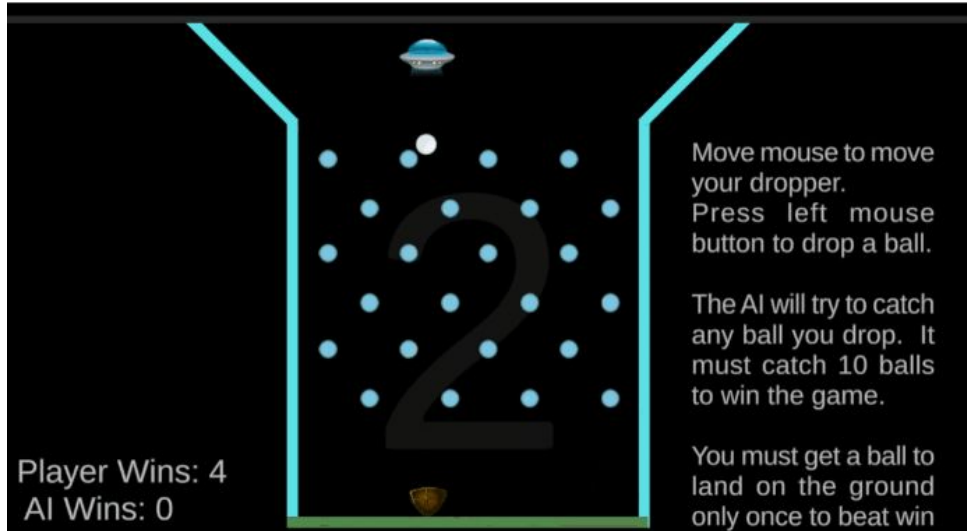# Group 11 – Final Project

Artificial Intelligence for Gaming - INFR 4320

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Our Game

Move mouse to move your dropper.
Press left mouse button to drop a ball.

The AI will try to catch any ball you drop. It must catch 10 balls to win the game.

You must get a ball to land on the ground only once to beat win

Player Wins: 4
AI Wins: 0

- Ball Catcher Game
- Player vs AI
- Player wins everytime the AI misses - AI wins everytime it catches 10 balls in a row

What we used? - Reinforcement Learning

- Reinforcement learning is the training of machine learning models to make a sequence of decisions.

- A computer may represent an agent in a particular state (S_t). It takes action (A_t) in an environment to achieve a specific goal. As a result of the performed task, the agent receives feedback as a reward or punishment (R).

- Computer agents are able to make critical decisions that achieve results in the intended tasks without the involvement of a human or the need for explicitly programming the AI systems.

REINFORCEMENT LEARNING MODEL

State (S_t)

Agent

Action (A_t)

Reward (R_t)

$R_{(t+1)}$

$S_{(t+1)}$
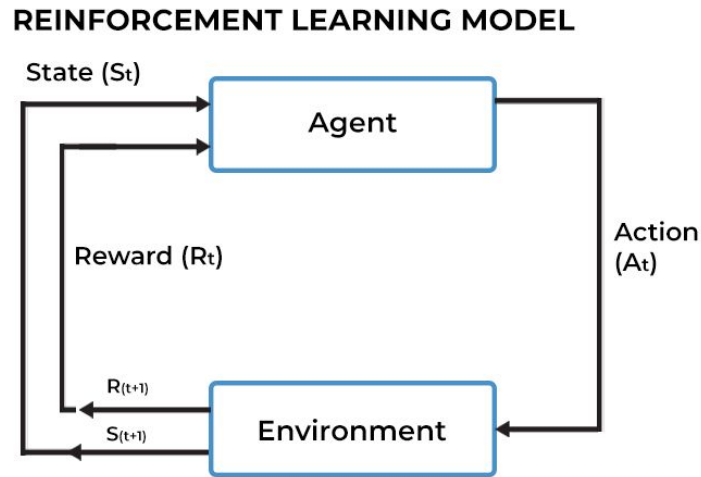
Environment

Why we used Reinforcement learning?

Advantages

- Reinforcement learning algorithms enable agents to learn from their experiences in an environment, adapting their behavior based on the outcomes of their actions.

- Unlike supervised learning, which requires labeled data to train the model, RL agents learn from rewards or penalties received from the environment. This makes RL suitable for scenarios where labeled data may be difficult or expensive to obtain.

