Project 2: Atari Gymnasium

Deliverable:

You will submit a GitHub link through Canvas. The root folder will have your project report (further detailed throughout this document), and subfolders will contain your various code snippets and extraneous artifacts.

Team Members:

You will work in groups of 3.

Team Leader:

Team leader, your job isn't to make all of the decisions, it is to facilitate and organize your team's desires and decisions. Take charge in creating the report's outline and making it clear what each member's responsibilities are, after having discussed it with the entire team.

GitHub Link:

This link is what you will submit on canvas. Your GitHub should contain your final report in the root folder, but also use this as your team's repository throughout the project.

Motivation:

If ever we succeed in making a hard AI agent I suspect it will rely heavily on reinforcement learning. Reinforcement learning can seem like an abstract topic at times, but video games provide a great way to visualize an agent's progress. In this project we will create active agents to master four different Atari games.

Part I – Professional Development

Use GitHub Copilot as you work on this project. Write a short blurb in your final report that details:

- What GitHub Copilot is
- What algorithms it uses
- Where the data that trained it came from
- How you used it in this project.

Part II – Project Identification

We will be using Gymnasium (which was first started at OpenAI) are our test bed. Choose four different Atari games from their selection (or if you find other project ideas from their library you may use them as well). Include in your lab report:

- What four games you chose and why

Part III – Algorithm Implementation

You may use existing implementation of the Q-learning agents, or you may use your own if you want. Master each game with a Q-learning agent, an approximate Q-learning agent, and a Deep Q-Network. In your project report include:

- Where your algorithms came from (whether you coded your own agent, used one from Gymnasium, or some other source)
- A table that shows each agent's performance as it learns each game. Include information such as the number of episodes required to teach the agent, the highest level it achieved, and any other metrics you think illuminate your agent's efficacy
- A GIF showing your most impressive agent's learning progress
- A GIF showing that agent's final performance in greater detail

Part IV – Feedback

Include in your final report:

- Three things you liked about this project
- Three improvements for next year's class
- Other general constructive feedback