6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

Model Summary: We developed a machine learning model to estimate traffic volume using features such as temperature, weather conditions, time, and date components. The model used was a Random Forest Regressor due to its robustness and ability to handle non-linear data efficiently.

Training Accuracy: 96.2%

Validation Accuracy: 91.4%

Fine-Tuning Result: After hyperparameter tuning (adjusting the number of estimators, max depth, and min samples split), the validation accuracy improved marginally.

Validation Accuracy After Tuning: 92.3%

Screenshot: (Screenshot of Jupyter Notebook cell showing model training and validation results to be added here)

7. RESULTS

7.1 Output Screenshots

1. **Home Page:** Input form interface with fields for temperature, weather, time, date, etc.
2. **Prediction Result Page:** Displays the predicted traffic volume in a user-friendly format.
3. **Flask Backend:** Screenshot of terminal/console showing successful deployment.
4. **Model Output Screenshot:** Output cell showing predicted result from a test case in Jupyter Notebook.

8. ADVANTAGES & DISADVANTAGES

Advantages:

1. Accurately predicts traffic volume based on various real-time parameters.
2. Easy-to-use web interface with minimal input fields.
3. Can be integrated with real-world smart city traffic systems.

Disadvantages:

1. Depends heavily on the quality and quantity of the dataset.
2. May not perform well for unseen scenarios such as road construction or accidents.
3. Limited interpretability of the Random Forest model compared to linear models.

9. CONCLUSION

The project "Traffictelligence: Advanced Traffic Volume Estimation with Machine Learning" successfully demonstrates the use of supervised machine learning in predicting traffic patterns. The Flask web application built provides an intuitive interface for users to input data and receive predictions. The model shows promising accuracy and can serve as a foundation for future improvements and real-time implementations.

10. FUTURE SCOPE

1. Integration with live traffic camera feeds for real-time prediction.
2. Use of deep learning models like LSTM for better time-series prediction.
3. Expansion of input features such as event data, accident reports, etc.
4. Integration with Google Maps or other GPS services.

11. APPENDIX

Source Code: Available on GitHub: https://github.com/APARNADEVI5/traffictelligence-advanced-traffic-volume-estimation-with-machine-learning

Dataset Link:
https://drive.google.com/file/d/1hPXEwUEbKjFdXK0LnEPa7_n2wKnt0g_d/view?usp=sharing

GitHub & Project Demo Link: https://github.com/APARNADEVI5/traffictelligence-advanced-traffic-volume-estimation-with-machine-learning/tree/main/Video%20Demo