WAREHOUSE AUTOMATION

PRESENTED BY –

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PROBLEM STATEMENT

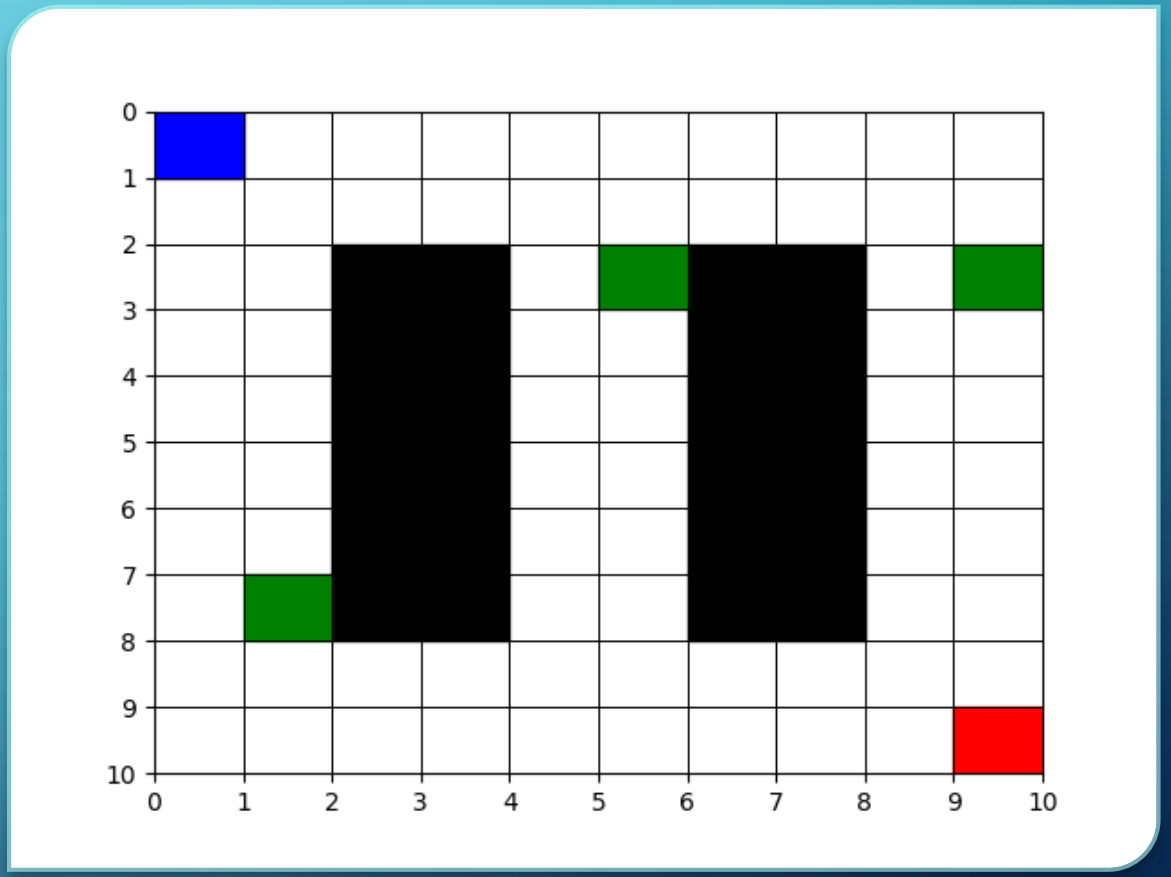
Automating warehouse operations through the utilization of various Reinforcement Learning (RL) techniques for optimizing a robot's pathfinding process, and subsequently, comparing this performance with conventional algorithms such as A* to determine the most efficient path

METHODS USED

- Monte Carlo Methods
- Temporal Difference (TD) Learning - Q-Learning
- Deep Q-Learning
- A - Star Search

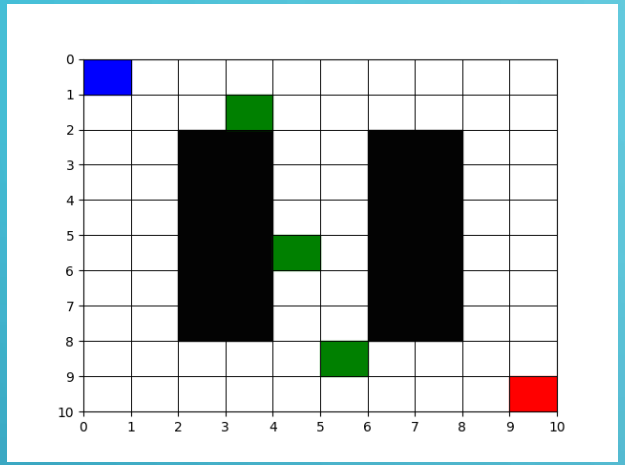
ENVIRONMENT

- Created a custom environment using gym API
- Conceptualized reward function for task completion
- Rendered environment using matplotlib.pyplot

