DAYANANDA SAGAR UNIVERSITY

SCHOOL OF ENGINEERING

Bachelor of Technology

in

Computer Science and Engineering

(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

A Project Report On

REINFORCEMENT LEARNING FOR GAME PLAYING: AI AGENT TRAINING STRATEGIES

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CERTIFICATE

This is to certify that the project entitled **REINFORCEMENT LEARNING FOR GAME PLAYING: AI AGENT TRAINING STRATEGIES** is a bonafide work carried out by **Student 1 (ENG00000000)**, **Student 2 (ENG00000000)**, **Student 3 (ENG00000000)** and **Student 4(ENG00000000)** in partial fulfillment for the award of degree in Bachelor of Technology in Computer Science and Engineering (Artificial Intelligence and Machine Learning), during the year 2023-2024.

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1 ....

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Acknowledgement

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REINFORCEMENT LEARNING FOR GAME PLAYING: AI AGENT TRAINING STRATEGIES

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Abstract

The project titled "Reinforcement Learning for Game Playing: AI Agent Training Strategies" is a comprehensive exploration of applying reinforcement learning techniques to train artificial intelligence (AI) agents for game-playing scenarios. Leveraging the Unity ML-Agents framework, the project seeks to develop intelligent agents with the capacity to learn optimal strategies for effective navigation within dynamic game environments, emphasizing the attainment of predefined goals and the avoidance of obstacles. The study delves into a thorough investigation of diverse training strategies and algorithms to enhance the efficiency and adaptability of these AI agents. Implementing and assessing various reinforcement learning algorithms, including but not limited to Q-learning, Deep Q Networks (DQN), and Proximal Policy Optimization (PPO).

Creating intricate game environments within Unity ML-Agents to simulate realistic challenges for AI agents, fostering a dynamic learning environment.

Exploring a spectrum of training strategies, encompassing hyperparameter tuning and optimization techniques, to maximize the learning efficiency of AI agents. Goal Achievement and Obstacle Avoidance: Developing a framework to enable AI agents to strategically achieve predefined goals while efficiently avoiding obstacles.

The outcomes of the project present promising capabilities of trained agents in achieving predefined goals and navigating through obstacles. The comparative analysis of reinforcement learning algorithms provides valuable insights into their respective strengths and limitations in the context of game playing.

Contents

1 Introduction

Reinforcement Learning (RL) [1] stands as a pivotal methodology in the realm of artificial intelligence, particularly in the context of game playing. This paper delves into the myriad strategies employed for training AI agents using reinforcement learning techniques within the domain of game playing. The exploration spans a spectrum of crucial aspects, including diverse reinforcement learning algorithms, innovative training methodologies, and nuanced neural network architectures. The primary objective is to bolster the decision-making capabilities of AI agents, fostering adaptability to intricate gaming environments and ultimately achieving heightened performance levels. Through a meticulous examination of recent advancements and insightful case studies, this paper not only provides a comprehensive overview of the current state of reinforcement learning for game playing but also identifies trends and challenges prevalent in this rapidly evolving field. Furthermore, the paper analyzes the interplay between exploration and exploitation [2], emphasizing the delicate balance required for effective learning. It also explores transfer learning techniques, where knowledge gained in one gaming context can be leveraged for accelerated learning in a different environment. This introduction explores the landscape of RL for game playing, emphasizing the evolving strategies employed to train AI agents effectively and efficiently, contributing to the broader field of artificial intelligence and computational gaming.

1.1 Scope

2 Problem Definition

3 Literature Survey

4 Methodology

4.1 Data Collection

Data collection is the systematic process of gathering and accumulating relevant information from various sources. This phase involves defining the scope of the data, selecting appropriate sources, and employing methods such as surveys, experiments, or utilizing existing databases. The quality and reliability of collected data significantly impact the success of subsequent analysis and modeling.

4.2 Data Pre-processing

Data preprocessing is a crucial step in preparing raw data for analysis. It involves cleaning and transforming the data to enhance its quality and usability. Tasks include handling missing values, addressing outliers, scaling features, encoding categorical variables, and performing normalization. Effective data preprocessing ensures that the data is in a suitable format for modeling, improving the accuracy and interpretability of machine learning algorithms.

4.3 Model Implementation

In our major project, a total of 10 classification models were implemented for better understanding of the dataset and the domain

4.3.1 Logistic Regression

5 Requirements

5.1 Functional Requirements

Requirement 1

Requirement 2

Requirement 3

5.2 Non- Functional Requirements

Requirement 1

Requirement 2

Requirement 3

6 Results & Analysis

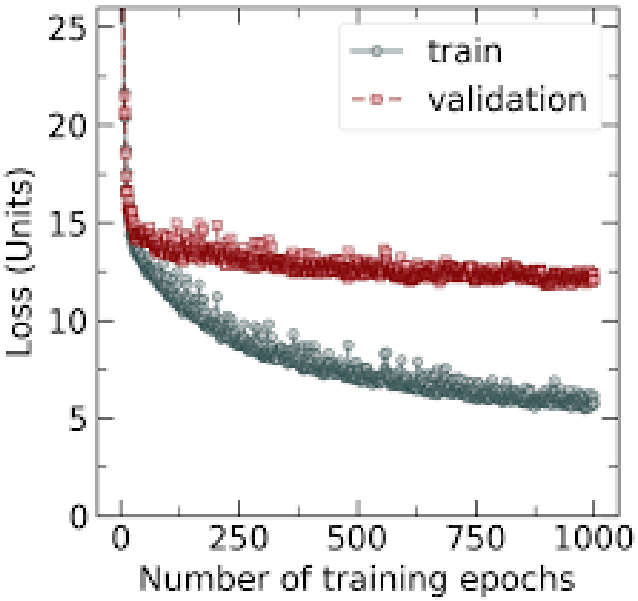

Figure 1: Your Image Caption

7 Conclusion & Future work

8 References

References

[1] Chan, Stephanie CY, et al. "Measuring the reliability of reinforcement learning algorithms." arXiv preprint arXiv:1912.05663 (2019).

[2] Louis, Ruwaid, and David Yu. "A study of the exploration/exploitation trade-off in reinforcement learning: Applied to autonomous driving." (2019).
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