- RL algorithms can handle environments that are complex and constantly changing, as agents learn to adapt to these changes over time.
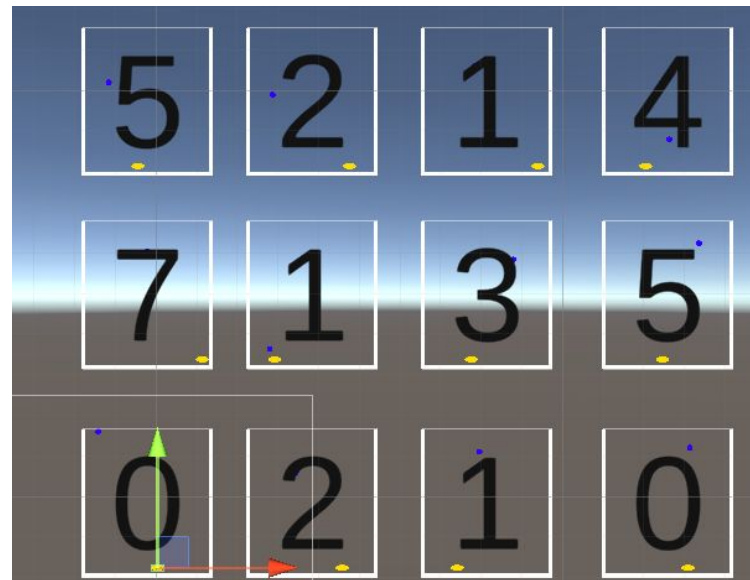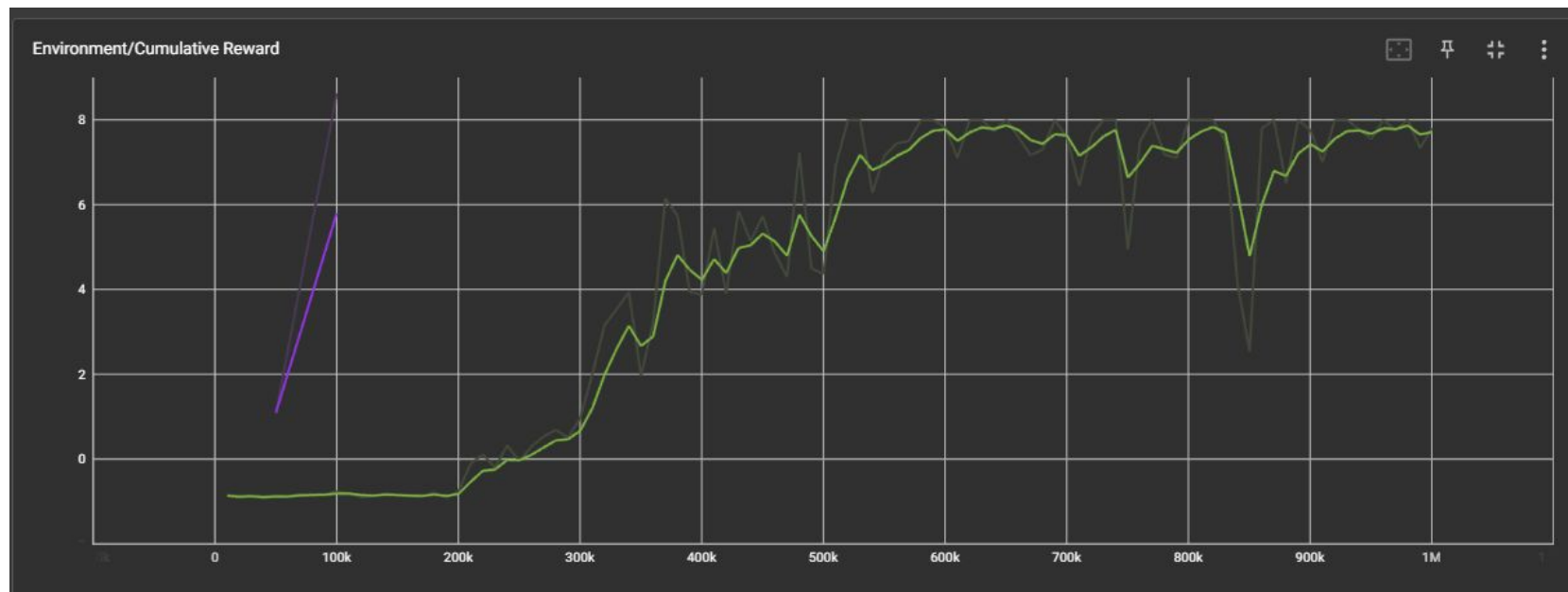
Catching AI - Generation 1

