Project Proposal

Title:

TrafficSense – Intelligent Vehicle Detection, Classification, and Speed Estimation System

Project Description:

The TrafficSense project aims to develop an intelligent, real-time traffic monitoring system that
automatically detects, counts, and classifies vehicles using live video feeds from surveillance
cameras. Additionally, the system estimates vehicle speed and identifies over-speeding vehicles.
By leveraging Artificial Intelligence (AI) and computer vision techniques, the system can accurately
detect and analyze vehicles such as cars, buses, trucks, and motorcycles. This project seeks to
improve urban traffic management by providing accurate traffic flow data and insights. It supports
city authorities in monitoring congestion, optimizing signal timing, and enhancing road safety
through data-driven decision-making.

Objectives:

• To design and train an AI-based model capable of real-time vehicle detection using live video feeds.
• To accurately count vehicles in motion for traffic flow analysis.
• To classify vehicles into categories (cars, buses, trucks, motorcycles, etc.) using deep learning.
• To estimate vehicle speed and detect over-speeding incidents.
• To visualize detection, counting, and speed results in real time for monitoring and analysis.

Scope of the Project:

The TrafficSense system focuses on real-time detection, counting, classification, and speed

estimation of vehicles using AI-powered video analytics. It is designed for smart city environments,
traffic authorities, and research purposes. The system emphasizes reliable detection and accurate
analytical performance.

Technologies to Be Used:

• Programming Language: Python
• Deep Learning Frameworks: TensorFlow / PyTorch
• Computer Vision Tools: OpenCV, NumPy, Pandas
• Model Architecture: YOLO (You Only Look Once)
• Tracking Algorithm: DeepSORT
• Visualization Tools: Matplotlib, Streamlit
• Deployment Tools: Flask / FastAPI

Methodology:

1. Data Collection: Gather traffic video datasets from open sources or locally recorded camera feeds.
2. Preprocessing: Perform frame extraction, resizing, annotation, and data augmentation.
3. Model Development: Train a YOLO-based deep learning model for vehicle detection and classification.
4. Speed Estimation: Implement distance and time-based calculations to estimate vehicle speed.
5. Evaluation: Test model performance using accuracy, precision, recall, F1-score, and speed error metrics.
6. Deployment: Integrate the trained model into a real-time web interface for live video analysis and visualization.

Expected Outcome:

The expected outcome of the TrafficSense project is an AI-based real-time vehicle detection,
classification, and speed estimation system. The system will accurately count and categorize
vehicles, estimate their speed, and identify over-speeding incidents. It will assist in efficient traffic
monitoring, enhance road safety, and contribute to the development of intelligent transportation systems.