

## REVIEWER'S REPORT

Manuscript No.: 52079

Date: 05-06-2025

### Title:

Hyperparameter Impact on Learning Efficiency in Q Learning and DQN using OpenAI Gymnasium Environments

### Recommendation:

Accept as it is ..... Yes .....  
 Accept after minor revision.....  
 Accept after major revision .....  
 Do not accept (*Reasons below*) .....

Rating	Excel.	Good	Fair	Poor
Originality			Yes	
Techn. Quality		Yes		
Clarity		Yes		
Significance			Yes	

Reviewer Name: Gulnawaz Gani

### Reviewer's Comment for Publication.

This paper contributes to the understanding of hyperparameter impact on Q-Learning and DQN efficiency, demonstrating DQN's robustness and highlighting the challenges of state discretization for tabular Q-Learning.

### Detailed Reviewer's Report

- This paper effectively demonstrates the superior performance of DQN over Q-Learning in the CartPole-v1 environment, highlighting the critical role of hyperparameter tuning.
- However, the study's scope is limited by its exclusive focus on a single, relatively simple environment and the absence of automated hyperparameter optimization techniques like Bayesian optimization, potentially leaving more optimal configurations unexplored.
- The coarse state discretization for Q-Learning also significantly hampered its performance, and deeper exploration of adaptive discretization methods would have provided a more balanced comparison.
- Furthermore, the reliance on fixed hyperparameter ranges might not fully generalize to more complex RL tasks or diverse environments.
- Finally, the paper could benefit from a more in-depth discussion of computational resources and time taken for training, especially for DQN's neural network, as this is a practical consideration for reinforcement learning.