Course #: Applied Reinforcement Learning
Syllabus: Fall 2025

Course Information

Course Start Date–End Date: August 26–December 9, 2025
Credit Hours: 3
Prerequisites: At least one course in the following:

- Python coding
- Machine Learning
- Probability

Catalog Description: [Formal description from the University Registrar]
Live Online Meeting Times: Mondays, 6:00 – 7:00 pm EST

Instructor Information

Adam Tashman
Director of Data Science Capstone Program
Associate Professor
Email: apt4c@virginia.edu
Office Hours: [by Zoom XXX day/time]
Office Location: remote
Teams/Slack: Channel

Instructional Support [Name]
Email: email@virginia.edu
Phone: if applicable
Office Hours: [by Zoom day/time]
Office Location: Room/remote
Teams/Slack: Channel

Inclusive Learning Environment

[Customize for your course, see examples.]

Course Overview

Reinforcement Learning is a dynamic, active area in machine learning. It is fundamentally different from supervised and unsupervised learning, as it allows an agent to learn by interacting with its environment. This allows for learning when the ground truth is unavailable, which is often the case. Even when ground truth is available, it often becomes outdated in a dynamic environment (think predicting Netflix usage before and during a pandemic). This course will introduce topics including the elements of RL, k-armed bandits, Markov Decision Processes, value functions, Policy Gradients, Q-Learning, and deep Q-Learning. The focus will be on computation and not theorem-proof (e.g., convergence guarantees).

Learning Outcomes

By the end of the semester, you will be able to:

1. Understand, compute, and improve value functions and policy gradients to optimize a policy
2. Explain and implement methods that trade off exploration for exploitation

3. Apply and contrast different methods for estimating value functions: dynamic programming, Monte Carlo simulation, temporal difference methods
4. Explain how Q-Learning works and how it learns off policy
5. Compare the value-based approach to the Policy Gradient approach
6. Apply deep reinforcement learning techniques
7. Explain methods for safely implementing reinforcement learning

Semester Schedule

[Customize for your course: Direct students to the Calendar tool and the dates on Canvas Assignments/Quizzes, optionally provide a schedule, using a table, plain text and headers.]

==[adjust given class time]==

Fall Reading Days
October 11, 2025 - October 14, 2025
No Classes

Election Day
November 4, 2025
No Classes

Thanksgiving recess
November 26, 2025 - November 30, 2025

Refer to the Canvas calendar tool for specifics dates and deadlines. All changes to due dates will be reflected in Canvas. **Tip:** Subscribe to this course's calendar feed using Google or Outlook calendars.

What to Expect in This Fully Online Course

This course is delivered in 12 learning modules through Canvas. Each course module consists of a live session.

Meetings (video and teleconference) for live sessions will be held on Zoom. Students are expected to actively participate in the live class discussions by asking questions and contributing to the discussion.

Students are expected to come to class prepared to participate in each week's live activity. Learners are expected to complete the asynchronous learning activities prior to the synchronous session.

The synchronous session will be used for a combination of walkthroughs, discussion of readings, and/or a Q&A period.

Required Software

[Customize for your course. If using hyperlinks for resources, ensure they are formatted with link text that is self-describing and meaningful, [WebAIM Links and Hypertext](#)]

Python
Brief overview and instructions

Command-line Interface
Brief overview and instructions

Docker
Brief overview and instructions

Software
Brief overview and instructions

Learning Resources

Required Textbook/Resources

Reinforcement Learning 2nd edition. RS Sutton & AG Barto

Mastering Reinforcement Learning with Python. E Bilgin

Grading

Grade Breakdown

Assignment	Percentage of Overall Grade
Labs	30%
Journaling	15%
Quizzes	20%
Attendance	5%
Final Project	30%

Grading Policies

Quizzes

All quizzes are multiple choice, with full points awarded for a correct answer, and no points awarded for an incorrect answer. Partial credit is given where appropriate. **Quizzes are closed book.**

Attendance

Student attendance is required. If a student cannot attend a class, the instructor needs to be

notified in advance.

Journaling

The purpose of journaling is to track student learning and growth throughout this course. The journal will be submitted over the course of the term, appending new entries.

