Weekly Progress Report

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Domain: Smart City Traffic Forecasting

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Week Ending: 01

I. Overview:

This week focused on laying the foundation for a traffic forecasting system as part of the Smart City initiative. Key areas included understanding traffic flow patterns, collecting relevant datasets, and exploring suitable forecasting models. Emphasis was placed on building a data-driven approach to manage traffic efficiently, especially during holidays and special events.

II. Achievements:

1. Problem Understanding and Scope Definition:
  - Identified key junctions in the city for traffic analysis.
  - Outlined the differences in traffic flow on working days, weekends, and special occasions.
  - Mapped out the goals: congestion reduction, real-time signal optimization, and infrastructure planning.

2. Data Collection & Preprocessing:
  - Collected sample traffic data including vehicle counts, timestamps, and weather information.
  - Initiated data preprocessing tasks such as handling missing values and time alignment.
  - Explored public datasets and city transport APIs for real-time data feeds.

3. Modeling Framework Exploration:
  - Evaluated various forecasting techniques (ARIMA, Prophet, LSTM) suitable for time series traffic data.
  - Created initial baseline forecasts using historical averages and moving averages for comparison.

III. Challenges:

1. Data Availability and Quality:
  - Faced gaps in data collection for holidays and special events.
  - Inconsistent format and resolution in traffic logs from different sources.

2. Event-aware Modeling:
  - Difficulty in incorporating one-off events like political rallies or concerts into time series models.
  - Working on integrating a holiday/event calendar into the dataset for better forecasting accuracy.

IV. Learning Resources:

1. Traffic Forecasting Literature:
  - Reviewed academic papers and case studies on intelligent traffic prediction.
  - Referred to Smart City architecture models and IoT integration for real-time traffic systems.

2. Technical Resources:
  - Followed an online course on Time Series Forecasting using Python (e.g., Coursera/YouTube).
  - Explored Python libraries: pandas, prophet, matplotlib, scikit-learn, and tensorflow.

V. Next Week's Goals:

1. Model Implementation and Evaluation:
  - Implement and compare Prophet and LSTM models for traffic volume prediction.
  - Evaluate model accuracy using metrics like MAE, RMSE, and MAPE.

2. Event-Aware Forecasting and Visualization:
  - Integrate holidays and city event data into the modeling pipeline.
  - Build a simple dashboard for visualizing traffic trends and forecasts at junctions.

3. Collaboration and Feedback:
  - Present initial findings to stakeholders for feedback.
  - Collaborate with urban planners to align forecasting with infrastructure planning needs.

VI. Additional Comments:

- The project aligns with the larger Smart City vision by leveraging data science to solve real-world urban mobility issues.

- The integration of event-awareness into traffic modeling remains a key focus for achieving accurate, actionable insights.