



UNIVERSITY OF ALBERTA

CMPUT 365 A1 (53468)

Fall 2026

REINFORCEMENT LEARNING

Territorial Acknowledgement

The University of Alberta acknowledges that we are located on Treaty 6 territory, and respects the histories, languages, and cultures of First Nations, Métis, Inuit, and all First Peoples of Canada, whose presence continues to enrich our vibrant community.

Instructor Information

Instructor

Marlos C. Machado

Contact Information

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Office Hours: Most days after class.

Lecture Room & Time

ETLC E1-007, MWF 13:00 - 13:50

Course Page: <https://canvas.ualberta.ca/courses/36154>

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Calendar Description

This course provides an introduction to reinforcement learning, which focuses on the study and design of learning agents that interact with a complex, uncertain world to achieve a goal. The course will cover multi-armed bandits, Markov decision processes, reinforcement learning, planning, and function approximation (online supervised learning). The course will take an information-processing approach to the study of intelligence and briefly touch on perspectives from psychology, neuroscience, and philosophy. The course will use the University of Alberta MOOC on Reinforcement Learning. Any student who understands the material in this course will understand the foundations of much of modern probabilistic artificial intelligence (AI) and be prepared to take more advanced courses, or to apply AI tools and ideas to real-world problems. Prerequisites: CMPUT 175 or 275; one of CMPUT 267, 466, or STAT 265.

Additional Course Information (General Content)

The course will use Python 3. We will use elementary ideas of probability, calculus, and linear algebra, such as expectations of random variables, conditional expectations, partial derivatives, vectors, and matrices. Students should either be familiar with these topics or be ready to pick them up quickly as needed by consulting outside resources.

Attendance isn't mandatory, although strongly encouraged.

Course Objectives/Outcomes

- With a focus on AI as the design of agents learning from experience to predict and control their environment, topics will include: Markov decision processes, planning by approximate dynamic programming, Monte Carlo and temporal difference learning for prediction, Monte Carlo, Sarsa and Q-learning for control, Dyna and planning with a learned model, prediction and control with function approximation, and policy gradient methods.
- By the end of the course, you will have a solid grasp of the main ideas in reinforcement learning, which is the primary approach to statistical decision-making. Any student who understands the material in this course will understand the foundations of much of modern probabilistic artificial intelligence (AI) and be prepared to take more advanced courses (in particular, CMPUT 655: Topics in Reinforcement Learning I, CMPUT 609: Reinforcement Learning II, and CMPUT 653: Real-Time Policy Learning), or to apply AI tools and ideas to real-world problems. That person will be able to apply these tools and ideas in novel situations -- e.g., to determine whether the methods apply to this situation and, if so, which will work most effectively. They will also be able to assess claims made by others, with respect to both software products and general frameworks and also be able to appreciate some new research results.

Required Course Materials

Reinforcement Learning: An Introduction

Authors: Richard Sutton and Andrew Barto

Publisher: MIT Press

Edition: 2nd Edition

Link: <http://www.incompleteideas.net/book/the-book-2nd.html>

All course reading material will be available online. We will be using videos from the Reinforcement Learning Specialization on Coursera, which was created by faculty members in the Department of Computing Science of the University of Alberta.

Course Material Access

[Course Material Access](#) allows students to access their required course materials through Canvas for the duration of the term. A flat fee per term will appear in the student's Fee Assessment section in Bear Tracks. Digital formats are prioritized, but print materials are provided if digital formats are not available. **This is an automatic opt in program, but students can choose to opt out**, if they decide it is not for them. Some reasons may include:

- the cost of all required course material is less than the program flat fee for the term
- print materials are preferred over digital formats
- access to course material is desired beyond a given term

Students must choose to opt out by each term's [registration deadline \(i.e., add/delete date\)](#). Students will automatically be opted out if none of their digital or printed course material has a cost associated with it. For more information on how to access your course materials on Canvas or how to opt out, visit the [Course Material Access](#) website.

On-Line Homework Disclaimer

Online homework is a component of this course and is provided by a third-party company, Coursera, through a partnership with the University of Alberta. University of Alberta students can get free access to the online content of the Reinforcement Learning Specialisation via the steps outlined in the link below. You are required to set up a free Coursera account with your ualberta.ca email address. You will be automatically enrolled in a private version of the course for this class.

