

SCIENTIFIC SEMINAR TOPIC SELECTION (AVE)

TOPIC: Reinforcement Learning for Real-Time Decision-Making in Autonomous Vehicles

Task Description and Objectives:

The application of reinforcement learning (RL) to autonomous vehicles (AVs) has gained significant interest due to its ability to enhance decision-making and learn how to accommodate changing driving environments. Reinforcement learning, a machine learning technique, enables AVs to learn optimal driving policies by trial and error using their environment. Generally, real-time decision-making and the ability to anticipate and counter uncertain human driver behavior are critical problems for autonomous vehicles, especially in mixed urban traffic scenarios.

One of the key features of effective autonomous driving systems is the capability to integrate sensor data from various sources, such as cameras, LiDAR, and radar, to predict and respond to dynamic traffic situations. The systems must not only navigate through common road conditions but also face the uncertainty of human drivers. The better an AV can manage such dynamic scenarios, the more directly it relates to its safety and efficiency.

The main research question for this research is: **"How do different reinforcement learning techniques compare in predicting and adapting to unpredictable human driver behavior in urban traffic environments using real-time sensor data, and which method provides the best balance between safety and efficiency in decision-making?"** The question aims to investigate the performance of different RL approaches in real-world driving situations, focusing on their ability to predict and adapt to human driver behavior in real-time, with the safety and efficiency of the AV driving being assured.

In answering this research question, the research will be making a contribution towards the ongoing evolution of reinforcement learning algorithms for AVs, toward an eye on how such techniques might be tuned for real-world application in urban traffic. The results will be of interest to the development of AI in autonomous driving and to the development of safer, more efficient transport networks.

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