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|  | | CSE 6363: MACHINE LEARNING ASSIGNMENT - 5 | | | | |  | |
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|  | | | | 12/10/2023—Fall 2023—Alex J Dillhoff |  | | | |
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1. **Q-Learning and Policy Iteration on the Frozen Lake Environment:**
   1. understood the Frozen Lake environment and its dynamics from the gymnasium documentation.
   2. Implemented the Q-Learning algorithm using the documentation as a guide and plotted Average Steps Per Episode, Average Rewards Over Episodes, Cumulative Rewards Over Episodes.
   3. Evaluated the performance of the agent for 3 different values of each hyperparameter and analyzed the impact of hyperparameters on the learning process.

alpha\_values = [0.1, 0.3, 0.5]

gamma\_values = [0.90, 0.95, 0.99]

epsilon\_values = [0.1, 0.3, 0.5]

* Learning Rate (alpha): It controls how much the Q-values are updated in each iteration. As the alpha value increased the success rate decreased.
* Discount Factor (gamma): It determines the importance of future rewards. As the gamma value increased the success rate increased.
* Exploration Rate (epsilon): It balances exploration and exploitation. As the epsilon value increased the success rate decreased.
  1. Implemented the policy iteration algorithm and compared its performance to Q-Learning.

1. **Proximal Policy Optimization on an Atari Game Environment:**
   1. Tried to implement q-learning algorithm on Pong and CartPole
   2. Tried to implemented PPO on Pong and CartPole(after referring to a few cited online sources I could implement on CartPole)

REFERENCES:

* <https://medium.com/@shogulomkurganov73/atari-games-with-proximal-policy-optimization-ed28c7fafa3f>
* <https://stable-baselines3.readthedocs.io/en/master/modules/ppo.html>
* <https://github.com/vwxyzjn/ppo-implementation-details/blob/main/ppo_atari.py>
* <https://www.youtube.com/watch?v=05RMTj-2K_Y>
* <https://towardsdatascience.com/a-graphic-guide-to-implementing-ppo-for-atari-games-5740ccbe3fbc>