Training the agent to take actions in an environment to maximize a reward signal
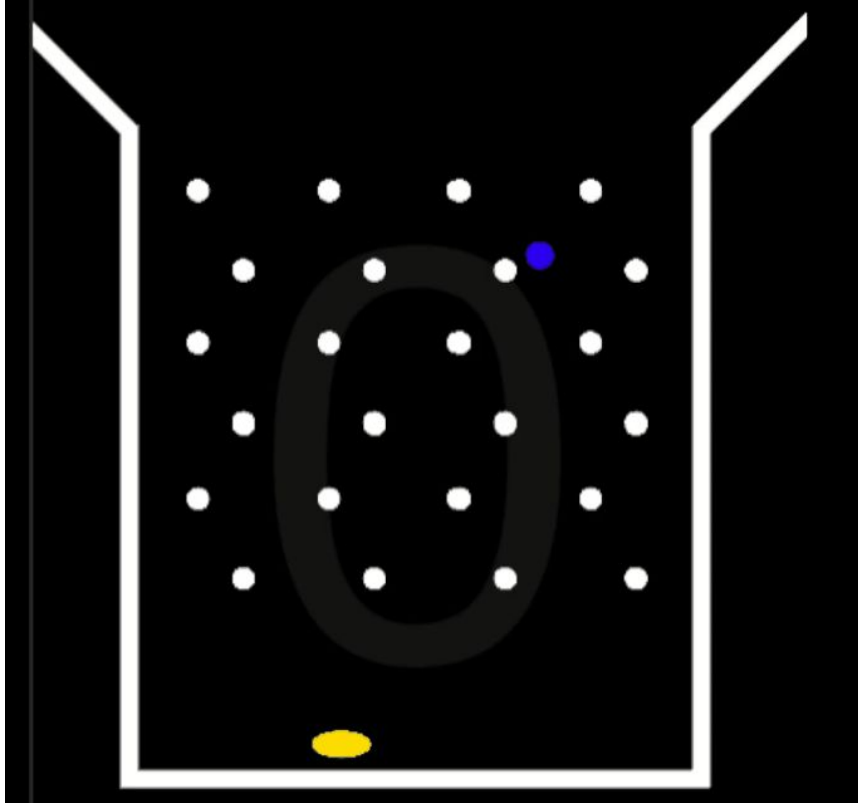
Multiple Instances running simultaneously
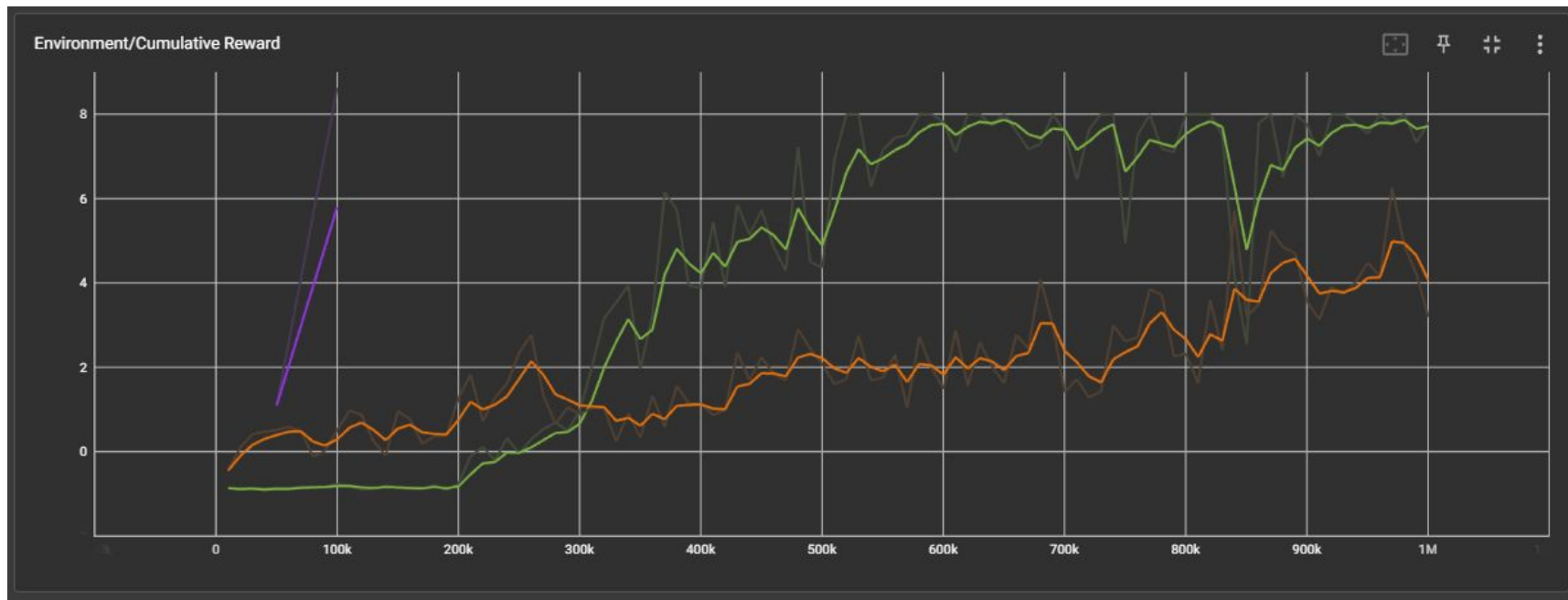
Results over 1M steps