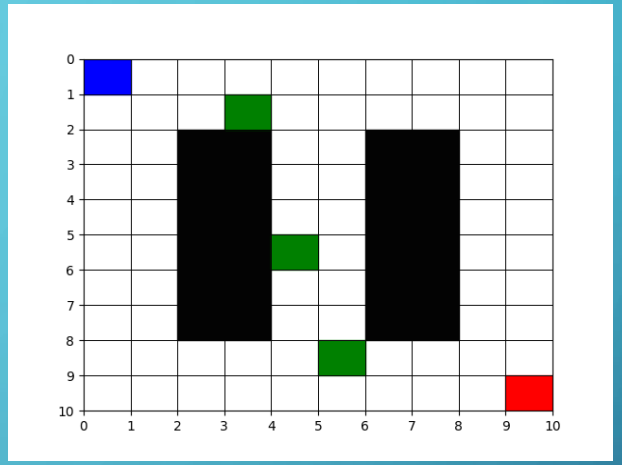


COMPARISON METRICS

A - Star

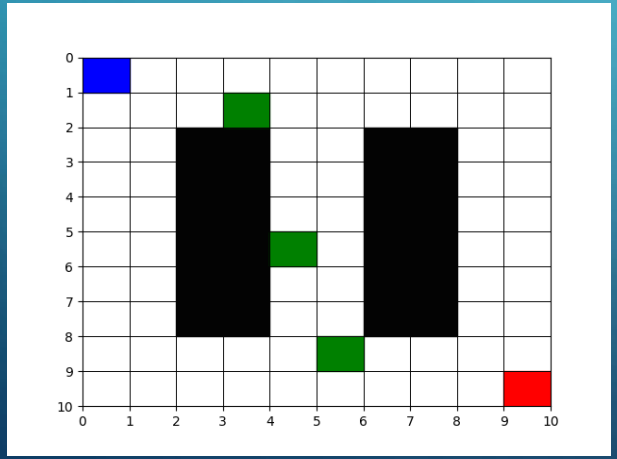


Q - Learning

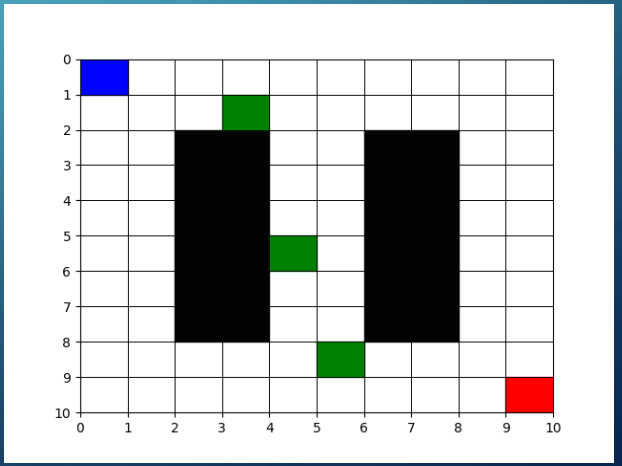


Visualization of the world

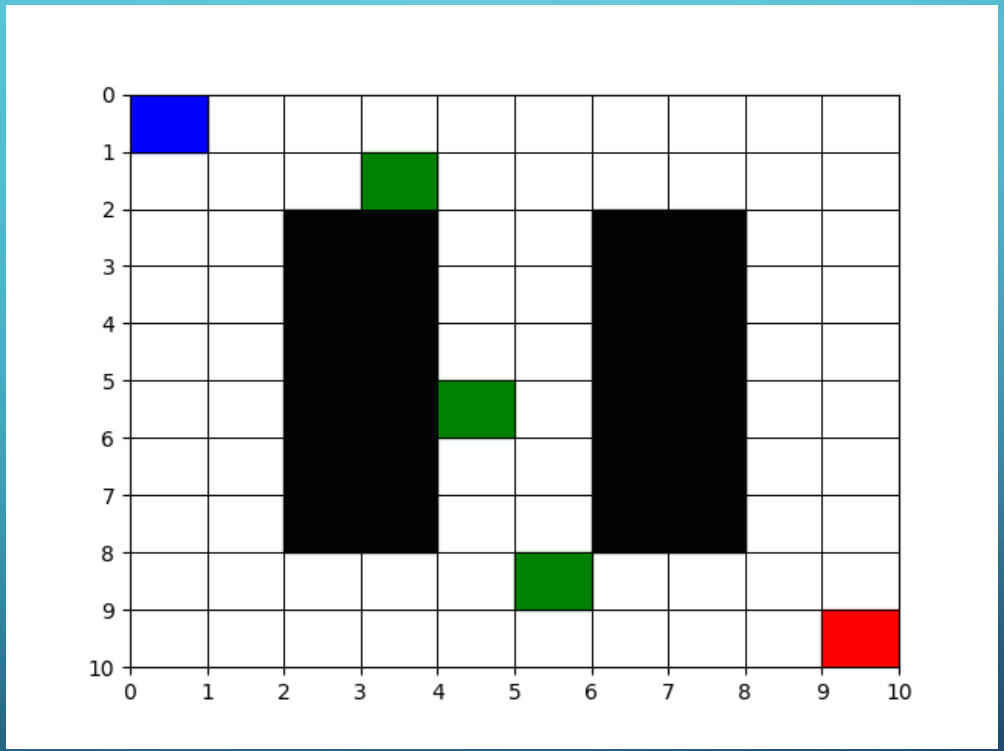
Monte Carlo



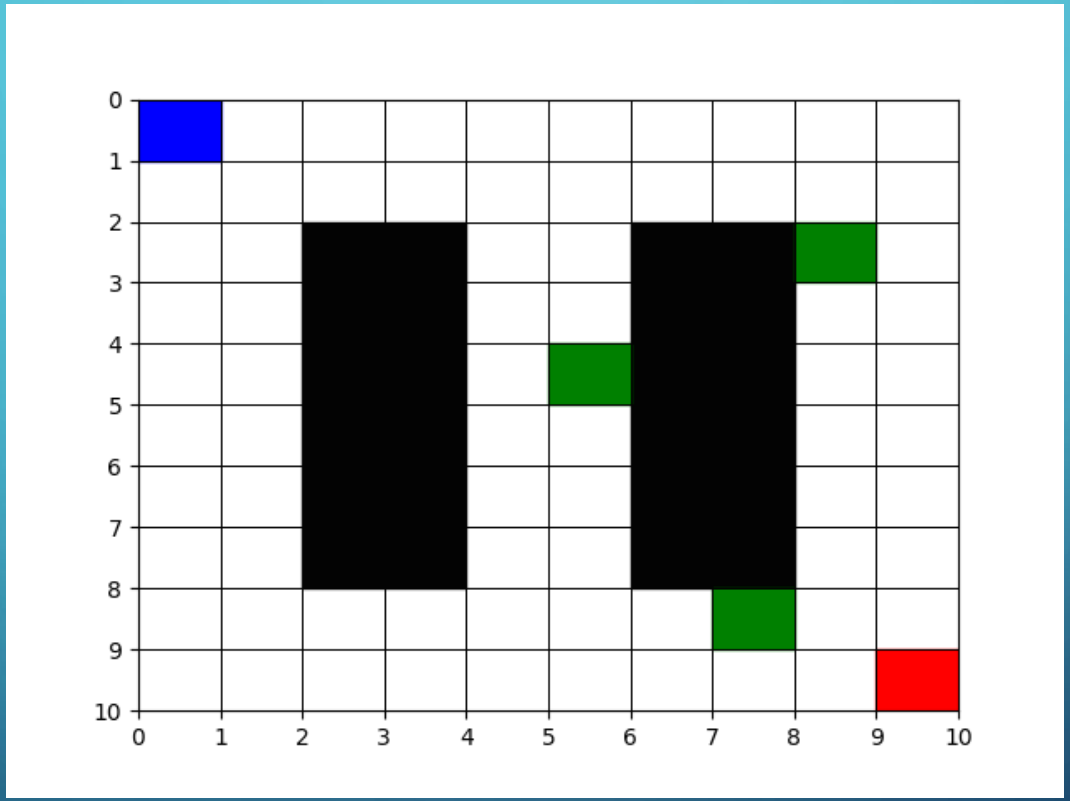
