

COMP 4900I (Fall, 2026)

Multi-agent Aspects of Deep Reinforcement Learning

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Best ways to be in touch: in class, during office hours, Brightspace Forums, email
Teaching Assistant: TBD
Lecture times: Mondays and Wednesdays, 10:00-11:30
Course website: https://brightspace.carleton.ca/d2l/home/453108

Course Calendar Description

Deep (Reinforcement) Learning has been successfully applied in a variety of domains, but the presence of multiple learners (potentially with distinct purposes/optimality criteria) engenders critical non-stationarity in the system. We will study a variety of approaches that deal with, acknowledge and exploit this effect: cooperative learning and its federated point of view, learning to communicate, and behaviour/strategy manipulation. The course will have the format of a reading seminar with a mini-project (we'll aim for publication potential).

- Precludes: N/A
- Prerequisite(s): (for UGs) COMP 3105 or COMP 3106

Learning Material(s) and Other Course/Lab-Related Resources

Learning Material	Options for Purchasing (<i>e.g., Bookstore, Used, etc.</i>)	Approximate Cost
MARL Book by Albrecht et al	MIT Press	Free Download
Exercise Set	Barcelona Summer School 2024	Free Online
Barcelona Summer School Recordings	YouTube	Free Online
MARL Code Base	MARL Book Official GitHub	Free Online

Students are not required to purchase textbooks or other learning materials for this course.

Topics Covered and Learning Outcomes

The course will largely divide into three portions.

First portion is introductory: we will review some basic and up-to-date multi-agent learning algorithms, striking at the issues of cooperative learning, basic learning to communicate, and learning in games. Students will be required to address several programming exercises.

Second portion is participatory (seminar-style): students will attend a series of seminars presented by the students of 5801G section of the course. Students will be required to provide live Q/A and forum-based feedback to the presenting students. This second portion will allow students to discover research-edge topics, such as emergent communication, federated learning, manipulation and machine teaching, and others.

Third portion is applied (project): students will be asked to organise into groups of up-to 3 people, choose among a set of suggested subjects (or introduce one of their own accord, as long as it aligns with the course) and implement it.

The idea behind this course structure is to provide students both with information on recent advances in MultiAgent (Reinforcement) Learning, and foster soft and specific research skills, including (but not limited to) project design, literature review, presentation skills and practical experience in coding and training multi-agent algorithms. Notably, however, the course will not teach coding, but rather give an opportunity to further the skill.

Exact scheduling will depend on the number of students signed up for the course. However, there will be in any case the following periods:

- Overview and introductory lectures (and the development of project ideas)
- Project Design Presentations and Defence
- Seminar Talks
- Project Outcome Presentations and Defence

We will also endeavour to invite guest speakers, though it depends on their and time-slot availability.

Week	Topic/Content	Readings/Prep for Class
0	RL Basics, Games: Models and Solution Concepts	MARL Book Chapters 2-4
1	Intro, MARL: Basic Games and Foundationals	MARL Book Ch: 1,5,6
2	MARL Foundations, Deep RL	MARL Book Ch: 5,7
3	MARL Foundations, Deep RL	MARL Book Ch: 7,8
4	MARL Foundations, Deep RL	MARL Book Ch: 9
5	MARL + Communications	
6	MARL + Communications	
7-11	Seminars 1-24	TBD
12-13	Project Final Presentations	

Assessment Scheme

Grade Breakdown

COMPONENT	GRADE VALUE	DATE (preliminary)
Participation	20 %	Weekly + online
Programming Assignments (x3)	30 %	Weeks 2, 4, 6
Project Defence Presentations (x2)	20 %	Week 6 and Weeks 13
Project RnD	30 %	Weeks 13

About Participation

Participation consists of

- Attendance. We will be running Wooclap during our lectures and seminars
- Grading project defence presentations. Students will be given grading rubrics and will use them (together with additional feedback) to evaluate each other. It is the quality of the evaluation that will be graded for participation
- Grading seminar presentations. Students will be given grading rubrics and will use them (together with additional feedback) to evaluate each other. It is the quality of the evaluation that will be graded for participation.

About Project Defence Presentations

There are two project defence presentations:

- ~20 minutes long for the project proposal
- ~30-40 minutes long for the project final outcome

Both presentations will be submitted as a recorded video, followed up by feedback from the lecturer and/or the TA, as well as Q/A with other students.

About Group Projects and Group Assignments

Students should form groups of up to 3 people for their project work and their Programming Assignments. However, students are expected to submit a clear credit contribution statement, describing the responsibilities of each group member. Furthermore, it is expected that students would be able to explain (at least at a high level) the work of their teammates.

About the use of AI in an AI Course

Students are allowed to use AI tools for this course. **However**, students bear full responsibility for the end product correctness. **Furthermore**, it is expected that students would be able to address any and all questions regarding the composition of their code, information mentioned in their presentations, and design decisions in their project. Failure to do so during live Q/A will be taken as an indication of mis-contributed authorship and, in more severe cases, may result in zero marks even if otherwise the task appears to be completed well. It is the **obligatory practice** to always cite AI tools where they were used. Both the machine and its creators well deserve the credit.

