Safe Reinforcement Learning for Navigating Complex Urban Environment.

Project Background

In recent years, Autonomous Vehicle (AV) has attracted widespread attention. However, there are still plenty of problems in complex urban environments, especially at dense intersections. AVs, at urban intersections, must interact with other AVs and other road users to select an appropriate strategy to pass through intersections safely and efficiently.

Reinforcement Learning (RL) is considered a promising method to address these issues. However, RL faces an exploration and exploitation dilemma, which is a trade-off between safety and efficiency for AVs at urban intersections. In the simulator, AVs explored without any cost, but in the real world, this will lead to serious accidents. Safe RL focus on constraining the exploration of agent to avoid unsafe conditions. An optimal correction value of the original dangerous action will help with the enhancement in safety without losing much efficiency.

Therefore, in this research project, the safe RL algorithms will be improved and applied to AV decision-making in urban environments.

Responsibilities

- Utilize the existing simulators, such as SUMO, CARLA, etc. to build required scenarios to estimate performance of safe RL algorithms.
- Develop and implement state-of-the-art safe RL algorithms for AVs.
- Collaborate with other researchers to optimize existing safe RL algorithms.

Qualifications

- Solid optimization theory, RL knowledge, probability and mathematical statistics, even better if know control theory.
- Good programming skills, especially in Python.
- Proficiency in toolkits/libraries for neural networks, such as TensorFlow, PyTorch.