

# 1. INTRODUCTION

## 1.1 Project Overview

TrafficTelligence is an advanced machine learning-based system designed to estimate and forecast traffic volumes using historical traffic data, weather inputs, and event information. The system supports traffic authorities, urban planners, and commuters by offering predictive insights that improve traffic flow, reduce congestion, and enhance commuting experiences.

## 1.2 Purpose

The primary objective of TrafficTelligence is to provide accurate and real-time traffic volume predictions. It enables data-driven decisions in dynamic traffic signal control, infrastructure development, and route planning for daily commuters.

# 2. IDEATION PHASE

## 2.1 Problem Statement

Current traffic systems react to congestion rather than predicting and preventing it. This results in wasted time, resources, and increased stress among users. City authorities lack access to real time and predictive tools to manage traffic proactively.

## 2.2 Empathy Map Canvas

- Think & Feel: Commuters feel frustrated due to daily traffic jams.
- See: Increasing congestion during peak hours without proper control.
- Say & Do: Complain about poor road planning and traffic delays.
- Hear: Other commuters and drivers voicing similar concerns.
- Pain: Long travel times, unpredictability.
- Gain: Accurate traffic forecasts, optimized routes, smooth travel.

## 2.3 Brainstorming

Key ideas generated:

- Use ML to predict traffic volume

- Integrate weather and event APIs
- Provide dynamic dashboards
- Visualize results and trends
- Build a responsive user interface

## 3. REQUIREMENT ANALYSIS

### 3.1 Customer Journey Map

1. User opens the web application
2. Inputs desired location and time
3. Receives traffic prediction
4. Views recommendations for alternate routes
5. Authority views dashboard to optimize signals

### 3.2 Solution Requirement

Functional Requirements:

- Traffic data input form
- Machine learning prediction engine
- Visualization dashboard
- Data export options

Non-functional Requirements:

- Scalability
- High availability
- Security protocols
- Fast response time

### 3.3 Data Flow Diagram

- User inputs: location, time, date
- Preprocessing: clean and prepare data
- ML model: generates prediction
- Output: displayed on web interface
- Optional: export results

### 3.4 Technology Stack

- Frontend: HTML, CSS, JavaScript

- Backend: Python, Flask
- ML Tools: Scikit-learn, Pandas, XGBoost •
- Database: SQLite, PostgreSQL
- Deployment: Heroku, Render
- APIs: OpenWeatherMap, Google Maps

## 4. PROJECT DESIGN

### 4.1 Problem-Solution Fit

We identified a high need for predictive traffic systems among authorities and commuters. Our ML-powered solution addresses this with real-time forecasts and actionable insights.

### 4.2 Proposed Solution

TrafficTelligence enables users to access a smart dashboard that shows traffic volume predictions based on historical and real-time data, helping them plan routes and manage signals effectively.

### 4.3 Solution Architecture

- User Interface: HTML/CSS form
- API Layer: Flask REST API
- Processing Layer: ML model prediction
- Data Storage: Database + File System
- External APIs: Weather, Maps
- Deployment: Cloud Hosting

## 5. PROJECT PLANNING & SCHEDULING

### 5.1 Project Planning

Sprint 1: Data Collection and Preprocessing (13 SP)

Sprint 2: Model Building and Evaluation (14 SP)

Sprint 3: UI Development and Deployment (13 SP)

Velocity: 13.33 Story Points per sprint

## 6. FUNCTIONAL AND PERFORMANCE

### TESTING 6.1 Performance Testing

- Prediction Latency: < 2 seconds
- API Load Testing: Stable up to 1000 requests/min
- Accuracy Score: R-squared ~0.89
- Visual Interface: Compatible across browsers

## 7. RESULTS

### 7.1 Output Screenshots

- Input form for traffic prediction
- Prediction output card
- Graph showing traffic volume trends
- Admin dashboard for authorities

## 8. ADVANTAGES & DISADVANTAGES

### Advantages

- Accurate and fast traffic forecasts
- Easy-to-use interface
- Integrates multiple data sources
- Cloud deployable and scalable

### Disadvantages

- Dependent on dataset quality
- May require periodic retraining
- Limited in data-sparse regions

## 9. CONCLUSION

TrafficTelligence is a practical AI-based solution that enhances traffic management by providing real-time, predictive insights. It addresses key challenges faced by city planners and commuters, offering a scalable, data-driven alternative to reactive systems.

## 10. FUTURE SCOPE

- Integrate mobile application
- Include live traffic camera feeds
- Use deep learning for better accuracy
- Smart signal control integration

## 11. APPENDIX

- Source Code:

`app.py index.html`

- Dataset Link:

[https://drive.google.com/file/d/1sLx-0Hx\\_8rYhQsAXRowRIISWO4cehAQL/view?usp=drive\\_link](https://drive.google.com/file/d/1sLx-0Hx_8rYhQsAXRowRIISWO4cehAQL/view?usp=drive_link)

GitHub :

<https://github.com/Dronadula4/traffictelligence-advanced-traffic-volume>

- Project Demo Link:

<https://drive.google.com/file/d/1YySItyup8PbvFxbefa28fKEDzI1cnw5i/view?usp=sharing>