As our understanding of the uses of AI and its relationship to student work and academic Integrity continue to evolve, students are required to discuss their use of AI in any circumstance not described here with the course instructor to ensure it supports the learning goals for the course.

Late and Missed Work Policies

Late Work (Short Term delay)

As our **projects** aim at a paper-level research, their schedule will echo the same process. In particular, all relevant materials will have to be delivered as per schedule without delays. As with real papers, technical problems do not exempt you from timeliness, so if you wait until the last minute and then have issues with your connection or code or your computer, you will still receive a mark of zero.

Consequently, you are advised to:

- Periodically upload/commit your progress (e.g., upload your progress/partial results at the end of day, every day). This will ensure that even if you do not manage to complete your project, at least part of the mark can be salvaged based on your partial work.
- Attempt to submit your final submission at least one hour in advance of the due date and time. This echoes the previous point, but it suggests that you should work on a time schedule that is a pinch shorter than what is allowed – you should keep a time buffer for external interferences.

You will be submitting your project source-code, and it will have to be appropriately documented and packaged. You will also be submitting a project report. You are expected to demonstrate good programming practices at all times, as experiment reproducibility is a key feature of modern research.

In contrast to the project work, **presentations (seminar or defence)** do have some affordances in their timeline. Following similar practices of the research community publications and presentations, should there be some circumstance beyond your control that prevents you from keeping the dead-line, you may be allowed to submit a recording of your **presentation** (seminar or defence) at no more than 1 week delay. Such an extension requires you to complete the [academic considerations form](#), and remains at the discretion of the lecturer. Do not rely on receiving this extension.

Programming Assignments can be delayed for up to a week as well, given that the [academic considerations form](#) has been submitted and the extension granted.

Do not presume that an extension will be given, as it is at the instructor's discretion.

Missed Work (Long-term delay (> 5 days)):

Approved [longer-term accommodation](#), where the circumstance has lifted within 2 weeks before the end of the semester, may grant the possibility to submit the missing Programming Assignments by the end of the semester. If the circumstance persists, then only the project RnD will be taken into account. If the project RnD cannot be complete by the end of the semester, there is no recourse but to drop the course. Do not presume that these accommodations are made automatically, as the decision remains at the instructor's discretion.

Undergraduate Academic Advisors

The Undergraduate Advisors for the School of Computer Science are available in Room 5302HP; 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.

SCS Computer Laboratory

Students taking a COMP course can access the SCS computer labs. The lab schedule and location can be found at: <https://carleton.ca/scs/tech-support/computer-laboratories/>. All SCS computer lab and technical support information can be found at: <https://carleton.ca/scs/tech-support/>. Technical support staff may be contacted in-person or virtually, see this page for details: <https://carleton.ca/scs/tech-support/contact-it-support/>.

Mental Health and Wellness

The [Carleton Wellness Website](#) is a wonderful resource link to include in the course outline for students.

Academic Accommodations and Regulations

Academic Accommodation

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes are outlined on the Academic Accommodations website (<https://students.carleton.ca/course-outline/>).

Chat GPT/Generative AI Usage (worth saying it twice)

Students are allowed to use AI tools for this course. **However**, students bear full responsibility for the end product correctness. **Furthermore**, it is expected that students would be able to address any and all questions regarding the composition of their code, information mentioned in their presentations, and design decisions in their project. Failure to do so during live Q/A will be taken as an indication of AI authorship and, in more severe cases, may result in zero marks even if otherwise the task appears to be completed correctly. It is the **obligatory practice** to always cite AI tools where they were used. Both the machine and its creators well deserve the credit.

As our understanding of the uses of AI and its relationship to student work and academic Integrity continue to evolve, students are required to discuss their use of AI in any circumstance not described here with the course instructor to ensure it supports the learning goals for the course.

Academic Integrity

Students are expected to uphold the values of academic Integrity, which include fairness, honesty, trust, and responsibility. Examples of actions that compromise these values include but are not limited to plagiarism, accessing unauthorized sites for assignments or tests, unauthorized collaboration on assignments or exams, and using artificial intelligence tools such as ChatGPT when your assessment instructions say it is not permitted.

Misconduct in scholarly activity will not be tolerated and will result in consequences as outlined in [Carleton University's Academic Integrity Policy](#). A list of standard sanctions in the Faculty of Science can be found [here](#).

Additional details about this process can be found on [the Faculty of Science Academic Integrity website](#).

Students are expected to familiarize themselves with and abide by [Carleton University's Academic Integrity Policy](#). Claiming ignorance of or confusion about the academic integrity standards as described in the Policy does not excuse a student from responsibility for violations of those standards.”

Student Rights & Responsibilities

Students are expected to act responsibly and engage respectfully with other students and members of the Carleton and the broader community. See the [7 Rights and Responsibilities Policy](#) for details regarding the expectations of non-academic behaviour of students. Those who participate with another student in the commission of an infraction of this Policy will also be held liable for their actions.