Predicting Bangalore's Traffic Volume with Regression Models

Leveraging weather and time data, we develop models to forecast traffic volume accurately. This aids traffic management and urban planning in Bangalore.

Project Overview: Addressing Bangalore's Traffic Woes

Traffic Congestion

Bangalore faces worsening traffic delays and pollution challenges daily.

Project Goal

Predict traffic volumes using advanced regression models for improved planning.

Impact

Reduce congestion and commute times via data-driven traffic management.

Data Sources: Weather and Time Variables

Traffic Data

Sourced from Bangalore Traffic Police Department (2023-2024).

Weather Data

Collected via OpenWeatherMap API: temperature, humidity, rainfall.

Temporal Data

Includes hour, day of week, month, and holiday info for better context.

Feature Engineering: Crafting Predictive Variables

Cyclical Time Features

Sine and cosine transforms for hour, day, and month improve prediction.

Lagged Traffic Variables

Previous hour's traffic helps capture temporal dependencies.

Interaction Terms

Combining weather and time boosts model relevance and accuracy.

Regression Models: Selection and Training

Linear Regression

Baseline model for establishing benchmark predictions.

Random Forest

Captures complex non-linear patterns effectively.

Model Performance: Accuracy and Validation

1

Training & Validation Split

Data divided into 80% training and 20% validation sets to assess model fit.

2

Cross-Validation

Ensures robustness and generalization across data subsets.

