Traffictelligence Project Documentation

Title:

Traffictelligence – Advanced Traffic Volume Estimation With Machine Learning

1. INTRODUCTION

1.1 Project Overview

Traffictelligence is an intelligent system designed to estimate traffic volume using machine learning and computer vision techniques. This solution is aimed at helping city planners, traffic control centers, and smart city initiatives to monitor and manage traffic more efficiently. The system uses video footage to predict traffic density in real time.

1.2 Purpose

- To build a model that accurately estimates vehicle count and traffic density from video input.
- To develop a real-time web interface for monitoring traffic flow.
- To support intelligent transportation systems by providing accurate traffic data.

👥 Team Members:
- Jadala Prashanthi

2. IDEATION PHASE

2.1 Problem Statement

Traffic congestion in urban areas requires real-time, intelligent solutions for vehicle monitoring and volume estimation using machine learning and video analytics.

2.2 Empathy Map Canvas

Includes understanding city planner needs, user frustrations (delays, congestion), and behaviors (navigation decisions, peak time flow).

2.3 Brainstorming

Ideas included:
- Real-time video analysis from traffic cameras
- YOLO-based object detection for vehicle counting

- Integration with dashboards for visualization
Selected YOLO + computer vision approach for accuracy and scalability.

3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

Camera Input -> Backend Processing -> Vehicle Detection & Counting -> Visual Display on Web Interface

3.2 Solution Requirement

- Public traffic video dataset
- Model training using YOLO or similar object detection frameworks
- Flask/Streamlit web deployment
- Real-time visualization and analytics

3.3 Data Flow Diagram

Video Frame Capture -> Preprocessing -> YOLO Model -> Traffic Volume Estimation -> Display

4. PROJECT DESIGN

4.1 Problem-Solution Fit

Manual traffic monitoring is inefficient. Automated volume estimation improves monitoring, reduces labor, and enhances smart city infrastructure.

4.2 Proposed Solution

Use YOLO-based detection model trained on traffic datasets to count vehicles and estimate volume in real-time.

4.3 Solution Architecture

Diagram:
Camera Input -> Frame Capture -> YOLO Model -> Vehicle Count -> UI Display

5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

- Week 1: Dataset Collection and Preprocessing
- Week 2: Model Training and Evaluation
- Week 3: Web App Development (UI + Backend Integration)
- Week 4: Testing and Optimization

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

- Vehicle Detection Accuracy: ~92–95%
- Real-time FPS Rate: 10–15 fps depending on hardware
- Web App Integration: Streamlined for video input and output

7. RESULTS

7.1 Output Screenshots

- Real-time vehicle detection bounding boxes
- Traffic volume metrics over time
- Responsive web interface

8. ADVANTAGES & DISADVANTAGES

Advantages

- Accurate real-time vehicle count
- Scalable to multiple cameras
- Supports traffic planning and congestion control

Disadvantages

- Dependent on camera angle/quality
- Requires GPU for real-time processing
- Weather/light conditions can affect accuracy

9. CONCLUSION

Traffictelligence provides a powerful, scalable, and intelligent system for real-time traffic volume estimation. It integrates machine learning with visual processing to support smart traffic management and future urban mobility planning.

10. FUTURE SCOPE

- Integration with city-wide traffic dashboards
- Real-time alerts for congestion detection
- Drone-based traffic monitoring
- Mobile app for local traffic stats

11. APPENDIX

Source Code & Model Files
- traffic_model.pt
- video_processing.py

Dataset Link
- Dataset.csv

GitHub Repository
- https://github.com/Prashnathi32/Traffic-Intelligence-Advanced-Traffic-volume-Estimation-with-Machine-Learning.git

Demo Video Link
- https://drive.google.com/file/d/16bMYmUaTPu-OLVtbuwUchNHnCxwU4LMc/view?usp=drivesdk