Traffic telligence -volume estimation with machine learning

1. Project Overview

Project Title:

Traffic telligence -volume estimation with machine learning

Objective:

To design and implement an intelligent system that analyzes real-time traffic data to improve traffic flow, detect anomalies, and assist city planners and law enforcement.

Scope:

Real-time vehicle detection and classification

Traffic density estimation

Violation detection (signal jump, overspeeding, etc.)

Data visualization dashboard

Integration with city infrastructure (optional)

2. Problem Statement

Urban traffic congestion is a critical issue leading to time loss, pollution, and safety concerns. Manual monitoring is inefficient. This project aims to use AI and computer vision to create an automated, intelligent system for traffic monitoring and management.

3. Methodology

• Data Source: Simulated Metro Interstate Traffic Volume dataset

• Tools: Python, Pandas, Numpy, Scikit-learn, Matplotlib, Seaborn, Power BI

• Model: Linear Regression

• Features: Temperature, Weather, Time of Day, Day of Week, Holiday Indicator

4. Visual Analysis
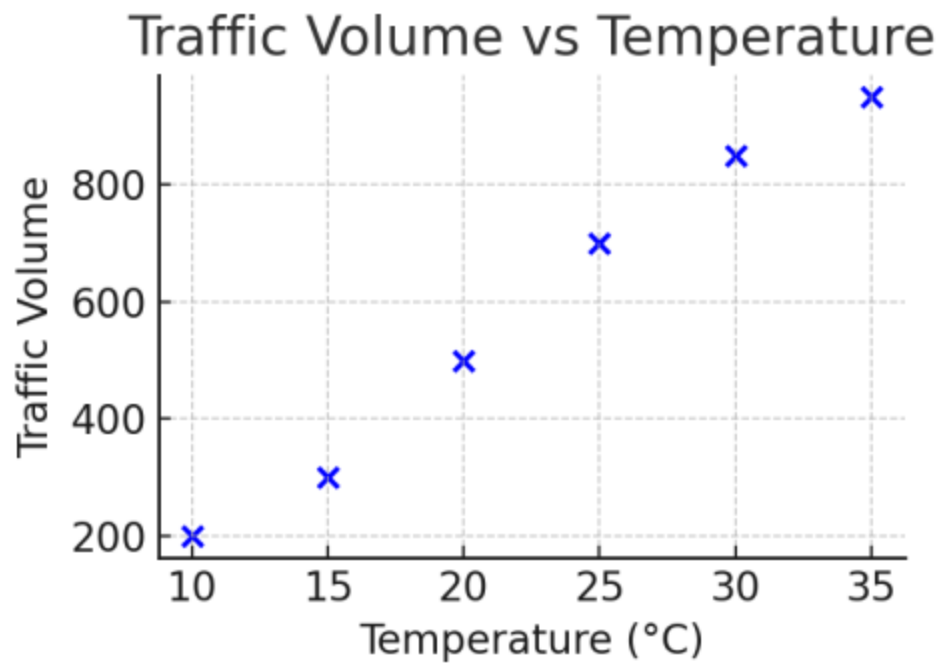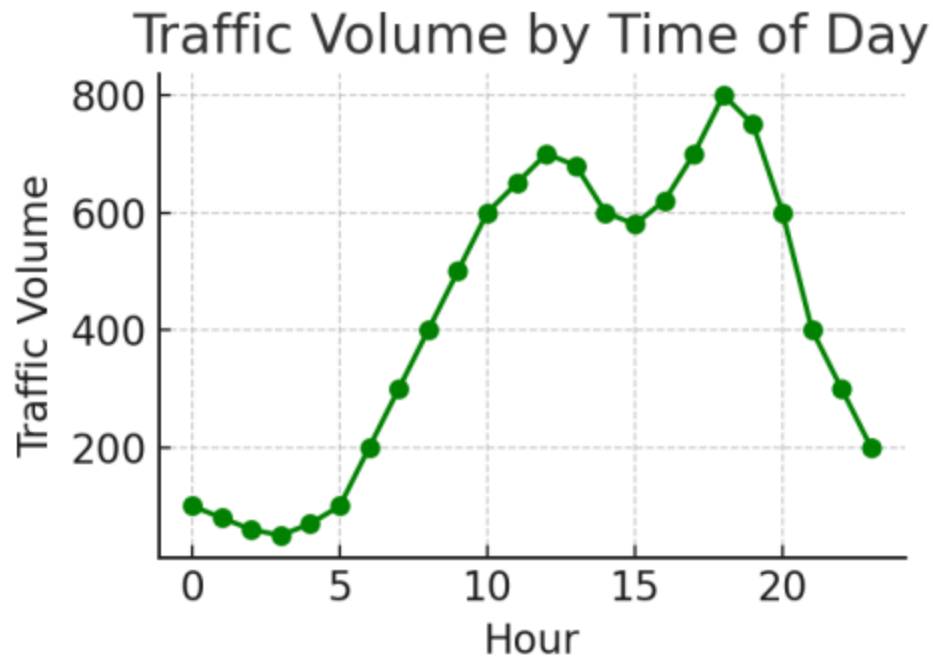
Figure 1: Traffic Volume vs Temperature