3

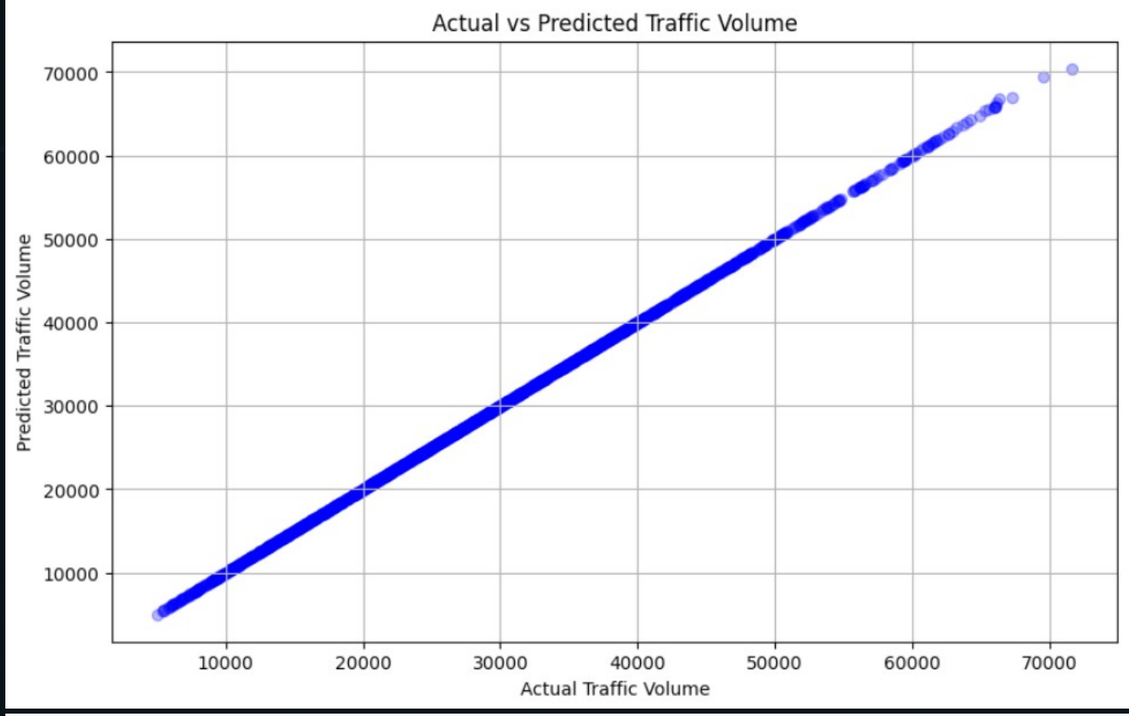
Performance Metrics

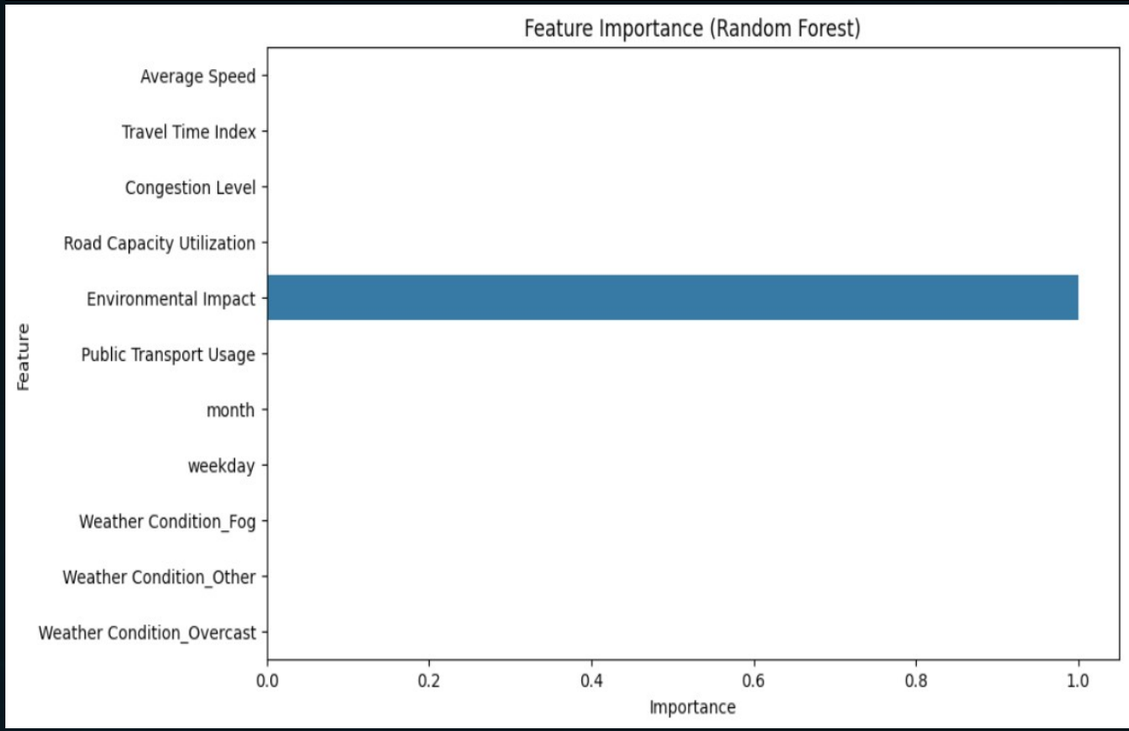
- R-squared
- MAE (Mean Absolute Error)
- RMSE (Root Mean Squared Error)

4

XGBoost Result

Achieved an R-squared of 0.85, indicating strong predictive power.





Case Studies: Real-World Traffic Scenarios

Rainfall Impact

Traffic predictions during sudden rain events for dynamic management.

Holiday Traffic

Forecasting patterns for Diwali and other major holidays.

Congestion Hotspots

30% increase in traffic near Electronic City flyover during peak hours.

Implications for Traffic Management and Planning

1

Signal Adjustments

Proactively modify traffic lights based on forecasted volumes.

2

Public Transport

Optimize routes and schedules according to predicted congestion.

