GameBrain: The Evolving Unity Experience

Team Members: Grant Fullenkamp, Noah Heinen, Roshan Krishnan
Advisor: Bayley King

Goals

Integrate Unity and RL Framework

- Develop snake game in unity, with defined mechanics and measurable performance
- Implement training agent and define scenarios to iterate through

Design and Implement RL Agent Architecture

- Established a training pipeline for RL agent using reinforcement learning
- Measure success of agent over iterations

Intellectual Merits

Dynamic Learning Environment

- Designed the game to serve as a challenging environment for training an RL agent.

Unity and ML Agents Synergy

- Seamlessly integrated ML Agents with Unity to bring intelligent behavior to game characters.

Adaptive Training Pipeline

- Developed a custom training pipeline that adapts to the evolving complexity of the game.

Broader Impacts

Dynamic Experiences

- By adapting to the player's actions, the game is always changing and is automated create complexity and depth to overcome

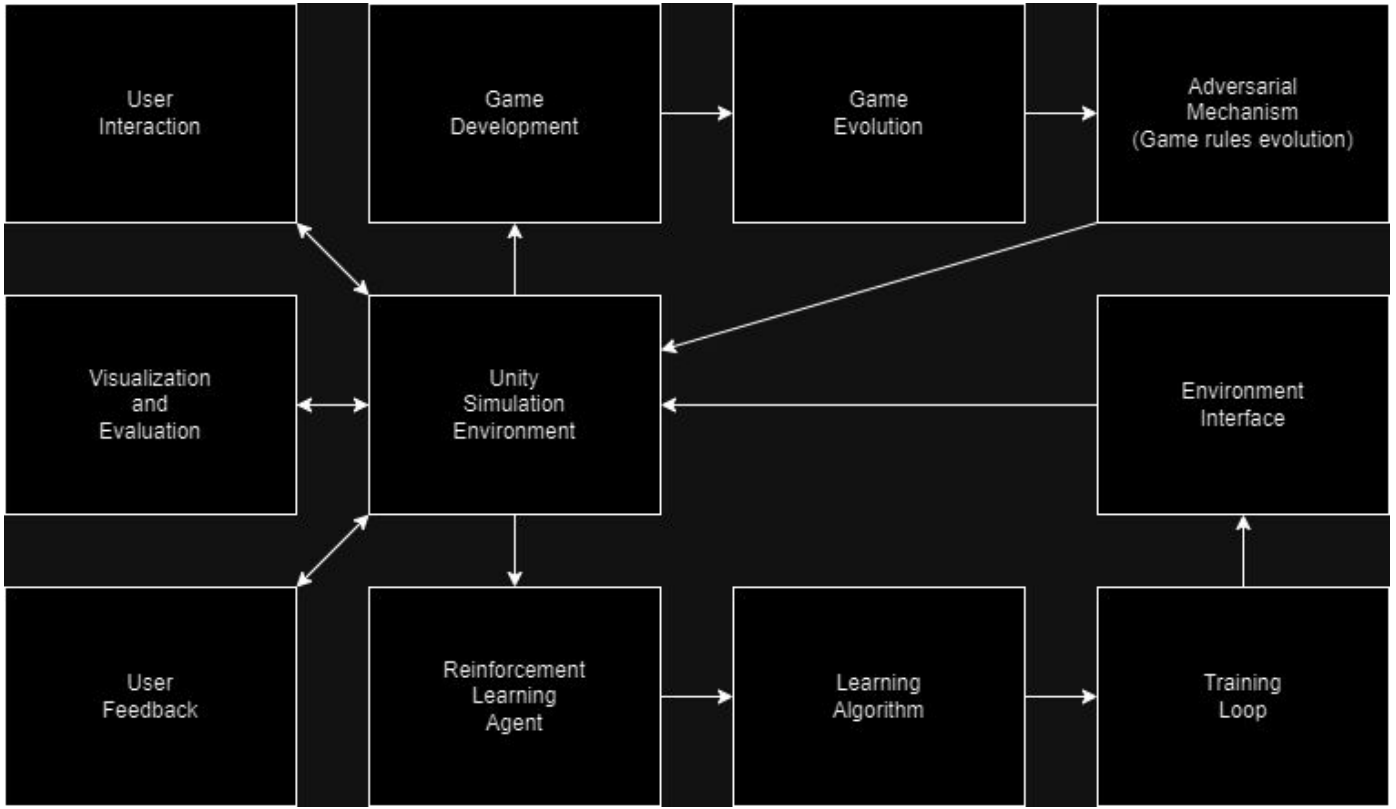
Personalized Entertainment

- The game's ability to evolve with the player ensures a unique experience for each user, promoting a more interactive experience.

Development Innovation

- It can inspire developers to integrate ML agents into NPC's to reduce behavior scripting and find unique strategies and behaviors

Design Specifications



Technologies

Languages:

- Python and C#(Unity)

Tools:

- Unity
- TensorFlow
- ML Agents Libraries: NumPy, Pandas, Matplotlib, HuggingFace, OpenAI

Milestones

Initial game - October 2023

Interface for training - November 2023

RL agent configuration - November 2023

Training success(18 food within 100 moves) - December 2023

Create live demo for Senior Showcase - February 2024

Results

Completed Goals

- Develop snake game in unity, with defined mechanics and measurable performance
- Implement training agent and define scenarios to iterate through
- Established a training pipeline for RL agent using reinforcement learning
- Measure success of agent over iterations

Finishing Tasks

- Come up with other ways to leverage multimodal AI models to enhance training of agents
- Polish demo to show at Senior Showcase

Challenges

1.Time Management: Balancing project deadlines with RL integration complexity.	Implemented efficient project management strategies from LLM generation.
2. Alignment of Game Mechanics and RL Objectives: Challenge: Ensuring game mechanics align with RL objectives.	Adjusted mechanics and rewards for optimal learning and performance.
3.Feedback Integration and Iterative Development: Challenge: Incorporating RL feedback and iterative refinement.	Implemented robust feedback mechanisms for continuous improvement from LLM generation.