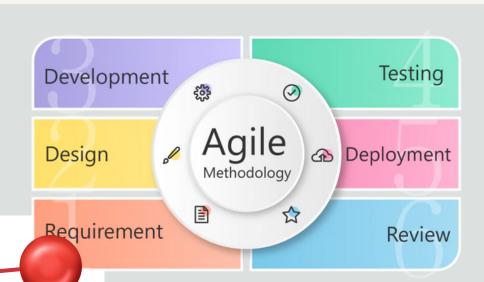# MARL SIMULATIONS

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Introduction

Multi Agent Reinforcement Learning Simulations studies how multiple agents interact in a shared environment, driven by individual rewards, akin to game theory. It models complex dynamics and aids in developing adaptable systems for real-world scenarios. Utilizing the Unity ML-Agents Toolkit with PyTorch, it trains agents for various game formats, facilitating AI research and game development. Through external Python processes, it optimizes neural networks to generate TensorFlow models for agent behavior, enhancing training visualization with tensorboard. The project addresses challenges in multi-agent settings and proposes future research on agent learning with unknown rewards, communication protocols, and human interaction considerations.

Agile Methodology
- Development
- Design
- Requirement
- Testing
- Deployment
- Review

Technologies Used

- Unity
- C#
- Python
- TensorFlow
- PyTorch
- Blender
- Flask
- HTML CSS JS
- Visual Studio
- Unity ML-Agents Toolkit

Types of Simulations

- **Cooperative Agents**
- **Competitive Agents**
- **Pathfinding Agents**
- **Goal Oriented Action Planning**
- **Hybrid Agents**

Snapshots

Block Diagram

Learning Environment

Agent A1, Agent A2, Agent B1, Environment Parameters, Agent C1, Agent D1

Behavior A, Behavior B, Environment Param. Channel, Behavior C, Behavior D

Communicator

Inference, Heuristic

Python API ↔ Python Trainer

Evaluation & Benchmarking

+1 Reward — Multi-agent — Count-based — Baseline — 0B Samples 6.0B
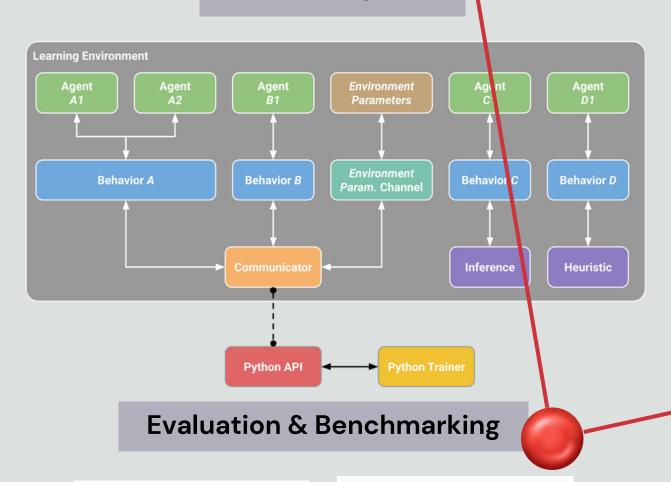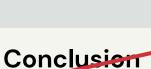
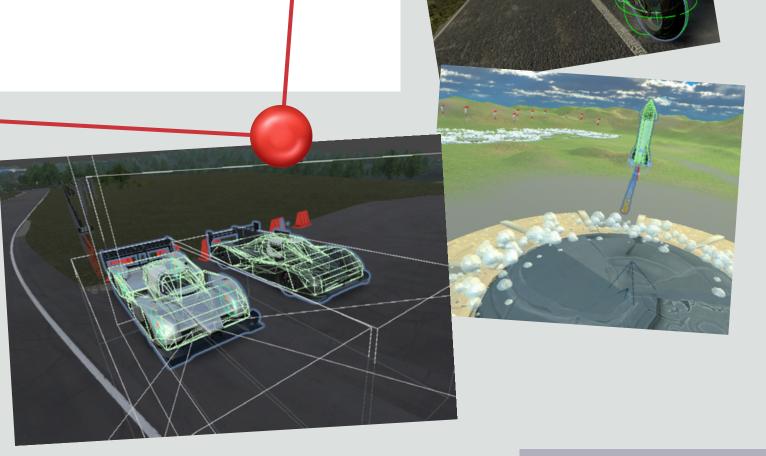+1 Reward — Multi-agent — Baseline — Count-based — 0B Samples 3.4B

Conclusion

In conclusion, Multi-Agent Reinforcement Learning (MARL) shows promise in AI research by enabling collaborative learning among agents in complex environments. It addresses challenges of multi-agent approaches and offers scalable solutions across various domains. This project demonstrates MARL's effectiveness in training agents using Unity ML-Agents Toolkit and PyTorch, highlighting adaptability and versatility. Challenges remain in coordination and scalability, but MARL holds potential for developing intelligent systems that augment human efforts. Ultimately, MARL aims to contribute positively towards society by creating autonomous agents that seamlessly interact with humans and complex systems.

Scan-to-Play

Guided by : Dr. Akshara Dave, Assistant Professor, IIICT

available on itch.io

GitHub