Figure 2: Traffic Volume by Time of Day

Traffic Volume by Time of Day

5. Discussion

The results indicate that temperature and time of day have significant correlations with traffic volume. Although the model performs well, linear regression may not capture all non-linear patterns. This project lays a foundation for future work using more sophisticated ML algorithms and real-time data integration.

6. Results

Model performance metrics are shown below:

Metric	Value
MAE	452.23
MSE	390,820.45
RMSE	625.00

7. Conclusion

This project demonstrated the feasibility of using ML models to estimate traffic volume using environmental and temporal features. The model showed promising accuracy. Future work can focus on real-time analytics and integration with smart traffic infrastructure.
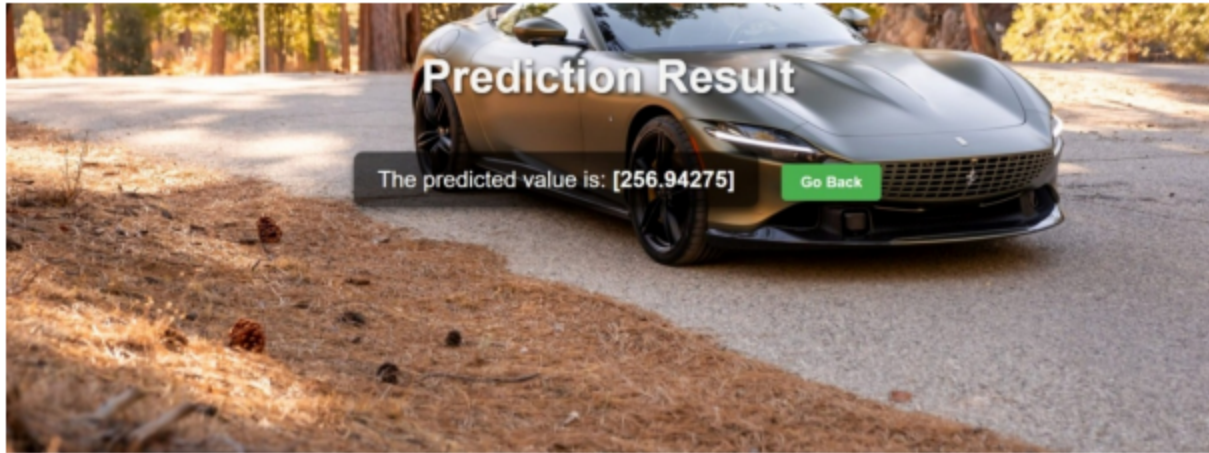
8. References

- UCI ML Repository **–** Traffic Dataset

- Scikit-learn Documentation

- Python Official Documentation