

Project Summary: SignRec - Traffic Sign Recognition for Autonomous Vehicles

Problem Description

Autonomous vehicles rely heavily on their ability to interpret their surroundings accurately to operate safely and efficiently. A crucial aspect of this interpretation involves recognizing and responding correctly to traffic signs. Failure to do so can lead to traffic violations or accidents, compromising public safety and the viability of autonomous transportation solutions. The SignRec project addresses this challenge by developing a robust traffic sign recognition system that uses deep learning techniques to enhance the perceptual capabilities of autonomous vehicles.

Dataset Description

The SignRec project utilizes the German Traffic Sign Recognition Benchmark (GTSRB) dataset, a large and well-known dataset used for training machine learning models in the field of image recognition. This dataset contains over 50,000 images of 43 different types of traffic signs, including speed limits, warning signs, and regulatory signs. Each image is labeled with the class of the sign, providing a comprehensive training set for developing an accurate classification model. The images vary in brightness, angle, and occlusion, which simulates real-world conditions and ensures that the model trained on this dataset can perform well under diverse operational scenarios.

Stakeholders

- Automotive Manufacturers: Companies that produce vehicles stand to benefit directly from advancements in autonomous vehicle technology.
- Technology Developers: Firms specializing in AI and machine learning technologies that can be integrated into broader transportation or automotive solutions.
- Regulatory Bodies: Government and regulatory agencies interested in setting standards for autonomous vehicle safety.
- Consumers: End-users who will potentially own or use autonomous vehicles.
- Urban Planners: Professionals involved in designing city infrastructure that accommodates autonomous vehicles.

Key Performance Indicators (KPIs)

- Accuracy of Traffic Sign Recognition: The primary KPI for SignRec is the accuracy rate of the traffic sign recognition system. This is measured by the percentage of signs correctly identified by the system during testing phases.
- False Positive/Negative Rates: Minimizing the rate of incorrectly identified signs (false positives) and missed signs (false negatives) is critical for ensuring the reliability of autonomous driving systems.
- System Latency: The response time of the recognition system from detection to classification. Lower latency is essential for real-time decision-making in high-speed driving environments.
- Model Robustness: The ability of the model to maintain high performance under various conditions such as poor lighting, bad weather, and occlusions.

- User Satisfaction: Feedback from stakeholders during trials and early deployment phases, reflecting the system's effectiveness and usability.

This project seeks to create a traffic sign recognition system that not only enhances the safety features of autonomous vehicles but also supports the broader adoption of autonomous technology in everyday transportation solutions. By focusing on high accuracy, robustness, and low latency, SignRec aims to deliver a critical component of the sensory and perception systems necessary for fully autonomous vehicles.