Weekly Progress Report

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Domain: Smart City Traffic Forecasting

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Week Ending: 02

I. Overview:

This week focused on implementing the first set of predictive models for traffic forecasting and refining the dataset to improve accuracy. Efforts were directed toward integrating external event data, evaluating different model architectures, and creating initial visualizations for stakeholder review. Work also included tuning model parameters and optimizing preprocessing workflows for efficiency.

II. Achievements:

1. **1. Model Implementation and Evaluation:**

- Implemented Prophet and LSTM models for short-term traffic volume prediction.
- Compared models using MAE, RMSE, and MAPE on a test dataset.
- Observed that Prophet handled seasonal trends better, while LSTM captured short-term fluctuations effectively.

2. **2. Event-Aware Data Integration:**

- Successfully integrated a holiday and local event calendar with the traffic dataset.
- Created features to flag event days for model input, improving prediction accuracy during irregular traffic patterns.

3. **3. Visualization and Dashboard Prototype:**

- Developed a basic dashboard using Plotly Dash for interactive traffic forecast visualization.
- Enabled junction-wise filtering and trend comparison between actual and predicted data.

III. Challenges:

4. **1. Model Overfitting in LSTM:**

- LSTM initially overfitted due to limited data for certain junctions.
- Applied dropout layers and early stopping to reduce overfitting.

5. 2. Real-time Data Pipeline:

- Encountered delays in fetching live data from transport APIs.
- Working on a caching mechanism to store and reuse recent data when API latency is high.

IV. Learning Resources:

6. 1. Modeling and Forecasting:

- Followed tutorials on LSTM hyperparameter tuning and time series cross-validation.
- Studied Prophet's handling of seasonality and event regressors from official documentation.

7. 2. Visualization Tools:

- Learned dashboard creation techniques in Plotly Dash and experimented with map-based visualizations.

V. Next Week's Goals:

1. Hybrid Model Development:
- Combine Prophet for seasonal trends and LSTM for short-term fluctuations in a hybrid pipeline.
- Test hybrid approach against standalone models.

2. Real-time Data Integration:
- Finalize real-time data fetching and preprocessing pipeline.
- Automate daily forecast generation.

3. Stakeholder Feedback & Improvements:
- Present dashboard prototype for feedback.
- Incorporate suggestions into improved UI/UX for traffic insights.

VI. Additional Comments:

- Event-aware modeling showed measurable improvement in forecast accuracy, especially during weekends and public gatherings.
- The dashboard will be a key tool for urban planners to monitor and respond to traffic conditions proactively.