<https://www.ualberta.ca/en/admissions-programs/online-courses/reinforcement-learning/index.html>

Remote Delivery Considerations

To successfully participate in remote learning in this course, it is recommended

that students have access to a computer with an internet connection that can support the tools and technologies the University uses to deliver content, engage with instructors, TAs, and fellow students, and facilitate assessments and examinations. If you encounter difficulty meeting the technology recommendations, please email the Office of Student Success and Experience (sse@ualberta.ca) directly to explore options and support. Please contact the instructor by the [add/drop deadline](#) if you do not have access to the minimum technology recommended.

Student Resources for Remote Learning:

Online learning may be new to you. Please refer to [Technology for Online Learning - For Students](#) to ensure you have the appropriate technology for remote learning.

Grade Evaluation

Title	Assessment Type	Weight	Date of Evalu...
Practice Quizzes	Other	9 x 1% = 9%	
Assessments (graded quizzes/notebooks on Coursera)	Other	9 x 2.5 = 22.5%	
Midterm 1	Midterm	20%	10/2/26
Midterm 2	Midterm	20%	10/30/26
Final Exam	Exam (final)	30%	

For courses with a Final Exam, students must verify the date of the Final Exam on Bear Tracks when the Final Exam Schedule is posted.

Grades are unofficial until approved by the Department and/or Faculty offering the course.

Grade Adjustment

In total, grades add up to 101.5%, and students are being allowed not to submit two practice quizzes and two graded assignments (see below). Therefore, grades will not be rounded at the end. *No extra marks will be given, with no exceptions.*

Re-examination

There is no possibility of a re-examination in this course.

Final Letter Grades

University of Alberta Grading Policy

Grades reflect judgments of student achievement made by instructors and must correspond to the associated descriptor. These judgements are based on a combination of absolute achievement and relative performance in a class. Faculties may define acceptable grading practices in their disciplines. Such grading practices must align with the University of Alberta [Assessment and Grading Policy](#) and its procedures, which are available online at the [University of Alberta Policies and Procedures Online \(UAPPOL\)](#) website.

Course Grades Obtained by Undergraduate Students

Descriptor	Letter Grade	Grade Point Value
Excellent	A+	4.0
Excellent	A	4.0
Excellent	A-	3.7
Good	B+	3.3
Good	B	3.0
Good	B-	2.7
Satisfactory	C+	2.3
Satisfactory	C	2.0
Satisfactory	C-	1.7
Poor	D+	1.3
Minimal Pass	D	1.0
Failure	F or F4	0.0

Note: F4 denotes the eligibility of a student to apply for a re-examination of a course.

Access to Past or Representative Evaluative Material

Format of Exams: The midterm exams will be held in the classroom from 13:00 - 13:50 (50 minutes). The date, time, and place of the final exam are scheduled by the office of the registrar; the final will be a 2-hour exam. *The exams will be closed book and written in real-time.*

The quizzes and graded assignments are excellent examples of representative material, as well as the exercises in the course's textbook. Additional representative material will be discussed in the classroom and later posted on Canvas

Statement of Expectation for AI Use

The primary goal of this course is to foster individual critical, creative thinking, and problem-solving skills related to reinforcement learning and, more broadly, machine learning. Thus, in order to achieve such learning outcomes, students can submit each practice quiz and graded assignment multiple times, which allows for many learning opportunities. Therefore, the use of advanced AI tools based on large-language models such as ChatGPT or Gemini is strictly prohibited for all quizzes and graded assignments. The only exception is their use for Python-related queries (but the use of such tools to help with the programming assignments themselves is still strictly prohibited). As stated in the university's AI-Squared - Artificial Intelligence and Academic Integrity webpage, "learning is not only about the product; learning is also about the process of acquiring new knowledge or learning ways to think and reason."

IMPORTANT: Failure to abide by this guideline may be considered an act of cheating and aviolation as outlined in the relevant sections of the University of Alberta Student Academic Integrity Policy.

Missed Term Work/Final Exam Due to Non-medical Protected Grounds (e.g., religious beliefs)

When a term assessment or final exam presents a conflict based on [non-medical protected grounds](#), students can register with the Academic Success Centre for accommodations via their [Register for Accommodations](#) website. Students can review their eligibility and choose the registration process specific for **Accommodations Based on Non-medical Protected Grounds**.

It is imperative that students review the dates of all course assessments upon receipt of the course syllabus, and register **AS SOON AS POSSIBLE** to ensure the timely application of the accommodation. Students who register later in the term may experience unavoidable delays in the processing of the registration, which can affect the accommodation.

