Traffic Telligence: Advanced Traffic Volume Estimation with Machine Learning

# 1. INTRODUCTION

## 1.1 Project Overview

This project focuses on estimating traffic volume using machine learning techniques to provide intelligent insights for urban mobility.

## 1.2 Purpose

To develop an AI-based solution that can estimate traffic flow to support smart city infrastructure and reduce congestion.

# 2. IDEATION PHASE

## 2.1 Problem Statement

Increasing urban traffic congestion demands smarter solutions for traffic volume estimation and management.

## 2.2 Empathy Map Canvas

Empathy maps were used to understand the pain points of traffic authorities and commuters.

## 2.3 Brainstorming

Several models and techniques were discussed including Random Forest, XGBoost, and Deep Learning.

# 3. REQUIREMENT ANALYSIS

## 3.1 Customer Journey map

A journey map was designed to reflect user interactions with the system.

## 3.2 Solution Requirement

The system requires traffic data, preprocessing tools, and an ML model pipeline.

## 3.3 Data Flow Diagram

The DFD depicts how data moves from sensors to the prediction system.

## 3.4 Technology Stack

Python, Pandas, Sklearn, XGBoost, Streamlit for frontend.

# 4. PROJECT DESIGN

## 4.1 Problem Solution Fit

The proposed ML models accurately estimate traffic volumes from historical and real-time data.

## 4.2 Proposed Solution

A web-based system that receives traffic inputs and outputs estimated volume.

## 4.3 Solution Architecture

A layered architecture with data ingestion, processing, modeling, and visualization.

# 5. PROJECT PLANNING & SCHEDULING

## 5.1 Project Planning

Planned using Agile methodology, sprint-based development with testing.

# 6. FUNCTIONAL AND PERFORMANCE TESTING

## 6.1 Performance Testing

Models tested with RMSE, MAE, and R² score on test datasets.

# 7. RESULTS

## 7.1 Output Screenshots

Screenshots of the application UI and prediction results.

# 8. ADVANTAGES & DISADVANTAGES

Advantages: Real-time prediction, scalability.

Disadvantages: Requires quality data, may be affected by anomalies.

# 9. CONCLUSION

The project successfully demonstrates how ML can assist in traffic volume estimation.

# 10. FUTURE SCOPE

Integration with live traffic feeds, support for multimodal transportation, and deployment in smart cities.

# 11. APPENDIX

## Dataset Link

Dataset used: [traffic\_volume\_dataset.csv]

## GitHub & Project Demo Link

GitHub: https://github.com/YAyeshaSultana/TrafficTelligence-Advanced-Traffic-volume-estimation-with-machine-learning