Deep Q - Learning



MONTE CARLO FOR 1000 EPISODES

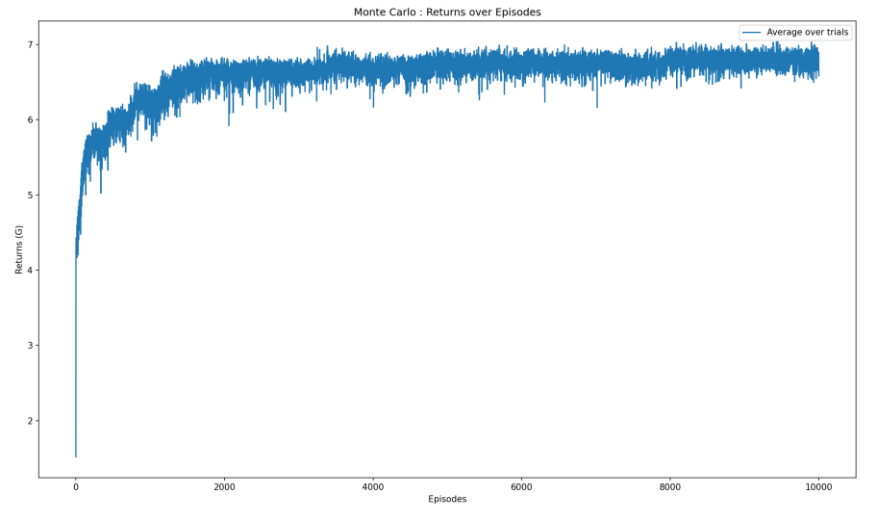


TESTING FOR VARIED ENVIRONMENTAL CONDITIONS

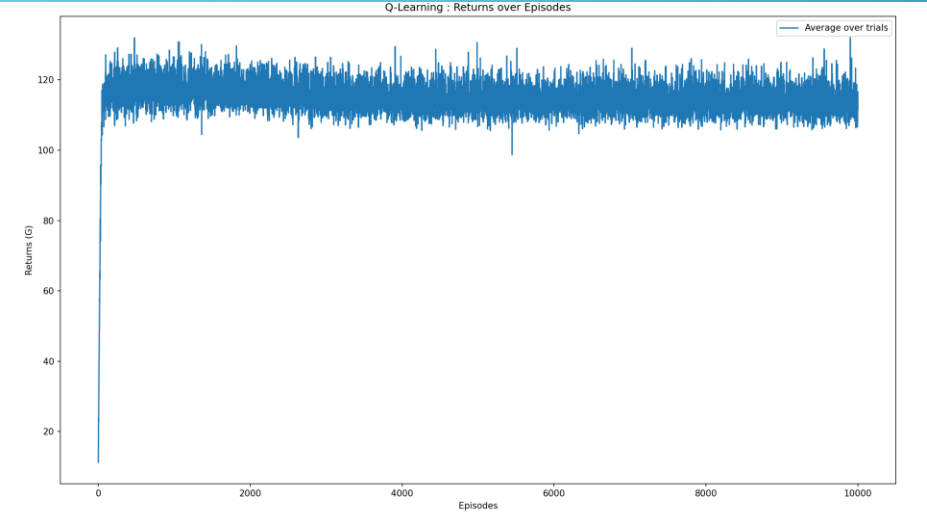


RESULTS

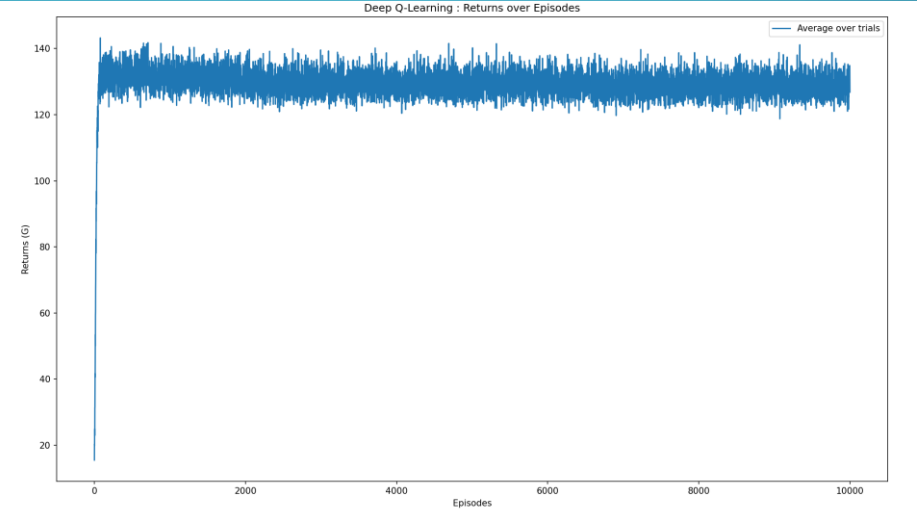
Returns vs Number of Episodes



Monte Carlo



