

Deep Reinforcement Learning Concepts Project

B9AI105 REINFORCEMENT LEARNING

18/3/2024

Objective

Develop a comprehensive understanding of key concepts in deep reinforcement learning (DRL) and algorithms used in DRL, with a practical implementation in the Frozen Lake environment.

Task

Choose one of the following topics related to DRL:

1. Deep Q-Network (DQN)
2. Replay Buffer
3. Target Network
4. Double DQN
5. Prioritized Experience Replay
6. Advantage Function
7. Long Short-Term Memory (LSTM) in Deep Recurrent Q-Networks (DRQN)
8. Value-Based Methods
9. Policy-Based Methods
10. Policy Gradient Method
11. Reward-to-Go
12. Policy Gradient with Baseline Function
13. Baseline Function

Implementation Task

- Implement the chosen concept or algorithm in the Frozen Lake environment using OpenAI Gym.
- Train an agent to navigate the Frozen Lake using the implemented algorithm.
- Compare the performance of your agent with different hyperparameters and settings.

Requirements

1. Write a detailed explanation of the chosen topic, covering the following aspects:
 - Definition and purpose of the concept or algorithm.
 - Why it is important or necessary in reinforcement learning.
 - How it is used or implemented in DRL algorithms.
 - Any advantages, disadvantages, or variations of the concept or algorithm.
2. Provide a code example or pseudocode illustrating the concept or algorithm in action in the Frozen Lake environment.
3. Include references to academic papers, articles, or online resources that further explain the concept or algorithm.

Deliverables

- A written report or presentation summarizing the chosen topic, including the explanation, code example (if applicable), and references.
- Code files for the implementation in the Frozen Lake environment.

Submission Guidelines

- Submit the report or presentation slides in PDF format.
- Include the code files in a separate folder or archive.
- Make sure to submit this assignment by **18th of April 2024**

Evaluation Criteria (Total: 100 points)

1. Explanation of Chosen Topic (30 points)
2. Code Implementation (30 points)
3. Performance Evaluation (20 points)
4. Documentation (10 points)
5. References and Further Reading (5 points)
6. Overall Presentation (5 points)