Policies for Late and Missed Term Work

Late policies: Late submissions will not be accepted, but students are allowed to miss some submissions, as outlined below.

Missed practice quiz: There are a total of 11 weekly practice quizzes, and students are expected to do all of them. But because issues sometimes arise, students have to complete 9 of the 11 quizzes to get the full 9% participation mark. All the quizzes will be due at 23:59:59 on the day mentioned in the schedule. Each practice quiz has equal weight (1%). *Please note that students can miss two instances of the practice quiz without penalty.*

Missed graded assignment: There are 11 graded assignments; they are usually Python notebooks, but sometimes they are graded quizzes. Students should do all of them, but because issues sometimes arise, students' final marks will be the sum of their top 9 assignment submissions. Effectively, students only need to complete 9 of the 11 assignments to get the full 22.5% marks. All the assignments will be due at 23:59:59 on the day mentioned in the schedule. Each graded

assignment has an equal weight (2.5%). *Please note that students can miss two instances of the practice quiz without penalty.*

Missed midterm exam: A student who cannot complete a midterm exam due to incapacitating illness, severe domestic affliction or other compelling reasons can apply for an excused absence. To apply for an excused absence, you must contact the instructor within two working days of missing the assessment or as soon as possible. If an excused absence is granted, then the weight of the missed midterm will be deferred to the final examination. An excused absence is a privilege and not a right. There is no guarantee that an absence will be excused. Misrepresentation of facts to gain an excused absence is a serious breach of the Student Academic Integrity Policy.

Re-evaluation of Term Work

Re-evaluation of midterm exams: Students will have access to their midterm exam during an exam viewing period. A student who has concerns about how specific questions of their midterm exam were marked can submit a request to the instructor via email within two weeks of the date they received their marked exam. The request should specify (1) which question is to be re-evaluated, (2) the rationale for such a request, and (3) the proposed marks. Importantly, once a request for re-evaluation is submitted, it is up to the instructor's discretion to adjust the marks. Students won't be allowed to take their midterm exams with them, nor to take pictures of them, so in case of concerns, the student is advised to take notes during the exam viewing period. The TAs are not authorized to weigh in on the midterm exams; this is something only the instructor can do. *Notice marks can also go down once a question is re-evaluated.*

Deferred Final Examination

A student who cannot write the final examination due to incapacitating illness, severe domestic affliction, or other compelling reasons can apply for a deferred final examination. Such an application must be made to the student's home Faculty Office within two working days of the missed exam and must be supported by appropriate documentation or a Statutory Declaration (see calendar

on [Attendance](#)). Deferred examinations are a privilege and not a right; there is no guarantee that a deferred examination will be granted. The Faculty may deny deferral requests in cases where less than 50% of term work has been completed. Misrepresentation of facts to gain a deferred examination is a serious breach of the [Student Academic Integrity Policy](#).

Academic Integrity and Student Conduct

The University of Alberta is committed to the highest standards of academic integrity and honesty, as well as maintaining a learning environment that fosters the safety, security, and inherent dignity of each member of the community, ensuring students conduct themselves accordingly. Students are expected to be familiar with the standards of academic honesty and appropriate student conduct, and to uphold the policies of the University in this respect.

Students are particularly urged to familiarize themselves with the provisions of the [Student Academic Integrity Policy](#) and the [Student Conduct Policy](#), and avoid any behaviour that could potentially result in suspicions of academic misconduct (e.g., cheating, plagiarism, misrepresentation of facts, participation in an offence) and non-academic misconduct (e.g., discrimination, harassment, physical assault). Academic and non-academic misconduct are taken very seriously and can result in suspension or expulsion from the University.

All students are expected to consult the [Academic Integrity website](#) for clarification on the various academic offences. All forms of academic dishonesty are unacceptable at the University. Unfamiliarity of the rules, procrastination or personal pressures are not acceptable excuses for committing an offence. Listen to your instructor, be a good person, ask for help when you need it, and do your own work -- this will lead you toward a path to success. Any academic integrity concern in this course will be reported to the College of Natural and Applied Sciences (CNAS).

Suspected cases of non-academic misconduct will be reported to the Office of Student Success and Experience. The College, the Faculty, and the Dean of Students are committed to student rights and responsibilities, and adhere to due

process and administrative fairness, as outlined in the [Student Academic Integrity Policy](#) and the [Student Conduct Policy](#). Please refer to the policy websites for details on inappropriate behaviours and possible sanctions.

