***Abstract***

The report *"Enhancing Urban Navigation for Autonomous Vehicles Using AI and Machine Learning: A Deep Reinforcement Learning Approach"* focuses on using AI and machine learning techniques to improve decision-making capabilities in autonomous vehicles (AVs), particularly in urban settings. The research specifically examines Deep Reinforcement Learning (DRL) as a solution to the challenges AVs face in complex urban environments, including dynamic traffic, pedestrians, and unpredictable obstacles.

I have proposed DRL to overcome the limitations of traditional supervised learning and rule-based systems, which struggle with real-time decision-making and unexpected situations. By integrating DRL algorithms such as Deep Q-Network (DQN) and Proximal Policy Optimization (PPO), the research aims to enhance the efficiency, safety, and reliability of AV navigation systems in urban environments. To train and test these algorithms CARLA simulation environment is will be used. This will allow the creation of realistic urban scenarios that include various sensory inputs such as cameras, LiDAR, and GPS.

The study assesses the performance of the DRL models using evaluation metrics widely adopted in the automotive industry, including speed, success rate, and collision rate. These metrics provide a comprehensive understanding of how well the models perform in dynamic urban environments. By improving the AV decision-making process, the research hopes to reduce traffic accidents, improve urban mobility, and contribute to the development of safer, more efficient, and sustainable cities.

The report is structured into several key sections, including an introduction, literature review, methodology, results, and conclusion. The literature review highlights recent advancements in DRL for AVs and identifies gaps and opportunities for improvement. It also covers the integration of complex sensory inputs, such as the combination of simulation-based training and real-world data. The methodology section details the steps for setting up the simulation environment, developing and training the DRL models, and evaluating their performance.

In addition to technical advancements, the research also addresses ethical considerations such as safety, privacy, and bias. The report emphasizes the importance of ensuring that the models prioritize pedestrian safety, comply with data protection regulations, and remain unbiased across various conditions. The study also highlights future work in the field, including multi-agent coordination, dynamic environment adaptation, and real-world testing of DRL-based AV systems.

***Keywords: Autonomous Vehicles, Deep Reinforcement Learning, AI and Machine Learning, CARLA Simulation Environment, Urban Navigation.***