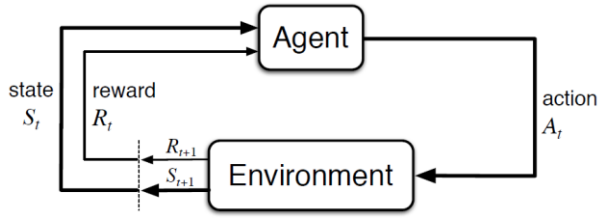
Final Project: RL in Action

Submission Due: December 6th 11:59 pm

Presentation date: December 8th and 10th (5min)

The purpose of this project is to build a complete agent-environment interaction loop where an RL agent that can learn (at least one of) the task you proposed during your mid-term project. In other words, in this project, you are going to construct the famous RL loop as shown here:



Keeping this in mind, you should start integrating different parts of the agent-environment interaction loop by going through the following steps:

Task I – Finalize Your Task/Game/Environment

Make sure the implementation of your task is RL compatible. It means that the code can easily generate/return all the features required by an RL algorithm (e.g. reward, next state, episode). Also make sure your task can be simulated in the background (with no visualization) and can animate the agent's behavior upon request.

Task II – Integrate the RL Loop

In this task, you should build the agent-environment interaction loop by constructing and adding the following modules:

- The environment – you have constructed this during the mid-term project
- A reward function - refer to our Reward Shaping lecture
- An approximation method - you can use any linear method (e.g. Fourier Basis)
- A Reinforcement Learning algorithm – Although you can use any approximate method we have discussed during the semester, you should consider the ones with an obvious advantage for your task (e.g. REINFORCE, SARSA(λ), or Actor-Critic with Eligibility Traces). In previous homework projects, you have already implemented (at least some of) those algorithms.

Task III – Write-up & Presentation

Write a report that includes an introduction, description of the algorithm, task details, results, and a conclusion. Your write-up should not be more than three pages (Font size 12, all margins 1", no fonts other than Times) and it should be prepared in either Latex or Word and then convert it to PDF. This document should include all the necessary pictures (e.g. the agent in the environment) and graphs (e.g. number of steps per episode or accumulated reward over the run). You should include relevant references as well.

Make presentation with no more than five slides that briefly describes your task. Similar to the write-up, it should include an introduction, task description, results, and a conclusion. I strongly recommend to add a video of the agent solving the task (playing the game). You will have 5mins

to present your task to the class on the presentation days. We will stop you if your time runs out. So it is a good idea to practice your talk before the presentation day.

Deadlines:

Write-up: The deadline for submitting the write-up is on December 6th before 11:59pm. However, I suggest you submit a few days earlier for you to have more time to incorporate comments and updates. This part has 40 points.

Presentation: You will be presenting your task in class on December 8th or 10th. Your presentation should include up to **five** slides and you will have 5mins to present. The deadline for submitting the write-up is on December 6th before 11:59pm. In addition to the 40 points assigned to this part, up to 20 points will be given from your classmates that will evaluate your work according to its feasibility, applicability, and thoroughness.

Note: you should let me know in advance if you cannot attend the class during those days.

Evaluation: we will grade your submission according to the following table:

Item	COMP4600	COMP5300
Write up	40	40
Presentation (class score)	20	20
Presentation (my score)	40	40

Note 1: These are the hard deadlines and there will be no extensions.

Note 2: Use the provided templates for preparing your report and presentation.

Submission: Submit the following items on December 6th before 11:59PM. Make sure everything is entirely contained within a zip file:

- **Code** – this should include all the necessary files to run your project, however, you do not need to prepare everything in a notebook. For instance, you can import a python file that holds the implementation of your task.
- **Video** – a media file that illustrates the agent playing the game. You can either submit the file or a downloadable link.
- **Presentation** – a power point file with no more than five slides. This should include all the graphs and videos you want to present to your classmates.
- **Write-up** – a Latex or Word document with no more than three pages.