# • | Traffic Volume Estimation - Final Project Report

## • 1. INTRODUCTION

- 1.1 Project Overview
- This project aims to develop a machine learning-based solution to estimate traffic volume based on historical and real-time data. The system analyzes patterns in traffic data to help city planners, commuters, and authorities make informed decisions for managing congestion.
- 1.2 Purpose
- The purpose is to automate traffic volume estimation using data science techniques, improving prediction accuracy over manual or static models, and supporting smart city initiatives.

#### 2. IDEATION PHASE

- 2.1 Problem Statement
- Increasing traffic congestion in urban areas leads to delays, pollution, and inefficiency. Accurately estimating traffic volume can help manage and plan road usage effectively.
- 2.2 Empathy Map Canvas
- Who are we helping? Commuters, traffic authorities, city planners
- What do they see? Traffic jams, unexpected delays
- • What do they feel? Frustration, stress
- What do they say? Need better traffic management
- What do they do? Use apps, follow traffic signals
- 2.3 Brainstorming
- Ideas considered:
- Use of real-time sensors
- Integration with weather data
- • Time-series modeling

Flask API for deployment

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#### 3. REQUIREMENT ANALYSIS

- 3.1 Customer Journey Map
- Commuter → Starts journey → Uses app for volume estimate → Chooses optimal route → Reaches destination
- 3.2 Solution Requirement
- Historical traffic dataset (traffic\_volume.csv)
- Preprocessing and feature engineering
- ML model (e.g., Linear Regression, Random Forest)
- Web interface (Flask app)
- 3.3 Data Flow Diagram
- 1 Input data →2 Preprocessing →3 Model Prediction →4 Output
- 3.4 Technology Stack
- Python, Pandas, Scikit-Learn
- Jupyter Notebook
- Flask (for API)
- IBM Cloud / Heroku (deployment)

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#### 4. PROJECT DESIGN

- 4.1 Problem Solution Fit
- The proposed solution directly addresses the need for dynamic traffic volume predictions.
- 4.2 Proposed Solution
- A machine learning model trained on traffic volume data, exposed via a Flask API for real-time use.
- 4.3 Solution Architecture
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- CopyEdit
- User  $\rightarrow$  API request  $\rightarrow$  Flask  $\rightarrow$  ML Model  $\rightarrow$  Response with prediction

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## 5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Phase	Timeline
Data collection & cleaning	Week 1
Model development	Week 2-3
API integration	Week 4
Testing & Deployment	Week 5

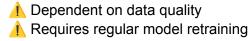
- 6. FUNCTIONAL AND PERFORMANCE TESTING
- 6.1 Performance Testing
- MSE / RMSE computed on test data
- Model tested with unseen data
- API tested for response time

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- 7. RESULTS
- 7.1 Output Screenshots
- Model predictions plotted (from traffic\_volume.ipynb)
  - ✓ API responses (Flask app screenshot)

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- 8. ADVANTAGES & DISADVANTAGES
- Accurate, data-driven predictions
  - Scalable and can integrate additional features (weather, holidays)



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## 9. CONCLUSION

• The traffic volume estimation project successfully demonstrates how machine learning can be applied to real-world urban challenges.

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## • 10. FUTURE SCOPE

- Incorporate live sensor data
- Use deep learning for higher accuracy
- Predict congestion zones on maps

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## • 11. APPENDIX

- Source Code: Included in train\_model.ipynb, traffic\_volume.ipynb
- • Dataset Link: Local file traffic\_volume.csv

## • GitHub & Project Demo Link:

[https://github.com/Venkatesh7981/TrafficVolumeProject]