RUTGERS

WINLAB | Wireless Information Network Laboratory

Machine Learning For Traffic Behavior Analysis in Smart Cities

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Goal

- Create an environment that can run Multi Agent Reinforcement Learning algorithms and evaluate/compare them to other algorithms
- Set up VR and steering wheel for an immersive and realistic experience
- Create real world digital twin maps to test MARL algorithms in a practical use scenario

Background and Motivation

- Rapid urbanization increases traffic complexity, requiring new solutions to manage dynamic scenarios effectively.
- Machine Learning (ML) and Multi-Agent Reinforcement Learning (MARL) offer innovative approaches to improve real-time traffic management.
- Our application attempts to create a platform for evaluating and comparing MARL algorithms, helping to develop and refine traffic management solutions.

Acknowledgements

CARLA Setup
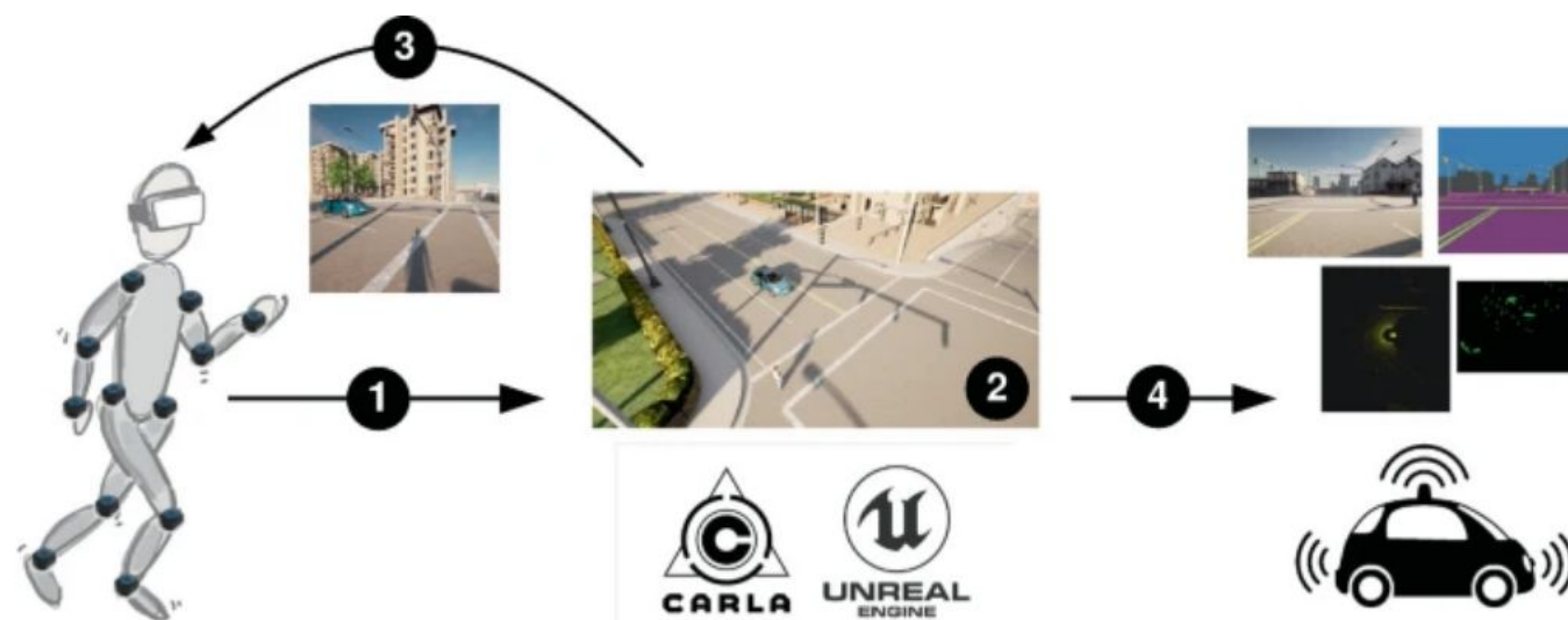
- CARLA is an open-source driving simulator that offers a multitude of maps, cars and traffic scenarios
- We used AVLR and SteamVR to enable the use of VR in CARLA
- Using Lenovos software, we connected a steering wheel and pedals for manually controlling vehicles within CARLA