CNAS has created an [Academic Integrity for CNAS Students](#) website. Website content includes the importance of academic integrity, examples of academic misconduct and possible sanctions, and the academic misconduct and appeal process. Students can also access this material as an [online, self-directed Canvas course](#) and complete assessments to test their knowledge.

The Office of Student Conduct and Accountability has also made the following Canvas course available for all students: [Academic Citizenship: Integrity and Belonging in the Learning Community](#).

"Integrity is doing the right thing, even when no one is watching" – C.S. Lewis

Contract Cheating and Misuse of University Academic Materials or Other Assets

Contract cheating describes the form of academic dishonesty where students get academic work completed on their behalf, which they submit for academic credit as if they had created it themselves. Contract cheating may or may not involve the payment of a fee to a third party, who then creates the work for the student.

Examples include:

1. Getting someone to write an essay or research paper for you.
2. Getting someone to complete your assignment or exam for you.
3. Posting an essay, assignment, or exam question to a tutorial or study website; the question is answered by a "content expert", then you copy it and submit it as your own answer.
4. Posting your solutions to a tutorial/study website, public server, or group chat and/or copying solutions that were posted to a tutorial/study website, public server, or group chat.
5. Sharing your login credentials to the course management system (e.g., Canvas) and allowing someone else to complete your assignment or exam remotely.

6. Using an artificial intelligence bot or text generator tool to complete your essay, research paper, assignment, or exam solutions for you (without the instructor's permission).

Contract cheating companies thrive on making students believe that they cannot succeed without their help; they attempt to convince students that cheating is the only way to succeed.

Uploading the instructor's teaching materials (e.g., course outlines, lecture slides, assignment, or exam questions, etc.) to tutorial, study or note-sharing websites, public servers, or chat apps is a copyright infringement and constitutes the misuse of University academic materials or other assets. Receiving assignment solutions or answers to exam questions from an unauthorized source puts you at risk of receiving inaccurate information.

Appropriate Collaboration

Students need to be able to recognize when they have crossed the line between appropriate collaboration and inappropriate collaboration. If students are unsure, they need to ask instructors to clarify what is allowed and what is not allowed.

Here are some tips to avoid copying on assessments:

1. Do not write down something that you cannot explain to your instructor.
2. When you are helping other students, avoid showing them your work directly. Instead, explain your solution verbally. Allowing your work to be copied is also considered inappropriate collaboration.
3. It is also possible that verbally discussing the solution in too much detail may result in written responses that are too similar. Try to keep discussions at a general or higher level.
4. If you find yourself reading another student's solution, do not write anything down. Once you understand how to solve the problem, remove the other person's work from your sight and then write up the solution to the question yourself. Looking back and forth between someone else's paper and your own paper is almost certainly copying and considered inappropriate collaboration.
5. If the instructor or TA writes down part of a solution in order to help explain it to you or the class, you cannot copy it and hand it in for credit. Treat it the same way you would treat another student's work with respect to

copying, that is, remove the explanation from your sight and then write up the solution yourself.

6. There is often more than one way to solve a problem. Choose the method that makes the most sense to you rather than the method that other students happen to use. If none of the ideas in your solution are your own, there is a good chance it will be flagged as copying.

You are allowed to consult the textbook and materials on Canvas while solving the assignments. You are also allowed to discuss the assignments with your classmates. Note, however, that you are not allowed to exchange any written text or code or to give and/or receive detailed step-by-step instructions on how to solve the proposed problems. *Moreover, as stated above, you are not allowed to use generative AI in your coursework.*

Exam Conduct

Please refer to the [Examinations](#) section of the Academic Calendar for more details on Conduct of Exams.

Some key points to be aware of:

- Your student photo ID is required at exams to verify your identity.
- Students must arrive at the specified time to take the exam. Once the exam has started, students must remain in the physical in-person or remote environment for at least 30 minutes. Students who arrive more than 30 minutes late for an in-person exam will not be permitted to take the exam. Students who arrive more than 30 minutes late for an online exam may have their exam attempt removed or disqualified by the instructor. In both cases, students may apply for a deferred examination.
- All cell phones must be turned off and stored in your bags.

University Policy

Withdrawals

See the [University Calendar](#) for the relevant [add/drop deadlines](#) for each term.

Course Outlines

Policy about course outlines can be found in the [Academic Regulations, Evaluation Procedures and Grading section](#) of the University Calendar.

Student Academic Integrity

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 Student Academic Integrity Policy and the Student Conduct Policy (on the [University of Alberta Policies and Procedures Online](#) (UAPPOL) website) and 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.