Environment/Cumulative Reward
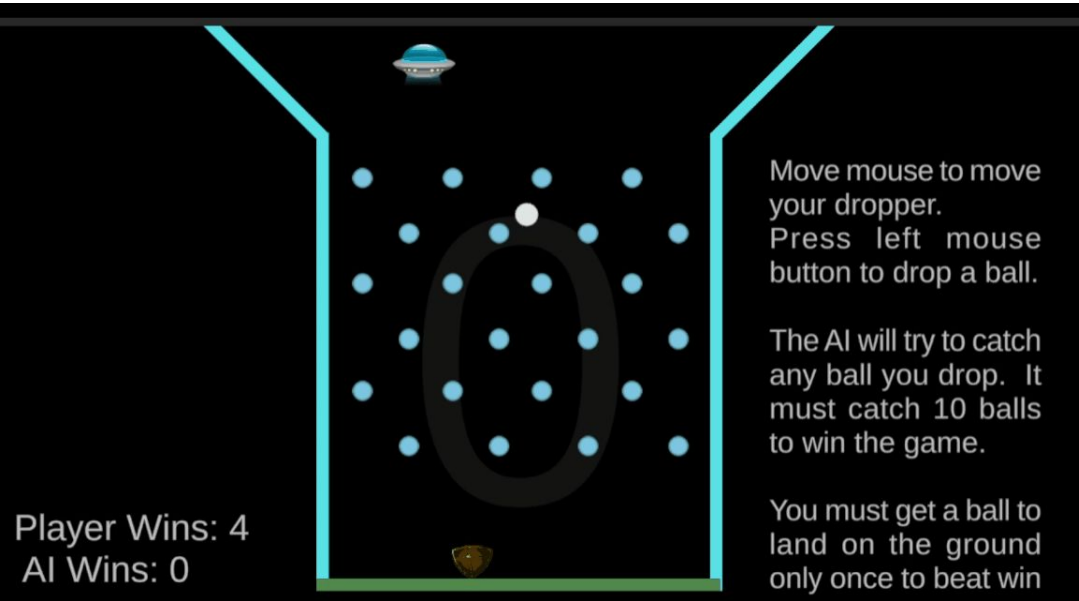
Catching AI - Generation 2

- Creating a more challenging environment for the AI to catch falling objects.

- Falling objects can now follow varied paths instead of descending linearly.

- Falling objects and paddle movement speed increased.

Compared to Generation 1

Catching AI - Generation 3

Move mouse to move your dropper.
Press left mouse button to drop a ball.

The AI will try to catch any ball you drop. It must catch 10 balls to win the game.

