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REINFORCEMENT LEARNING PROJECT PROPOSAL.

Title

Development and Deployment of a Reinforcement Learning Model for the Cart Pole Problem

Introduction

The Cart Pole problem is a classic environment in reinforcement learning where an agent must learn to balance a pole on a moving cart. This project aims to implement a simple reinforcement learning (RL) solution to teach an agent how to keep the pole upright by applying left or right forces.

Problem statement

Design and train a reinforcement learning agent that can successfully balance the Cart Pole for as long as possible using feedback from the environment.

Objectives

- Set up the Cart Pole simulation environment.
- Implement a basic RL algorithm (Deep Q-Network – DQN).
- Train the model and monitor its learning progress.
- Evaluate the agent's performance.
- Demonstrate the trained model in a simple deployment.

Background and Motivation

Reinforcement learning is an area of machine learning where an agent learns by interacting with an environment and receiving rewards. The Cart Pole task is widely used for testing RL algorithms because it is simple but still demonstrates the main ideas of control and decision-making.

Methodology

- Environment setup using Open Ai Gym's cartPlole-V1 environment

- Install required libraries like Gym, Pytorch, NumPy
- Implementing RL algorithm using Deep Q-Network (DQN) for training, Components include Neural Network, Replay Memory, Epsilon-greedy action selection

Training

- Train the agent over multiple episodes.
- Save the trained model

Evaluation

- Test the agent on several episodes
- measure average and episode duration

Deployment

- Load the trained model and run real-time simulation.

Expected Outcomes

- A trained RL Model capable of balancing the Cart Pole with high efficiency.
- Graphs showing improvement in reward over time
- A demo script showing the agent balancing the Cart Pole

Required tools and Libraries

Python

OpenAIGym

PyTorch

NumPy

Matplotlib for visualization

Conclusion

This Project provides a simple and practical introduction to reinforcement learning.

By training a model to solve the Cart Pole problem, we learn the fundamentals of RL algorithms, model training and performance evaluation.