RMIT University Vietnam

School of Science, Engineering & Technology

COSC2129/2723 – Artificial Intelligence

Assignment 3: Reinforcement Learning

Due: **17:00 PM, September 20th, 2025**

Introduction

This is the third assessment for the course COSC2129/2723 Artificial Intelligence, Semester 2, 2025.

- **Deadline:** September 20th, 2025 @ 17:00pm (Week 12)
- **Course Weight:** 25%
- **Assignment type:** Individual
- **Submission method:** Upload zip files (see below for instructions)

This assignment covers the topic of **Reinforcement Learning** (RL) in Artificial Intelligence. You have **three tasks** to complete.

You must read fully and carefully the assignment specifications and instructions detailed in this file. You are NOT to modify this file in any way, except if instructed by the teaching staff in writing.

Your tasks

Task 1: Implementation

In this **task** you must complete 5 Questions, from Question 1 to Question 5, in the UCB Project 3: Reinforcement Learning (this link). In this project, you will implement value iteration and Q-learning. You will test your agents first on the Gridworld, then apply them to a simulated robot controller (Crawler) and Pacman.

The code for this project is given in **task1.zip** file. As in previous projects, this project includes an autograder for you to grade your solutions on your machine.

Files to edit and submit: You will fill in portions of valueIterationAgents.py, qlearningAgents.py, and analysis.py during the assignment. Please do not change the other files in this distribution.

Task 2: Reflection on your implementation (max 1.5 pages)

Question 1. In your implementation of value iteration and Q-learning agents, how did you verify that the learned policies were behaving as expected in different Pacman layouts (e.g., smallGrid, mediumClassic)? What debugging or evaluation strategies did you find most useful?

Question 2. In your experiments, how did the discount factor (γ) influence Pacman's long-term vs. short-term decision-making? Provide specific examples of how different values of γ changed the learned strategies in maze navigation or ghost avoidance.

Task 3: Summary of AI use in the asssignment (max 2 pages)

Briefly explain the ways that you have used AI in the production of this assignment.

- Explain which AI tools you have used and for what purposes. Describe what output from the tool/service has been included, and where.

- Explain why these tools were selected and provide a URL link to the tool.

- Summarise how you have altered, adopted, edited, or built on the AI output.

In addition to using this summary to provide an overview of how AI has been used, it is strongly recommended that you also carefully document the processes undertaken in creating the assignment and to be able to present this process evidence upon request from the teaching staff.

Marking criteria

Task 1	Points
Question 1	5
Question 2	5
Question 3	5
Question 4	4
Question 5	1

Task 2	Points
Question 1	2
Question 2	3

Task 3 (Summary/declaration of AI use in the assignment) carries no marks. However, it will be considered in the evaluation of your submission.

Evaluation

- Your code will be autograded for technical correctness. Please do not change the names of any provided functions or classes within the code, or you will wreak havoc on the autograder. However, the correctness of your implementation – not the autograder's judgements – will be the final judgement of your score. The teaching staff reserves the right to run more tests, inspect your code manually, and **arrange a face-to-face meeting** for discussion and demo of your solution to ensure that you receive due credit for your work. Failure to follow instructions can result in loss of points.
- Your code must run error-free on Python 3.10.6+. Staff will not debug/fix any code. Using a different version will risk your program not running with the Pacman infrastructure and may risk losing (all) marks.
- Your code **must not contain any personal information**, like your student number or your name. If you use an IDE that inserts your name, student number, or username, you should disable that.
- You must follow good SE practice during your development; please refer to Marking criteria below.
- You are free to add additional testing scenarios under the `test_cases/` folder.

Submissions not compatible with the instructions above will attract zero marks and will not guarantee re-submission. We will not debug or fix errors in your submission. Read carefully and ask for help (in forum or lab) if needed.

Important information

You must ALWAYS keep your work **private** and **never share it** with anybody in or outside the course, except your teammates (if it is a teamwork project), *even after the course is completed*. You are not allowed to make another repository copy outside the provided Classroom without the written permission of the teaching staff. Please respect the authors request.

Please do not distribute or post solutions to any of the projects.

Corrections: From time to time, students or staff find errors (e.g., typos, unclear instructions, etc.) in the assignment specification. In that case, a corrected version of this file will be produced, announced, and distributed to you. Because of that, you are NOT to modify this file in any way to avoid conflicts.

Late submissions & extensions: Late submission is not allowed. Extensions will only be permitted in *exceptional* circumstances under the University's rules.

Academic Dishonesty: This is an advanced course, so we expect full professionalism and ethical conduct. Plagiarism is a serious offense. Please **do not let us down and risk our trust**. Sophisticated *plagiarism detection* software via Codequiry may be used in this edition to check submitted code against other submissions in the class as well as resources available on the web. We will pursue the strongest consequences available according to the **University Academic Integrity policy**. In a nutshell, **never look at solutions done by others**, either in (e.g., classmate) or outside (e.g., web, AI tools) the course.

Silent Policy: A silent policy will take effect **24 hours** before this assignment is due. This means that no question about this assignment will be answered, whether it is asked on the newsgroup, by email, or in person.

Code of Honour

We expect every RMIT student taking this course to adhere to the **Code of Honour** under which every learner-student should:

- Submit their own original work.
- Do not share answers with others.
- Report suspected violations.
- Not engage in any other activities that will dishonestly improve their results or dishonestly improve or damage the results of others.

Submission

Zip your Python files for Task 1 in **Task1.zip. Task 2** and **Task 3** should be presented in **one PDF file**. Then zip the two files and submit your Assignment 3 in **one final zip file**. File name of the final zip file is your student number, for example 1234567.zip and 1234567.pdf, if your student ID is s1234567. Do not submit unnecessary files.

Acknowledgements

Task 1 UCB Project 3 is from the set of UCB Pacman Projects. We are grateful to UC Berkeley CS188 for developing and sharing their system for teaching and learning purposes.