You must get a ball to land on the ground only once to beat win

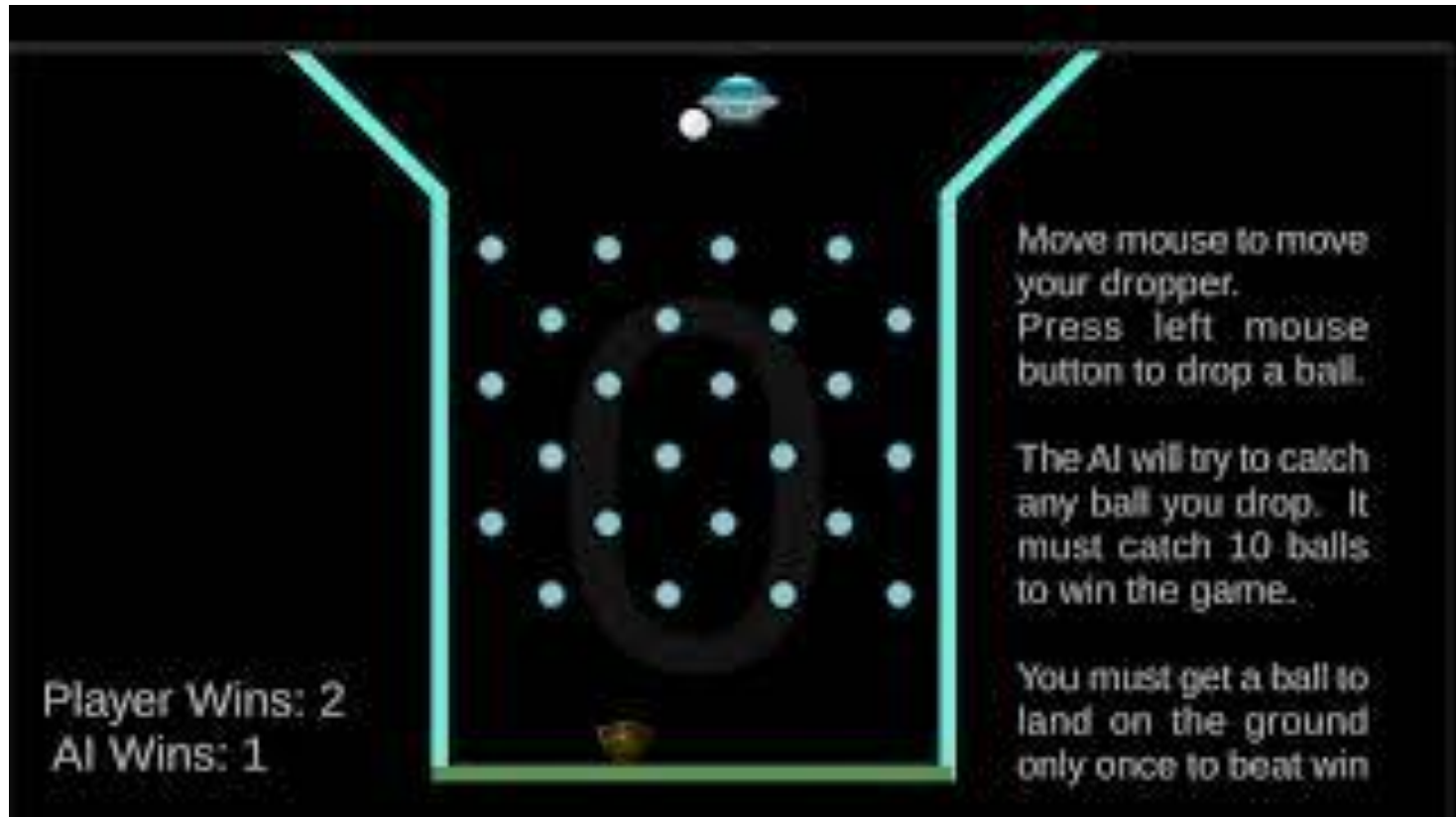Player Wins: 4
AI Wins: 0

- Introducing the player element

- Statistics tracking

- Easy - Medium level of difficulty for player to win

- Sound and Art Assets Implemented

- Instructions for Player

Next steps

- Additional generations of training for better accuracy

- Training the agent to handle catching multiple balls at once

- Resolve issue where Agent gets stuck in the corner

Full Demo Video