Objectives

- Set up VR and steering wheel for both Windows and Linux systems
- Create scripts for automatic and manual control of pedestrians
- Generate digital twin maps of New Brunswick and New York intersections
- Implement MAPPO algorithm to test performance
- Create a benchmark function to evaluate and compare the performance of one or multiple algorithms

Scenarios

- New Brunswick and New York digital twin CARLA maps with multiple intersections and buildings
- Two or more cars have to traverse the intersection, avoiding collisions with other cars or objects
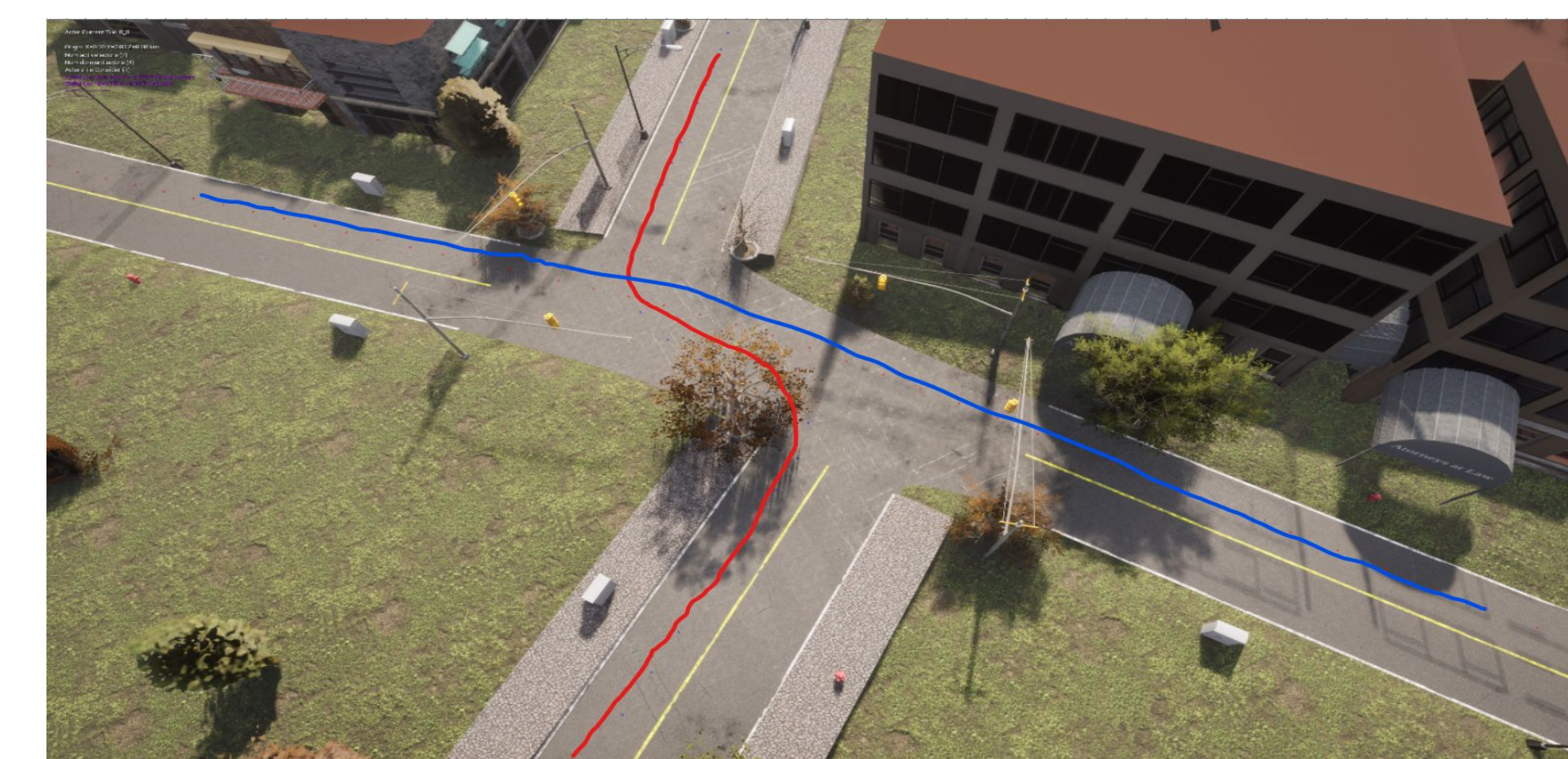
Results

