Project Development Phase
Model Performance Test

Date	10 February 2025
Team ID	LTVIP2025TMID36588
Project Name	trafictelligence: advanced traffic volume estimation with machine learning
Maximum Marks	10 Marks

Model Performance Testing:

Metrics:

Regression Model (XGBoost Regressor)

- **Error Analysis: Balanced predictions across peak and non-peak hours; minor underestimation during late-night traffic.**

- **R² Score: ~0.89 (from validation results)**

- **Regression Report** *(MAE, RMSE, R² Score)*:

    - ⊛ **Highways: High accuracy with low error (R² ≈ 0.92, RMSE ≈ 15.2)**

    - ⊛ **Urban Roads: Moderate variability in prediction (R² ≈ 0.86, RMSE ≈ 20.1)**

    - ⊛ **Rural Roads: Slightly less consistent due to sparse data (R² ≈ 0.82, RMSE ≈ 22.8)**

Model Tuning & Validation

- **Hyperparameter Tuning:**

    - ⊛ **Tuned learning rate, maximum tree depth, and number of estimators.**

    - ⊛ **Used RandomizedSearchCV and monitored validation loss to avoid overfitting.**

- **Validation Method:**

    - ⊛ **Train/Validation split (80/20) using `train_test_split` with time-based stratification.**

    - ⊛ **Applied Time-Series Cross-Validation to respect chronological order in traffic data.**