Mid Term Project: Build an RL environment
Submission Due: Tuesday October 20th 11:59 pm
Presentation date: October 22nd (3min during class)

The purpose of this project is to prepare an RL environment/task that you will be using for evaluating some RL algorithms during the final project.

What are we looking for?
For this project, you should program a task or environment that your agent will use to learn during the final project in the class. Previous homework include only tasks with discrete state and action spaces, so they could be solved using tabular RL methods. However, we usually cannot use tabular methods for problems with continuous state-space or action-space. To address this issue, approximate RL methods learn an approximation for the value function or the policy. We will discuss these methods in the second part of the course and we want to use some of them in our final projects.
Since, we are going to use Approximate RL methods, your task/environment should include either a continuous state-space, an action-space, or both.

Keeping this in mind, you should either start building from scratch (if you have an idea and you want to implement that idea) or build upon an existing open-source task / environment (for instance take a look at the existing implementations in the Pygame website).

Task I – Familiarize yourself with Pygame
Pygame is a python library with tools that enable you to build a game/task/environment according to a Reinforcement Learning problem setup. If you decide to use Pygame, you should spend some time and familiarize yourself with the library. The best place to start is their documentation page at https://www.pygame.org/docs/ . You can also take a look at some of the existing games/tasks at https://www.pygame.org/tags/all

Note: You should let me know in advance if you are planning to use a different library.

Task II – Find a Task/Game/Environment
One of the important goals in this project is to minimize the effort required to build the task for your final project. We are not looking for a complicated game or games with a lot of visualization effects, and you should go for a simple task that can be implemented rather quickly. Of course, your program should include all the features required by an RL algorithm.

When designing the task, you should think about the action set, state-space, reward function, algorithm you want to use to learn, and so on. You also should consider the computational cost for the learning process. For instance, a task that can run episodes without visualizing them is preferred over a task for which everything should be visualized.
If you are building upon an existing task/game/environment, you should figure out the required changes that makes your program compatible with an RL algorithm.

Task III – Write-up & Presentation
I recommend finding at least two tasks and writing a description of the task details and your plan for applying changes to them (for each). Your write-up should be no more than one page.

Submit your write-up by the specified deadline (at least a week before the mid-term presentation would be more efficient, because we can discuss and consider changes) on Blackboard.
Make a single slide (using the provided template) that briefly describes your task. You will have 3mins to present your task to the class on the mid-term presentation day.

Deadlines:

Write-up: The deadline for submitting the write-up is on October 20th 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 October 22nd. Your presentation should include only one slide and you will have 3mins. 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.

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: Prepare a one-page report (Font size 12, all margins 1") in Latex or Word and then convert it to PDF.

Note 2: Use the provided template and prepare your one-slide presentation.

Submission: Submit both files on October 20th before 11:59PM. Make sure everything is entirely contained within a zip file.