Labs

Labs will include exercises in algorithms, simulation, and machine learning. The outline of the exercise will be sketched out by the instructor to some degree. Students will fill in the code to run experiments and answer questions. **Students may collaborate with classmates but each student's code must be their own.**

Final Project

The final project will have the student solve a problem using reinforcement learning, or dive deeper into an area of RL. Students work in teams of 2-4. The project will consist of three components, each worth one-third of the final project grade:

1. Code
2. Presentation
3. Paper

Late Work Policy and Electronic Submission of Assignments

All assignments must be submitted electronically through Canvas by the specified due dates and times. It is crucial to complete all assigned work—failure to do so will likely result in failing the class. For late assignments, 10% of the total grade will be deducted per day, where the day means 11:59 p.m. Eastern time cutoff. After five days late, it will be marked as 0 points.

Extenuating Circumstances
If you need help, are falling behind and struggling to catch up, or if extenuating circumstances arise, the sooner you reach out for help, the more options there are to help and support you. Please contact Kristy Simpkins, kms8k@virginia.edu, Assistant Director, Online Student Success and Engagement, if you are experiencing extenuating circumstances.

Accessing Grades and Feedback in Canvas
[Customize for your course.]
- Let students know when they can expect their assignments to be graded, where to find specific feedback and comments from you and TA, how to see comments in Gradescope (need to select > to see comments from instructor) and when the gradebook will be updated.

- If you offer feedback in advance of a submission, let students know dates for submitting to receive and apply the feedback.

Weekly Attendance at Live Sessions
[Customize for your course, see example.]
Provide attendance policy for live sessions and what to do if a student needs to miss.

Grade Scale
According to the SDS Grading Policies, the standing of a graduate student in each course is indicated by one of the following grades: A+, A, A-; B+, B, B-; C+, C, C-; D+, D, D-; F.
B- is the lowest satisfactory grade for graduate credit. You will be graded according to the following markings:

Online MSDS Grade Scale	
Grade	**Range**
A+	> 97
A	93 - 97
A-	90 - 92.9
B+	87- 89.9
B	83 – 86.9
B-	80 – 82.9 *Minimum passing grade*
C+	77 – 79.9
C	73 – 76.9
C-	70 – 72.9
D+	67 – 69.9
D	63 – 66.9
D-	60 – 62.9
F	0 – 59.9

Assignments
[List in order of due date.]

Assignment 1: Title
Due Date:
Description, deliverable, grading criteria, rubric, etc.

Assignment 2 Title
Due Date:
Description, deliverable, grading criteria, rubric, etc.

Live Coding Assignments
Due Date:
Description, deliverable, grading criteria, rubric, etc.

Quizzes
Due Dates:
Description – Canvas or Gradescope, attempts, what do they cover, etc.

Discussions
Due Dates:
Description – Canvas or Piazza, when to post, what to post

Notebooks
Due Dates:
Description

Final Project
Due Date:
Description

Course Policies
Communication

Zoom Expectations
Don't let Zoom keep you from being an active learner!

You are required to have your camera on for the duration of our live class sessions. Your virtual presence adds tremendous value to the course and program: it allows me as your instructor to gauge understanding; it helps you focus at a time when we know you are tired after working a long day; it creates connections with you and your peers.

You may create a background using the [Zoom Virtual Background Generator](#), though it is not required. Distractions will happen – a needy child, wandering cat, messy pile – and I understand this as a working professional myself.

Mute yourself unless you want to speak. **Use the "Raise Hand" feature** if you wish to speak. Your questions and comments are valuable, and I encourage you to participate often.

Set your name to what you would like to be called. Update your profile with your preferred name. Be sure to log in with your UVA account.

Recording of Live Zoom Class Sessions

Class sessions for this course will be recorded. Recordings will be available only to the instructor(s) and students enrolled in the class, including those who may miss a live session. Recordings will be deleted when no longer necessary. Recordings may not be reproduced, shared with those not enrolled in the class, or uploaded to other online environments. Students

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who are not comfortable with participating in a recorded discussion session should contact the instructor to request an alternate assessment activity. Students in the class are prohibited from recording of any kind unless authorization is obtained from the instructor.

Communication and Student Response Time
[Customize for your class; see example from Taylor Brown, DS 6040.]
Email or slack me whenever you want, and I will respond as soon as possible. Slack is usually the preferred mode of communication. Asking questions in front of others promotes discussion and reduces me having to repeat myself. If you don't want to miss anything, check Slack often!

Questions containing personal information should be emailed to me. Throughout our time together, the sooner you inform me of any problem that may affect your attendance or performance, the better the chance we have of solving it together.

Teams or Slack
[Customize for your class, see examples.]

