ALY 6980: CAPSTONE

Week 5:

Report on Business Question Exploration and Data Analysis

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I. Introduction:

In response to the business question of improving transit signal priority (TSP) in intelligent transport systems, we have undertaken a comprehensive analysis leveraging advanced data exploration techniques and innovative solutions. This report outlines the thinking process, techniques used for data exploration, and the approach to tackle the business question.

II. Exploratory Data Analysis (EDA):

To explore the data, we utilized traffic image data from Roboflow and applied YOLOv9, an advanced object detection algorithm. Through this technique, we identified vehicles, pedestrians, and other objects in real-time traffic videos. The analysis revealed insights into vehicle counts, speed, and traffic patterns, providing a foundation for improving TSP systems.

III. Approach to Tackle the Business Question:

To address the business question of enhancing TSP, we are employing a multifaceted approach:

1. Advanced AI Techniques: Utilizing YOLOv9 for accurate vehicle detection and tracking, enabling real-time monitoring of traffic conditions.

2. Big Data Analytics: Leveraging big data techniques to aggregate and analyze vast amounts of traffic data, enabling predictive modeling of traffic patterns.

3. Integration with V2X Technology: Integrating with vehicle-to-everything (V2X) technology to optimize traffic signal timings and prioritize transit vehicles, thereby reducing congestion.

IV. Techniques and Rationale:

- YOLOv9: Chosen for its high accuracy and real-time processing capabilities, crucial for vehicle detection and tracking in dynamic traffic environments.

- Big Data Analytics: Selected to handle the large volume and variety of traffic data, enabling us to derive actionable insights and optimize TSP systems effectively.

- V2X Integration: Employed to leverage real-time data from vehicles and infrastructure, facilitating intelligent decision-making and traffic management.

V. Delivery to the Sponsor:

The findings and proposed solutions will be delivered to the sponsor through a comprehensive report and presentation. The report will include:

- Summary of data exploration findings and insights.

- Details of the techniques employed to address the business question.

- Proposed approach and solutions for enhancing TSP.

- Recommendations for implementation and future research directions.

The presentation will provide a visual overview of the key findings, methodologies, and actionable recommendations, ensuring clear communication of the proposed solutions and their potential impact on improving transit signal priority in intelligent transport systems.

VI. Conclusion:

Through the application of advanced AI techniques, big data analytics, and integration with V2X technology, we aim to deliver a transformative solution for enhancing transit signal priority. By leveraging real-time traffic data and predictive modeling, our proposed approach holds the potential to revolutionize traffic management and improve urban mobility, ultimately leading to more efficient and sustainable transportation systems.