Project Proposal

Course Title: Deep Learning Lab

Course Code: CSE-460

Project Title: Traffic Sign Recognition

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Submitted by

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Introduction:

Traffic sign recognition plays a vital role in autonomous driving and intelligent traffic systems. It enables vehicles to understand and obey road signs such as speed limits, stop signs, and warnings, contributing significantly to road safety and driver assistance systems. This project proposes a deep learning-based solution to detect and classify traffic signs in real-time, using convolutional neural networks (CNNs) and modern computer vision techniques.

Problem Statement:

Manual recognition of traffic signs by drivers can be error-prone, especially in challenging weather or lighting conditions. The increasing demand for semi-autonomous and autonomous vehicles necessitates a reliable system for automatic traffic sign recognition. The key challenges include:

- Variations in size, orientation, and illumination of signs.
- Real-time recognition requirements.
- Differentiating similar-looking signs.

ObjectivesConclusion:

- To build an end-to-end deep learning model for recognizing and classifying traffic signs from images.
- To evaluate model accuracy on benchmark datasets (e.g., GTSRB).
- To deploy the model in a real-time setting using webcam/video stream input.
- (Optional) To create a web or mobile-based demo interface for users to test the system.

Methodology:

1. Dataset Collection

- Use the German Traffic Sign Recognition Benchmark (GTSRB) dataset.
- Perform preprocessing: resizing, normalization, and data augmentation.

2. Model Development

- Use Convolutional Neural Networks (CNNs) like LeNet, ResNet, or custom architectures.
- Compare different architectures and hyperparameters.

3. Training & Validation

- Use training/validation split to monitor overfitting.
- Evaluate performance using metrics like accuracy, precision, recall, and confusion matrix.

4. Real-Time Deployment

- Use OpenCV for image capture.
- Integrate the trained model to recognize signs in real-time.

5. Tools & Technologies

- Python, TensorFlow/Keras or PyTorch, OpenCV, Jupyter Notebooks, Google Colab.

Conclusion:

This project aims to contribute to the development of intelligent traffic systems and autonomous vehicles by providing a reliable, accurate, and real-time traffic sign recognition system using deep learning techniques. The project also provides an opportunity to explore state-of-the-art CNN architectures and real-world computer vision applications.