Canvas Email
[Customize for your class.]
Be explicit about what you will use Canvas email for. How, if, and when should students use Canvas email to communicate with you?

Academic Integrity: Collaboration and Cheating
[Customize for your course; see examples or alter this example from Jon, DS 6001:]
Cheating tends to happen at higher rates in introductory programming-based courses because students get frustrated when their code won't run, because of the feeling that there is only one correct way to write the code, and because of how easy it is to copy and paste a few lines of someone else's code. Cheating also happens at higher rates during high pressure situations, such as a course like this one that is taught on a rigid timeframe.

Although every student is responsible for their own lab reports, you may chat and Zoom with one another to work together on labs. In that context, the line between collaboration and cheating can get a bit fuzzy. In general, the difference between collaboration and cheating comes down to intent. Cheating is trying to circumvent the learning process. Collaboration is trying to help yourself and your classmates learn the material more deeply. Use your own sense of right and wrong, but to help clarify the difference here are **examples of cheating**:
1. Directly copying someone else's text word for word, or copying text from ChatGPT
2. Sharing/showing code for the purpose of circumventing the learning process (for example, letting someone copy code because they are running up against the deadline)
3. Asking for help without doing anything to try to solve the problem first; asking someone to do the work for you
4. Making your homework freely available on GitHub or another website
5. Sharing answers to reading quizzes

Here are things that are okay:
1. Two people with the same code is okay as long as one person didn't copy-and-paste it from another person
2. Sharing/showing individual lines of code for the purpose of teaching/explaining or helping someone understand the material
3. Debugging together (this is only possible if both people have already written their own code, otherwise there's nothing to debug)
4. Sharing strategies, external texts, blogs, and other resources for completing problems on the lab assignments

There are many ways in which I am limited in my ability to enforce these rules, but I ask you to promise on your honor to not to share code or quiz answers. Cheating means that you do not give yourself the opportunity to master the skills to start working with data in Python. Why rob yourself? If you are stressed out about the intensity of the course, please message me and we can work together to get you back on track.

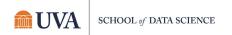## SDS Guidelines on AI Tools and Assistance

The use of generative AI tools and foundation models, (i.e. ChatGPT GPT, DALL-E, Stable Diffusion, Midjourney, GitHub Copilot, and similar tools) is permitted with the following activities in accordance with the stated guidelines at no penalty:
- Brainstorming and refining your ideas;
- Fine tuning your research questions;
- Finding information on your topic;
- Drafting an outline to organize your thoughts; and
- Checking grammar and style.

Students are responsible for
- Acknowledging that large language models tend to produce incorrect facts and fake citations.
- Acknowledging that code generation models may produce inaccurate outputs.
- Acknowledging that image generation models can occasionally come up with highly offensive products.
- Taking responsibility for any inaccurate, biased, offensive, or otherwise unethical content submitted, regardless of the origin (i.e. student-generated or from a foundation model).
- Properly citing the contribution of the foundation model or other AI tools in submitted material.
- The entirety of any information they submit, based on an AI query or AI assistance.

The use of generative AI tools is NOT permitted for the following activities:

- Impersonating students in classroom contexts, such as by using the tool to compose discussion board prompts or content entered into a Zoom chat.
- Completing group work assigned to a student, unless it is mutually agreed upon that they may utilize the tool.
- Writing a draft of a writing assignment.
- Writing entire sentences, paragraphs or papers to complete class assignments.

Students may be penalized for
- Using a foundation model without including an acknowledgement.
- Improperly citing the use of work by other human beings or the submission of work by other human beings as that of the student.
- Violating intellectual property laws.
- Submitting materials containing misinformation or unethical content.

The usage of AI tools must be properly cited to stay within university policies on academic honesty. Failure to adhere to these guidelines will result in a failing grade on the assignment or exam (a zero) and may be an honor code violation depending on the context (to be determined at the instructor's discretion). Having said all these disclaimers, the use of foundation models is encouraged, as it may make it possible for you to submit assignments with higher quality, in less time.

Technical Support
[Customize for your course.]

Technical Support Contacts
- Login/Password: https://in.virginia.edu/helpdesk
- Canvas: Check the Help tab for resources

School of Data Science Support and Policies

Office of Student Affairs

The Office of Student Affairs is here to support your academic journey toward success. Their office provides resources to help you be authentic, healthy, successful, and engaged. If you need support resources related to student success or personal well-being, please reach out to the Office of Student Affairs directly at SDSStudentAffairs@virginia.edu.