Recordings

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content authors.

Accommodations for Students

In accordance with the University of Alberta's [Accommodation Policy](#) and [Discrimination and Harassment Policy](#), accommodation support is available to eligible students who encounter limitations or restrictions to their ability to perform the daily activities necessary to pursue studies at a post-secondary level

due to medical conditions and/or non-medical protected grounds. Accommodations are coordinated through the [Academic Success Centre](#), and students can learn more about eligibility on the [Register for Accommodations website](#).

It is recommended that students apply AS SOON AS POSSIBLE in order to ensure sufficient time to complete accommodation registration and coordination. Students are advised to review and adhere to published deadlines for accommodation approval and for specific accommodation requests (e.g., exam registration submission deadlines). Students who request accommodations less than a month in advance of the academic term for which they require accommodations may experience unavoidable delays or consequences in their academic programs, and may need to consider alternative academic schedules.

Student Supports

Faculty of Science Student Services: The [Faculty of Science Student Services](#) office is located on the main floor of the Centennial Centre for Interdisciplinary Sciences (CCIS). This office can assist with the planning of [Your Academics](#), and provide information related to [Student Life & Engagement](#), [Internship and Careers](#), and [Study Abroad](#) opportunities. Please visit [Advising](#) for more information about what Faculty Academic Advisors can assist you with.

Student Services Directory: The [Student Services Directory](#) helps U of A students find and access support quickly and effectively, bringing together a catalogue of student services from across the university in one convenient location.

Academic Success Centre: The [Academic Success Centre](#) provides professional academic support to help students strengthen their academic skills and achieve their academic goals. Individual advising, appointments, and group workshops are available year round in the areas of Accessibility, Communication, Learning, and Writing Resources. Modest fees may apply for some services.

Writing and Learning Centre: Get support when and where you need it. The centre, located in 2-10 Cameron Library, offers both in-person and virtual supports for undergraduate and graduate students. Strengthen your academic skills by attending a workshop or booking a one-on-one appointment. Their [website](#) provides more information about drop-in appointments, writing groups, Canvas modules and special programming to find what works best for you. Workshops and appointments are free for current U of A students.

Feeling Stressed, Anxious, or Upset? It's normal for us to have different mental health experiences throughout the year. Know that there are people who want to help. You can reach out to your friends and access a variety of supports available on and off campus at the [Need Help Now](#) webpage or by calling the 24-hour Distress Line: 780-482-4357 (HELP).

Learning and Working Environment

The Faculty of Science is committed to ensuring that all students, faculty and staff are able to work and study in an environment that is safe and free from discrimination, harassment, and violence of any kind. It does not tolerate behaviour that undermines that environment. This includes virtual environments and platforms.

If you are experiencing harassment, discrimination, fraud, theft or any other issue and would like to get confidential advice, please contact any of these campus services:

- [Office of Safe Disclosure & Human Rights](#): A safe, neutral and confidential space to disclose concerns about how the University of Alberta policies, procedures or ethical standards are being applied. They provide strategic advice and referral on matters such as discrimination, harassment, duty to accommodate and wrong-doings. Disclosures can be made in person or online using the [Online Reporting Tool](#).
- [University of Alberta Protective Services](#): Peace officers dedicated to ensuring the safety and security of U of A campuses and community. Staff or students can contact UAPS to make a report if they feel unsafe,

threatened, or targeted on campus or by another member of the university community.

- [Office of the Student Ombuds](#): A confidential and free service that strives to ensure that university processes related to students operate as fairly as possible. They offer information, advice, and support to students, faculty, and staff as they deal with academic, discipline, interpersonal, and financial issues related to student programs.
- [Office of Student Success and Experience](#): They can assist students in navigating services to ensure they receive appropriate and timely resources. For students who are unsure of the support they may need, are concerned about how to access services on campus, or feel like they may need interim support while they wait to access a service, this office is there to help.

Disclaimer

Any typographical errors in this syllabus are subject to change and will be announced in class and/or posted on the course website. The date of final examinations is set by the Registrar and takes precedence over the final examination date reported in the syllabus.

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Dr. Marlos C. Machado, Department of Computing Science, Faculty of Science, University of Alberta (2026).

Course Schedule and Assigned Readings

https://docs.google.com/document/d/15HsEOgqptZYxnDRM25Mc4D_nw3yQKOpoyekez-lwVc4/edit?usp=sharing