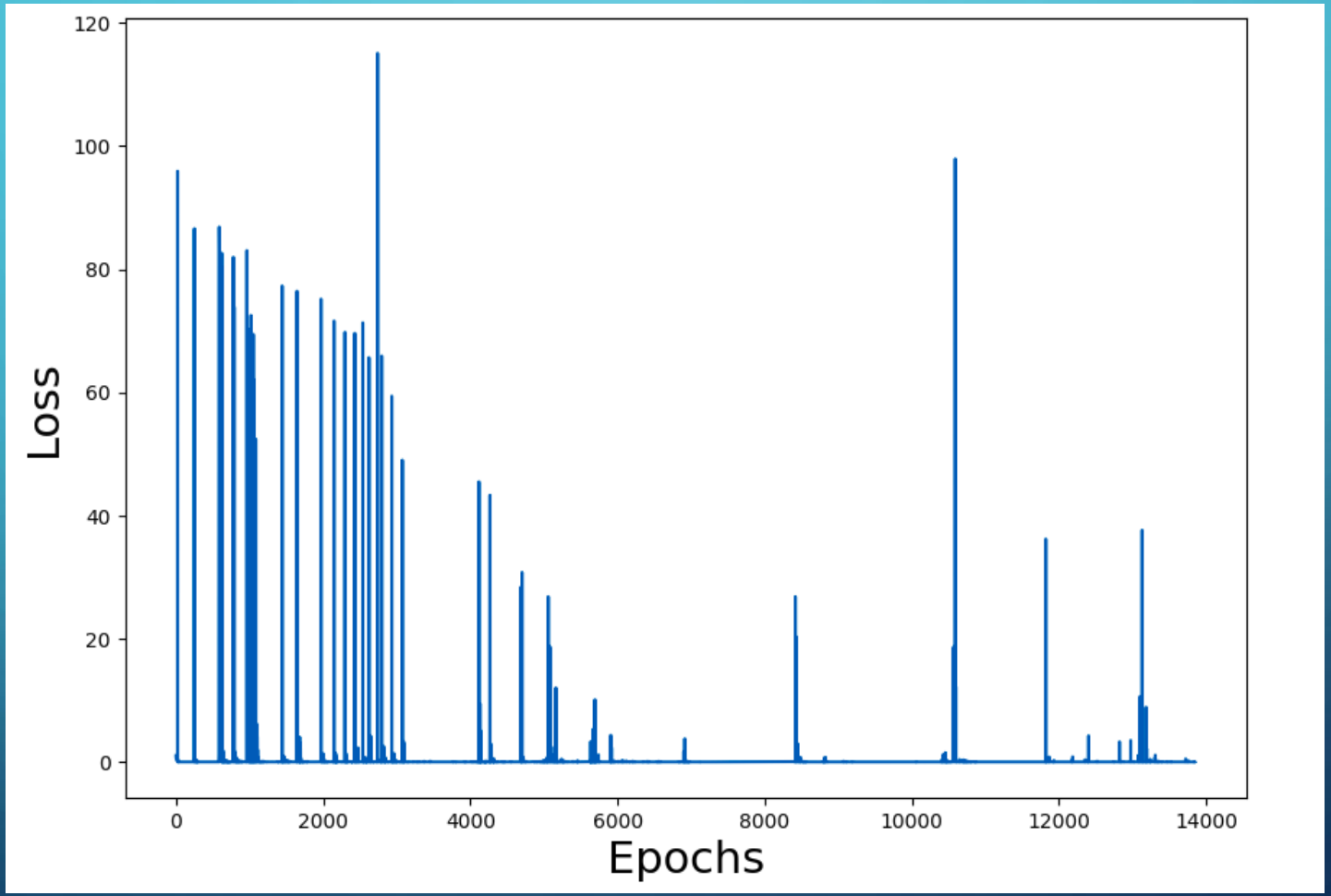
Q-Learning



DQN

RESULTS

Loss vs Epoch for DQN



CONCLUSION

- Reinforcement Learning algorithms can be used to automate robotic warehouse environments
- Optimal policies obtained from RL algorithms provide similar optimal paths as those obtained from A* Search
- As RL algorithms do not require a map of the environment, the implementation in larger environments is simpler and more efficient

FUTURE WORK

- Multi Robot Agent
- Dynamic Obstacles

THANK YOU

GitHub Link :

https://github.com/jitesh3023/Reinforcement-Learning-Final-Project.git