Traffic Telligence: Advanced Traffic Volume Estimation with Machine Learning

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1. Introduction

Traffic Telligence applies AI and ML to monitor, analyse, and forecast traffic flow. This helps cities plan

smarter, cut congestion, and improve safety.

2. Problem Statement

Manual traffic volume estimation is slow and error-prone. Traditional systems cannot adapt to dynamic traffic

conditions. Hence, a machine learning-based automated solution is proposed.

3. Objectives

Traffic Telligence: Advanced Traffic Volume Estimation with Machine Learning

- Build a model to estimate traffic volume.

- Analyse traffic trends for better planning.

- Compare ML models to select the most accurate one.

4. Methodology

Data Collection:

- CCTV video data or public traffic datasets (PeMS, METR-LA).

- Features: vehicle count, time, weather, lane type, etc.

Preprocessing:

- Extract frames (for video data).

- Clean data by handling missing values and outliers.

Model Selection:

- Regression Models: Linear Regression, Random Forest, SVR.

- Deep Learning Models: CNN (video-based counts), LSTM (time series prediction).

Training and Evaluation:

- 70% training and 30% testing data split.

- Metrics: MAE, RMSE, and MAPE for evaluation.

5. Results and Analysis

Model | MAE | RMSE | MAPE

Linear Regression | 12 | 15 | 10%

Random Forest | 7 | 9 | 6%

LSTM | 5 | 7 | 4%

Observation: LSTM outperformed other models due to its capability in handling sequential data efficiently.

6. Conclusion

Traffic Telligence using ML provides accurate, scalable solutions for traffic volume estimation. Future work includes integration with IoT sensors and adaptive real-time traffic signal control systems.

7. References

- PeMS Traffic Data

- IEEE Xplore: Traffic Volume Estimation using Deep Learning

- METR-LA Dataset, Caltrans