Educational Web App to Visualize Reinforcement Learning Methods

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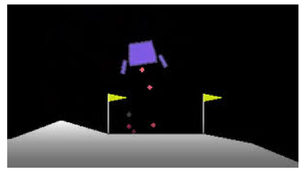
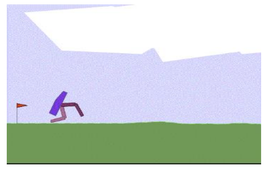
Introduction

Reinforcement learning is captivating, yet often challenging for students. Therefore, there exists a need to make the learning experience interactive and engaging, particularly in the initial stages. Students should be provided with a clear understanding of the concepts they will be learning, as well as what they can achieve with RL. Incorporating the visuals makes the learning intuitive and efficient and allow students to better grasp the core concepts.





Goal

Provide an interactive platform to students/learners that enables them to visualize how the learning of a model to solve an environment is impacted by various hyper-parameters and algorithms. Simplifying the concepts will develop an inclination towards RL.

Visualization help in grasping the concepts effortlessly. They can get a clear picture of role of each parameter in the algorithm.

This can also help in getting a hold on the assignments.

Issue

RL consist of many complex concepts and algorithms, understanding the working and how it is affected by different hyperparameters can be confusing and challenging.

Students can misunderstand the role of hyperparameters.

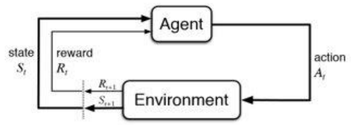
Methodology

- The flask app takes in the selected environment, algorithm and values for the hyperparameters.
- The agent is trained on the selected algorithm with the parameter choices.
- We save the frames after certain intervals to visualize the training process throughout the episodes.
- We perform evaluation of the policy learnt by the agent.
- A video of training and evaluation of agent on the environment and the rewards plots for the same are reflected on the interface.

Algorithms

The app has 3 Tabular algorithms:

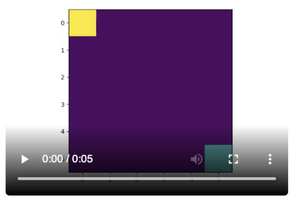
A. Q-Learning
B. SARSA
C. Double Q-Learning



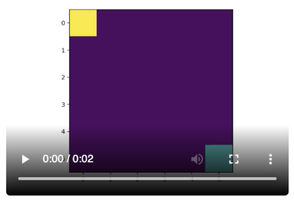
Results

Training & Evaluation of environments including recording & reward plots.

Training



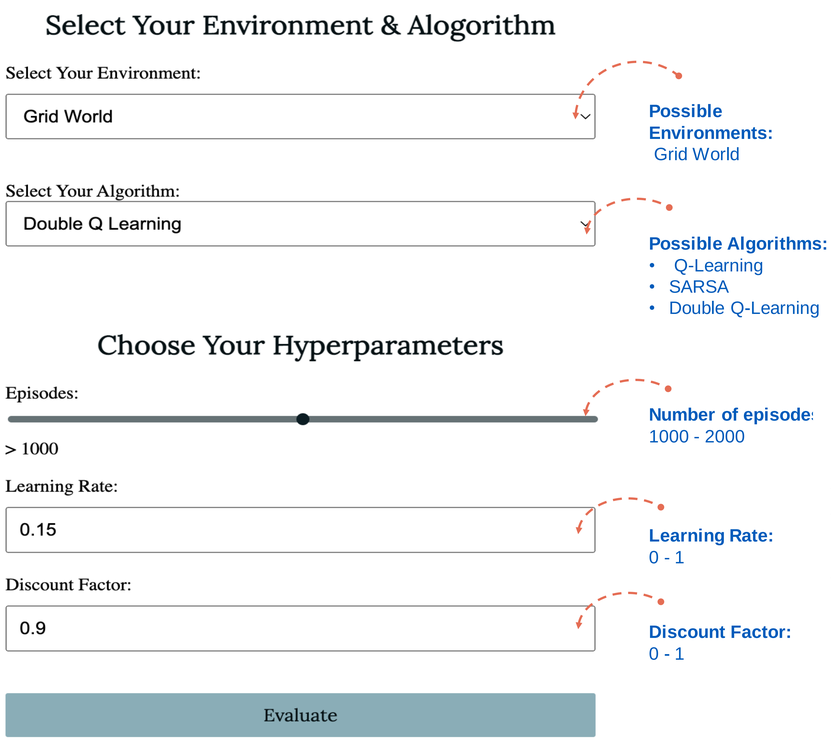
Evaluation

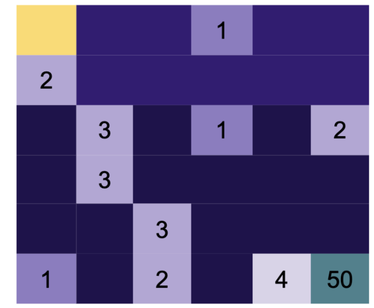


Training reward plot

Evaluation reward plot

Web App





Future Work

- The app uses Tabular RL methods, it can be extended to incorporate Deep RL methods like DQN, DDQN.
- We can integrate multiple environments such as Maze, Cartpole, LunarLander and Atari for visualization.
- Add more options for hyperparameters.

Conclusion

Our objective of simplifying the field of reinforcement learning has been accomplished by allowing users to visualize a range of environments and algorithms, while also enabling them to experiment with various parameters to gain a deeper understanding of their significance and functionality.

References

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4. Rest API
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