- Created an environment capable of running MARL algorithm and testing their performance
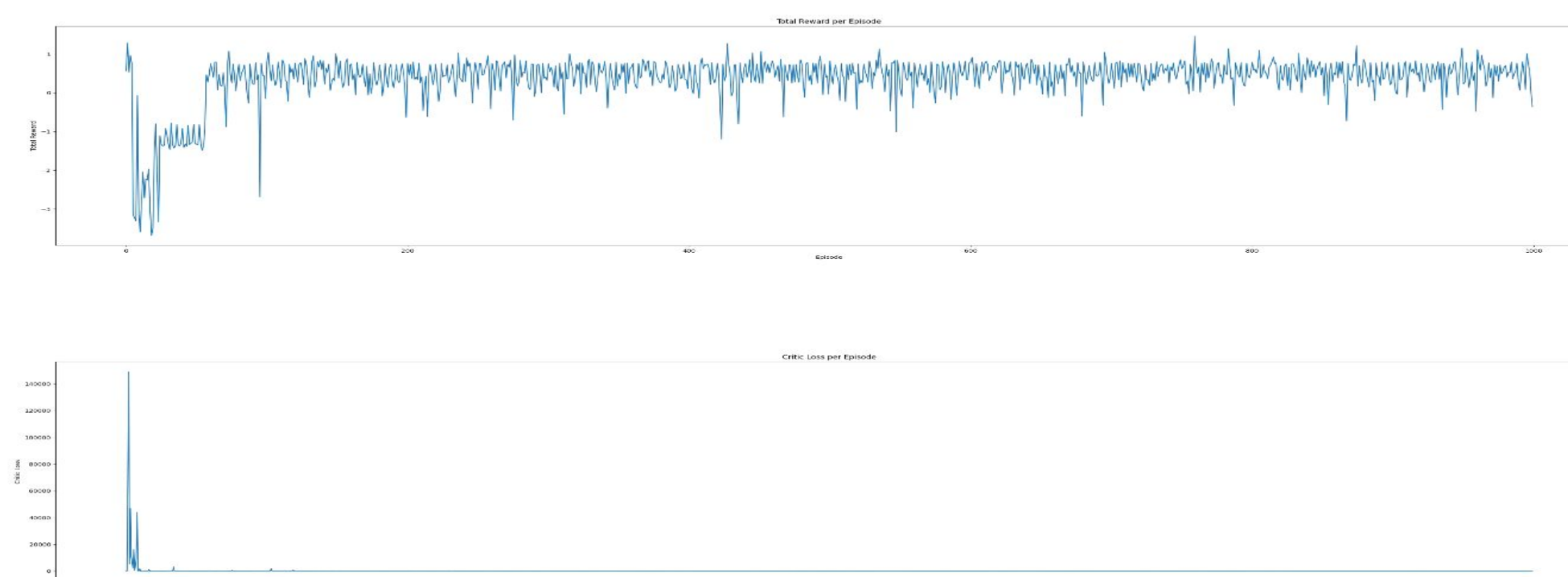
Future Plans

- Fine tune MAPPO algorithm and continue testing more MARL algorithms
- Generate more digital twin maps with new testing scenarios

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