

Project Title: TrafficTelligence: Advanced Traffic Volume Estimation with Machine Learning

Category: Artificial Intelligence

Team Size: 4 Members

Abstract: Traffic congestion is a persistent problem in urban environments, leading to wasted time, increased pollution, and decreased quality of life. TrafficTelligence is a smart web-based traffic volume estimation system powered by machine learning algorithms. The system utilizes historical traffic data and other influential parameters like weather conditions, date, and time to predict vehicle volume on roads. The main goal is to provide actionable insights for transportation authorities, urban planners, and commuters to make data-driven decisions.

Objectives: - Predict traffic volume accurately using historical and real-time features. - Build an easy-to-use web interface for entering parameters. - Help urban planning and commuter decision-making. - Implement real-world scenarios for traffic management.

Modules: 1. **Data Preprocessing:** Cleaning and transforming raw traffic data into usable formats. 2. **Model Training:** Applying machine learning algorithms (e.g., Random Forest, Linear Regression) to train prediction models. 3. **Web Interface:** Building a front-end form using HTML and CSS. 4. **Backend Integration:** Flask-based Python backend that takes input, runs the model, and returns prediction. 5. **Result Visualization:** Displaying predicted volume over a styled output page.

Technologies Used: - Python - Flask - Scikit-learn - Pandas - NumPy - HTML/CSS - Jupyter Notebook

Input Features: - Holiday - Temperature - Rain - Snow - Weather condition - Year - Month - Day - Hours - Minutes - Seconds

Output: - Estimated Traffic Volume (Numeric Value)

Real-Time Scenarios Implemented: 1. **Dynamic Traffic Management:** Helps authorities adjust signal timings and deploy traffic control. 2. **Urban Development Planning:** Aids planners in forecasting traffic impact of new infrastructure. 3. **Commuter Navigation:** Allows commuters to make smarter route/time decisions.

Architecture Flow: 1. User inputs traffic parameters on a web form. 2. Flask backend receives data and feeds it into the trained model. 3. Model processes the data and predicts traffic volume. 4. Prediction is displayed on a styled HTML result page.

Conclusion: TrafficTelligence is a robust AI-based system that showcases the power of machine learning in solving real-world urban challenges. By intelligently analyzing traffic-related data, it enables accurate traffic forecasting and decision-making. The project demonstrates the potential of artificial intelligence to drive smarter cities and future-ready transportation solutions.

Future Enhancements: - Integrate live traffic APIs (e.g., Google Maps, GPS feeds). - Add graph-based trend visualizations. - Enable mobile support and app version. - Expand input data to include special events and road incidents.

How to Run the Project: 1. Install requirements: `pip install flask pandas scikit-learn numpy`
2. Run the Flask server: `python app.py` 3. Open `http://localhost:5001` in browser. 4. Fill in the form and click Predict to view traffic volume.

Code Upload Instructions: - Option 1: Create a GitHub repo and push the project files. - Option 2: Zip the entire project folder and upload to Google Drive. - Include `app.py`, `templates/`, `static/`, and `Model.pkl`.
