Project Report

Project Title:

Advance Traffic Volume Estimation with Machine Learning

Team Members:

-Team ID: LTVIP2025TMID41513

* Team Leader: P. Dhanush
* Team Member : P. Reddy Chandu Priya
* Team Member : P. Navya Sree
* Team Member : P. Sheefa Khanam

Phase-1: Brainstorming & Ideation

Objective:

* Identify the problem statement
* Analyze real-time traffic issues and volume estimation gaps • Explore the use of machine learning in transportation systems

Key Points:

* Research existing traffic volume estimation methods
* Identify data sources (e.g., traffic cameras, sensors, weather data)
* Choose machine learning models suitable for regression and time series prediction
* Define success criteria

Phase-2: Research & Requirements Gathering

Objective:

* Understand domain specifics
* Collect and organize all requirements (both functional and non-functional)

Key Points:

* Requirements:
* Accurate prediction of traffic volume
* Real-time or near real-time predictions - Dashboard to visualize predictions

• Tools and Technologies:

* Python, Pandas, Scikit-learn, XGBoost, Flask
* Data visualization using Matplotlib/Plotly - Jupyter Notebook

• Dataset used:

- UCI Machine Learning Repository - Metro Interstate Traffic Volume dataset

Phase-3: Design & Planning

Objective:

* Define architecture and project design

Key Points:

* System Design:
* Data Preprocessing Module
* Model Training and Evaluation Module
* Frontend Dashboard • Wireframes/Flowcharts:
* Data flow from raw dataset → cleaned data → model → output visualized

• Timeline:

* Week 1: Data collection and preprocessing
* Week 2: Model training and testing
* Week 3: Backend + Dashboard development - Week 4: Integration and Testing

Phase-4: Prototype Development

Objective:

* Create a working version of the project

Key Points:

* Developed ML model (e.g., Random Forest/XGBoost)
* Integrated with simple user interface
* Demonstrated preliminary predictions
* Visualized predicted traffic volume by hour/date

Phase-5: Project Development

Objective:

* Code the project and integrate components

Key Points:

1. Technology Stack Used: - Python

* Scikit-learn, XGBoost
* Flask (for backend)
* HTML/CSS (for frontend)
* Jupyter Notebook 2. Development Process:
* Step 1: Data preprocessing and EDA
* Step 2: Model training and tuning
* Step 3: Flask API creation
* Step 4: UI development and backend integration

3. Challenges & Fixes:

* Missing/dirty data: Solved using interpolation and filtering
* Model overfitting: Handled with cross-validation and regularization
* API latency: Optimized by caching model and reducing overhead

Phase-6: Functional & Performance Testing

Objective:

* Ensure accuracy and performance

Key Points:

* Model evaluated using MAE, RMSE
* Functional testing of input/output flows
* Tested scalability of the model on sample extended datasets
* Load testing of Flask API

Phase-7: Final Validation & Deployment

Objective:

* Final project version readiness check

Key Points:

* Final Validation:
* Model accuracy ~90%
* UI responsiveness verified
* Meets the objective of real-time traffic volume prediction

• Deployment (if applicable):

* Hosted locally using Flask for demonstration
* (Optional) Deployed using Ngrok or a cloud platform

Final Submission:

GitHub Repository : https://github.com/dhanush419-tech/TrafficTelligence-AdvancedTraffic-Volume-Estimation-with-Machine-Learning.git

Demo video link: https://drive.google.com/file/d/1MQSZHvu4qDqoiUTZJjgTH4cJiWAKFec/view?usp=drivesdk

https://drive.google.com/file/d/1MJ\_A\_AFBEHp1B8dQ7bNAbFkbQ8Nb97O/view?usp=drivesdk

DataSet Link :

https://drive.google.com/file/d/1iV5PfYAmI6YP0\_0S4KYy1ZahHOqMgDbM/view