Proposal: Application of Reinforcement Learning in Autonomous Driving

ELEC-473: Deep Reinforcement Learning

JiaqiGuo: JGR9647; Yimin Han: YHA1926 Ruochen Jiao: RJB5625

Background and Motivation

Autonomous vehicles (AVs) are expected to enter society in the near future and are expected to be fully available in some regions as early as 2050. However, with the adoption of autonomous driving technology, the impact of these advances is not yet well understood. Numerous technical challenges arise from the goal of analyzing the partial adoption of autonomy: partial control and observation, multi-vehicle interactions, and the sheer variety of scenarios represented by real-world networks.

Reinforcement learning (RL) has a wide range of application scenarios, one of which is the application of reinforcement learning in the field of AVs. It permits the decoupling of the mathematical modeling of the system dynamics from the control law design. In our project, we study the feasibility of deep reinforcement learning (RL) for traffic control in a hypothetical single-lane circular track scenario. Our goal is to make the traffic flow smoother and safer

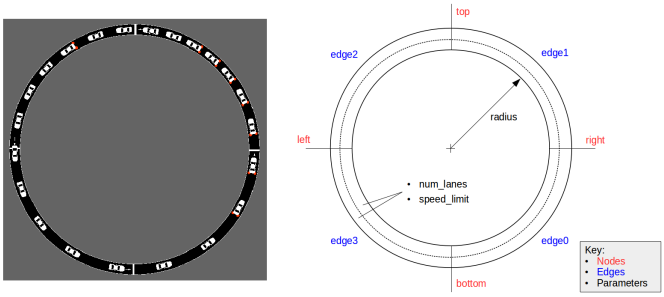

Figure 1: Simulated single-lane circular track scenario

Possible Scopes of Researches

In this project, we will probably focus on the following topics:

1. Simulate the single-lane circular track scenario with FLOW
2. Apply reinforcement learning algorithms - Proximal Policy Optimization (PPO)
3. Apply reinforcement learning algorithms - Asynchronous Proximal Policy Optimization (APPO)
4. Compare and analyze the results of the two algorithms, and make the final conclusion