3

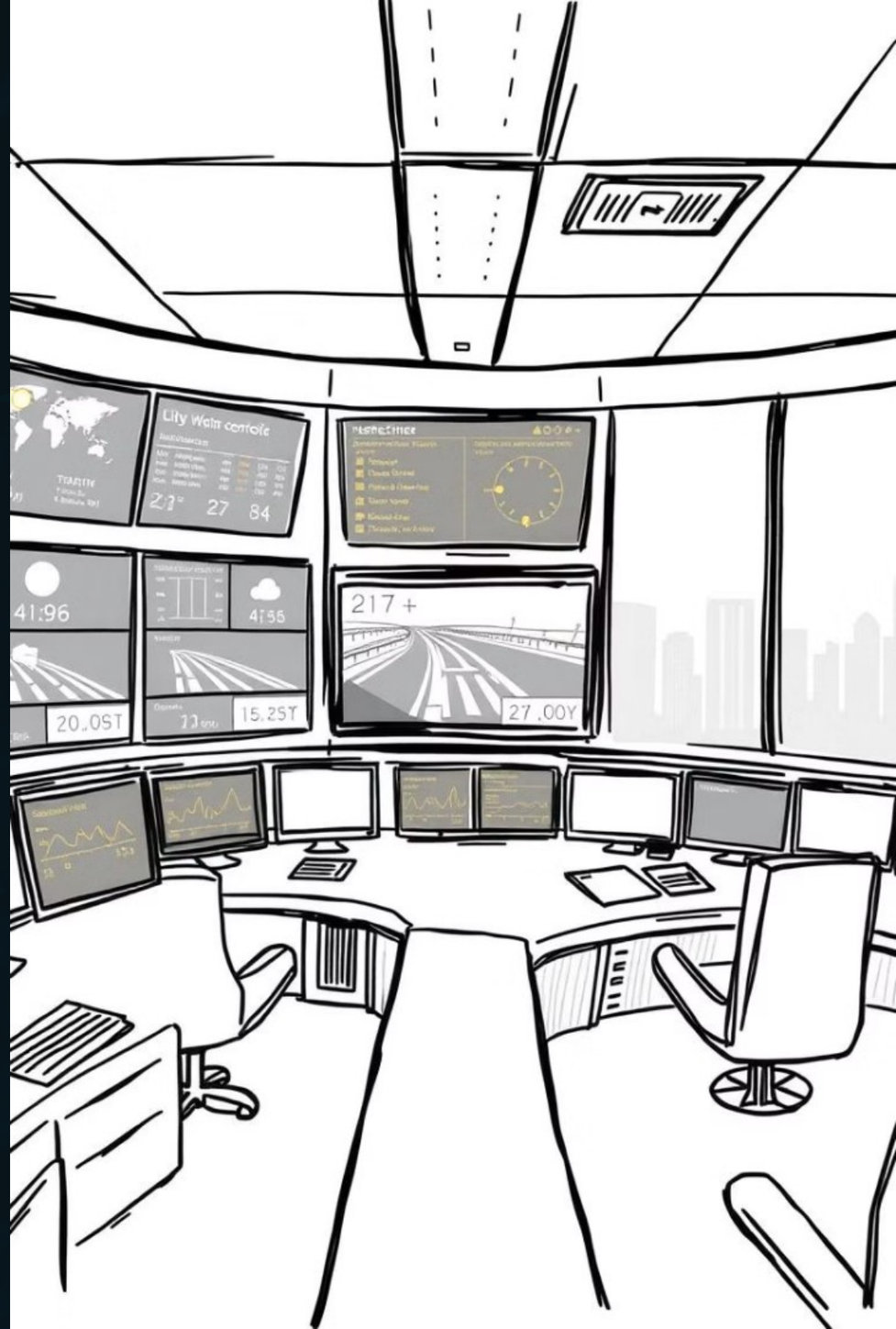
Real-Time Alerts

Send traffic and congestion warnings to commuters.

4

Tech Integration

Potential links with Google Maps and traffic apps for wider reach.



Conclusion: Data-Driven Solutions for Bangalore's Traffic

Accurate Forecasting

Regression models reliably predict traffic using weather and time data.

Strategic Insights

Enables smarter management and urban planning decisions.

Future Directions

Include real-time sensors and broaden geographic coverage.