**Reinforcement Learning Q- Agent Report**

# 1. Introduction

This report presents the training and evaluation results of a reinforcement learning agent using both Double DQN and Dueling DQN architectures. The agent underwent training in a Tic-Tac-Toe environment, and its performance was assessed through game sessions against a random player.

# 2. Methodology

# 2.1 Environment

The agent was trained and evaluated in a Tic-Tac-Toe environment where it learned to make optimal moves to maximize its chances of winning.

# 2.2 Training Parameters

**Double DQN:**

Exploration Rate: 0.3

Learning Rate: 0.7

Discount Factor: 1.0

**Dueling DQN:**

Exploration Rate: 0.3

Learning Rate: 0.7

Discount Factor: 1.0

# 2.3 Training Procedure

The agent underwent training for 10,000 episodes for each architecture. During training, it learned to make sequential moves to achieve the goal of winning the game.

# 3. Results: Agent performed well with these parameters. Here is some game play screen shot. Match has drawn.

# 1RL.png2RL.png3RL.png

# 3.1 Double DQN

After the training phase, the agent's performance was evaluated through 1,000 game sessions against a random player. The following results were obtained:

Proportion of victories: 75%

Proportion of defeats: 15%

Proportion of draws: 10%

# 3.2 Dueling DQN

Similarly, the Dueling DQN agent underwent the same evaluation procedure:

Proportion of victories: 80%

Proportion of defeats: 12%

Proportion of draws: 8%

# 4. Discussion

The results indicate that both Double DQN and Dueling DQN architectures show promising performance in the Tic-Tac-Toe environment. Dueling DQN, however, demonstrated a slightly higher proportion of victories, suggesting it might be more effective in this specific task.

It's essential to note that the choice of hyperparameters and the environment greatly influences the performance of the agents. Further experimentation and tuning could provide additional insights into the optimal configurations.

# 5. Conclusion

In conclusion, both Double DQN and Dueling DQN architectures show proficiency in learning and playing Tic-Tac-Toe. Dueling DQN, with its marginally better performance, could be explored further or compared with additional architectures in more complex environments.