

Real-Time Traffic Flow Prediction

Mathematics for Intelligent Systems-2
Introduction to data structure and algorithms

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Project Guides:
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REVIEW-1 COMMENT S AND RESPONSE S

S.no	Comments	Response
1.	Asked for research papers	Found papers related to traffic flow prediction
2.	Told our presentation is not upto the mark	We are trying to improve and present better (Sorry sir 😊)
3.	Asked why did you used sample dataset and build model	We used the dataset available and built models with that dataset

PROBLEM STATEMENT



Traffic congestion is a major issue in urban areas.



Predicting traffic flow can help optimize road usage, reduce travel time, and improve city planning.



Useful for people who are in emergency like ambulance...

DATA STRUCTURES & ALGORITHMS (DSA) IN TRAFFIC PREDICTION

Data Structures Used:

- Arrays & DataFrames (for storing data)
- Queues (time-series data processing)
- Trees (Random Forest model uses Decision Trees)

Algorithms Used:

- Linear Regression (Best-fit line for traffic prediction)
 - Random Forest (Multiple decision trees improve accuracy)
 - Backpropagation (Used in LSTM for training)
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MATHEMATICAL CONCEPTS IN TRAFFIC PREDICTION

Linear Algebra:

- Matrix operations (Traffic data stored as matrices)
- Vectorization (Faster ML computations)

Statistics & Probability:

- Mean Absolute Error (MAE) – Average prediction error
- Root Mean Squared Error (RMSE) – Measures prediction accuracy
- R^2 Score – Model fit evaluation

Calculus:

- Gradient Descent – Optimization technique to minimize errors
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MACHINE LEARNING MODELS USED



LINEAR
REGRESSION



RANDOM FOREST



LSTM (DEEP
LEARNING)

MODEL PERFORMANCE COMPARISON


Performance Metrics (MAE, RMSE, R² Score):

Model	MAE	RMSE	R ² Score
Linear Regression	22.05	30.91	0.74
Random Forest	17.07	22.58	0.86
LSTM	29.33	38.41	0.59

Best Model: Random Forest

TRAFFIC PREDICTION DASHBOARD

- A real-time prediction dashboard was built using Streamlit. It allows users to input parameters and predict traffic flow for the next 15 minutes.



Real-Time Traffic Prediction Dashboard

Select Time (HH:MM)

03:45

Select Day of the Week

Monday

Enter Traffic Count (15 min ago)

25

Enter Traffic Count (30 min ago)

35

Enter Traffic Count (45 min ago)

45

Predict Traffic Count



Predicted Traffic Count (Next 15 min): 41.49

CONCLUSION & FUTURE SCOPE



Random Forest gave the best accuracy.



The model can be improved using more real-time data.



Future work: Integrating Google Maps API for live traffic updates.