Please also utilize the Student Affairs Community Portal for resources and information about career, academic support, engagement opportunities, funding, and more.

Peer Tutors

The School of Data Science offers free, virtual, one-on-one tutoring with MSDS alumni. Our peer tutors provide personalized support tailored to your needs, whether you're struggling with a specific concept or want to deepen your understanding. They can clarify doubts, reinforce learning, and guide you toward success. Schedule your session at this Peer Tutoring scheduling link.

Online MSDS Student Advisory Board (OSAB)

Online MSDS students have a student advisory board to help them navigate their online experience and engage with peers about opportunities and concerns related to online learning at the School of Data Science. You can contact them at SDS_OSAB@virginia.edu.

Career Services

The School of Data Science Career Services Team provides a wealth of opportunities for you to learn, connect, and grow. These offerings are adapted to the needs of the cohort or the year and may take different forms as needs change.

Complete your profile and career interests, explore the Data Analytics Resource Card or make an appointment with Career Services at the School of Data Science by using your UVA Email to Login to Handshake.

Graduate Record

Visit the School of Data Science Graduate Record for policies and information about academic regulations, academic standing, financial assistance, and grades.

University Policies

University Email Policy

Students are expected to activate and then check their official UVA email addresses on a frequent and consistent basis to remain informed of University communications, as certain communications may be time sensitive. Students who fail to check their email on a regular basis are responsible for any resulting consequences.

Academic Integrity and University of Virginia Honor System

The School of Data Science relies upon and cherishes its community of trust. We firmly endorse, uphold, and embrace the University's Honor principle that students will not lie, cheat, or steal, nor shall they tolerate those who do. We recognize that even one honor infraction can destroy an exemplary reputation that has taken years to build. Acting in a manner consistent with the principles of honor will benefit every member of the community both while enrolled in the School of Data Science and in the future. Students are expected to be familiar with the university honor code, including the section on academic fraud.

All work should be pledged in the spirit of the Honor System of the University of Virginia. The instructor will indicate which assignments and activities are to be done individually and which permit collaboration. Students who submit exams electronically acknowledge the Honor Pledge by agreeing to the following statement:

- "On my honor, I have neither given nor received aid on this examination, nor did I have prior knowledge of its contents."

For more information, please visit http://www.virginia.edu/honor/.

Course Evaluations: Student feedback is critical to the school, the instructor, and future students. Students are expected to complete anonymous and confidential course evaluations in a timely manner for each course at the end of each term.
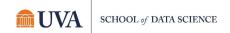
Discrimination/Harassment/Retaliation

UVA prohibits discrimination and harassment based on age, color, disability, family medical or genetic information, gender identity or expression, marital status, military status (which includes active duty service members, reserve service members, and dependents), national or ethnic origin, political affiliation, pregnancy (including childbirth and related conditions), race, religion, sex, sexual orientation, veteran status. UVA policy also prohibits retaliation. All faculty and TAs are also responsible employees for disclosures or reports of potential discrimination, harassment, and retaliation.

Disability and Pregnancy Accommodations

If you anticipate or experience any barriers to learning in this course, please discuss your concerns with me. If you have a disability, or think you may have a disability, contact the Student Disability Access Center ("SDAC") to request reasonable accommodation(s) for this course through their website. If you have accommodations through SDAC, send me your Faculty Notification Letter as soon as possible and meet with me so we can develop an implementation plan together.

Students may be entitled to reasonable accommodations for pregnancy, childbirth, or related medical issues. Please contact SDAC for additional information. Pregnant and parenting students are encouraged to contact SDAC or EOCR to discuss plans and ensure ongoing access

to their academic courses and program. Information for pregnant and parenting students is also available on EOCR's [Pregnancy and Parenting Resources webpage](#).

Student Mental Health and Wellbeing

The University of Virginia is committed to advancing the mental health and wellbeing of its students, while acknowledging that a variety of issues directly impacts students' academic performance. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, contact the CAPS Care Managers at CAPSCareMgrs@virginia.edu.

For help finding a community therapist, visit the [Community Referrals page](#) through CAPS.

Additional Resources

The School of Data Science Office of Student Affairs can help find resources for students experiencing Emergency Needs. Please contact them at [sdsstudentaffairs@virginia.edu.](mailto:sdsstudentaffairs@virginia.edu)