

## **Simulation-based Self-driving Car using Reinforcement Learning**

***Abstract***—Reinforcement learning is an essential machine learning paradigm that is used to develop an AI through interaction with the environment and self-improvement by learning from their mistakes and perceiving the rewards obtained while doing appropriate actions. Its implementation in autonomous driving has not yet been widely applied. But it should be noted that it is difficult to implement autonomous driving as a supervised learning problem. As such, our objective here is to simulate vehicle driving in a virtual environment using Reinforcement Learning to accomplish one of the first steps in self-driving car problems i.e., navigating through a predefined track. The simulated vehicle is only given distances to the walls of the track as input and based on the policy it develops, has to navigate the track without collision. We used a variant of QLearning (a Reinforcement Learning algorithm) called Deep Q-Network (DQN) to develop the aforementioned policy. DQN uses neural networks to approximate the policy function. The environment, as well as the vehicle simulation, is done in Unreal Engine 4.

***Index Terms***—Reinforcement Learning, Self-driving, Simulation