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Abstract

Efficient traffic management at urban intersections is a critical component of modern smart cities. This project focuses on optimizing traffic light policies at a single junction to enhance traffic flow and reduce congestion.
Utilizing the SUMO (Simulation of Urban MObility) simulation environment and Python, we implemented a Deep Q-Network (DQN) algorithm to learn and develop an optimal traffic signal control policy.
Through the TRACI (Traffic Control Interface) module, the DQN agent interacts with the SUMO simulation, gathering real-time traffic data and adjusting signal timings dynamically. The core objective is to minimize average waiting times and vehicle queue lengths at the intersection.
Our results demonstrate improvements in traffic efficiency, showcasing the potential of reinforcement learning techniques in traffic management systems. This project paves the way for scalable solutions in smart traffic control, contributing to smoother and more sustainable urban transportation networks.

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