Project Report Format

TrafficTelligence: Advanced Traffic Volume Estimation with Machine Learning

Team Members

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1. INTRODUCTION

1.1 Project Overview

TrafficTelligence is a machine learning-based system for estimating vehicle volumes in real time. It aims to support traffic authorities with actionable insights using data-driven predictions and visualizations.

1.2 Purpose

The purpose of this project is to develop a smart, scalable, and automated traffic monitoring tool that leverages ML models to estimate congestion levels, manage urban traffic efficiently, and minimize manual surveillance.

2. IDEATION PHASE

2.1 Problem Statement

Urban areas face significant traffic congestion, especially during peak hours. Manual traffic control is inefficient and prone to delays. A scalable solution is needed to estimate and analyze traffic volume using smart technology.

2.2 Empathy Map Canvas

2.3 Brainstorming

Use of video/image-based ML for traffic detection

Real-time dashboard and alerts

Predictive modeling using historical data

Integration with existing traffic camera infrastructure

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3. REQUIREMENT ANALYSIS

Customer Journey Map

Solution Requirement

Accurate real-time vehicle counting

Historical traffic trend visualization

User and admin authentication

API for sensor/video input

3.1 Data Flow Diagram

```
[User] --> [Frontend React App] --> [API Server (Node.js)] --> [ML Model + MongoDB]
                                      ↑
```

3.2 Technology Stack

Frontend: React.js, Material-UI

Backend: Node.js, Express.js

Database: MongoDB

Machine Learning: Python (OpenCV, TensorFlow/YOLO)

Tools: GitHub, Postman, VS Code, Heroku (or similar)

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4. PROJECT DESIGN

4.1 Problem Solution Fit

Problem-Solution Fit

Current manual traffic management is inefficient. A smart ML-based system reduces manual effort and provides data-backed insights.

4.2 Proposed Solution

full-stack web application where video feeds are processed via ML models to estimate traffic volume and visualize data in real time.

4.3 Solution Architecture

```
Frontend (React) <---> Backend (Node + Express) <---> MongoDB
                            |
                            |--> Python ML Service
```

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5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

Backend API load testing using Postman/Newman

ML inference speed: ~20 FPS on live feed

Database query optimization tested via MongoDB Atlas

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7. RESULTS

7.1 Output Screenshots

Output Screenshots

Include screenshots of:

Dashboard view

Login page

Traffic prediction output

Alerts interface

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8. ADVANTAGES & DISADVANTAGES

Real-time analytics

Scalable and modular

Minimal manual intervention

Predictive congestion alerts

DISADVANTAGES

Depends on video quality and lighting

High initial setup cost (if camera-based)

May require GPU for real-time processing

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9. CONCLUSION

TrafficTelligence provides an intelligent, ML-driven solution for real-time traffic volume estimation. It enables smarter decisions for traffic management authorities and paves the way for smart city infrastructure.

10. FUTURE SCOPE

Integration with government traffic APIs

Mobile app support

Real-time heatmaps

AI-based traffic light control

Vehicle classification (bikes, cars, trucks)

11. APPENDIX

Source Code(if any)

Dataset Link

GitHub & Project Demo Link
Source Code

GitHub Repository: [🔗 Insert GitHub Link Here]

Dataset Link

Public traffic surveillance datasets (e.g., [CityFlow, DETRAC])

Custom-labeled data for model training

Project Demo Link

[🔗 Insert Demo/YouTube Video Link Here]
