt you from late policy, so if you wait until the last minute and then have issues with your connection, it will still count as a late submission. Consequently, you are advised to
 1. Periodically upload you progress
 2. Attempt to submit your final submission early (e.g., at least one hour in advance of the due date and time) and
 3. Download the submitted files to make sure they are correct

Intellectual Property

All materials created for this course (including, but not limited to, lecture notes, in-class examples, tutorial exercises, assignments, examinations, and posted solutions) remain the intellectual property of the instructor. These materials are intended for the personal and non-transferable use of students registered in the current offering of the course. Reposting, reproducing, or redistributing any course materials, in part or in whole, without the written consent of the instructor, is strictly prohibited.

Sharing assignment or quiz specifications or posting them online (to sites like Chegg, CourseHero, OneClass, etc.) is considered academic misconduct. You are never permitted to post, share, or upload course materials without explicit permission from your instructor. Academic integrity offences are reported to the office of the Dean of Science. Penalties for such offences can be found on the [ODS webpage](#).

Undergraduate Academic Advisors

The Undergraduate Advisors for the School of Computer Science are available in Room 5302 HP; or by email at scs.ug.advisor@cunet.carleton.ca. The undergraduate advisors can assist with information about prerequisites and preclusions, course substitutions/equivalencies, understanding your academic audit and the remaining requirements for graduation. The undergraduate advisors will also refer students to appropriate resources such as the Science Student Success Centre, Learning Support Services and Writing Tutorial Services.

Graduate Academic Advisors

The Graduate Advisors for the School of Computer Science are available in Room 5302 HP; or by email at grad.scs@carleton.ca. The graduate advisors can assist with understanding your academic audit and the remaining courses required to meet graduation requirements

SCS Computer Laboratory

Students taking a COMP course can access the SCS computer labs. The lab schedule and location can be found [here](#). All SCS computer lab and technical support information can be found [here](#). Technical support staff may be contacted in-person or virtually, see [this page](#) for details.

University Polices

For information about Carleton's academic year, including registration and withdrawal dates, see [Carleton's Academic Calendar](#).

Pregnancy Obligation. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit [Equity Services](#).

Religious Obligation. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit [Religious/Spiritual Observances](#).

Academic Accommodations for Students with Disabilities. If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. For more details, visit the [Paul Menton Centre](#) website.

Survivors of Sexual Violence. As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: [Sexual Violence Support](#).

Accommodation for Student Activities. Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see [the policy](#).

Student Academic Integrity Policy. Every student should be familiar with the Carleton University student academic integrity policy. A student found in violation of academic integrity standards may be awarded penalties which range from a reprimand to receiving a grade of F in the course or even being expelled from the program or University. Examples of punishable offences include: plagiarism

and unauthorized co-operation or collaboration. Information on this policy may be found [here](#).

Plagiarism. As defined by Senate, “plagiarism is presenting, whether intentional or not, the ideas, expression of ideas or work of others as one’s own”. Such reported offences will be reviewed by the office of the Dean of Science. Standard penalty guidelines can be found [here](#).

Unauthorized Co-operation or Collaboration. Senate policy states that “to ensure fairness and equity in assessment of term work, students shall not co-operate or collaborate in the completion of an academic assignment, in whole or in part, when the instructor has indicated that the assignment is to be completed on an individual basis”. Please refer to the course outline statement or the instructor concerning this issue.

Special Information

It is important to remember that COVID is still present in Ottawa. The situation can change at any time and the risks of new variants and outbreaks are very real. There are number of actions you can take to lower your risk and the risk you pose to those around you including being vaccinated, wearing a mask, staying home when you’re sick, washing your hands and maintaining proper respiratory and cough etiquette.

Feeling sick? Remaining vigilant and not attending work or school when sick or with symptoms is critically important. If you feel ill or exhibit COVID-19 symptoms do not come to class or campus. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In all situations, you must follow Carleton’s symptom reporting protocols.

Masks: Carleton has paused the COVID-19 Mask policy, but continues to strongly recommend masking when indoors, particularly if physical distancing cannot be maintained. It may become necessary to quickly reinstate the mask requirement if pandemic circumstances were to change.

Vaccines: While proof of vaccination is no longer required as of May 1 to attend campus or in person activity, it may become necessary for the University to bring back proof of vaccination requirements on short notice if the situation and public health advice changes. Students are strongly encouraged to get a full course of vaccination, including booster doses as soon as they are eligible, and submit their booster dose information in cuScreen as soon as possible. Please note that Carleton cannot guarantee that it will be able to offer virtual or hybrid learning options for those who are unable to attend the campus.

All members of the Carleton community are required to follow requirements and guidelines regarding health and safety which may change from time to time. For the most recent information about Carleton’s COVID-19 website and review the Frequently Asked Questions (FAQs). Should you have additional questions after reviewing, please contact covidinfo@carleton.ca.