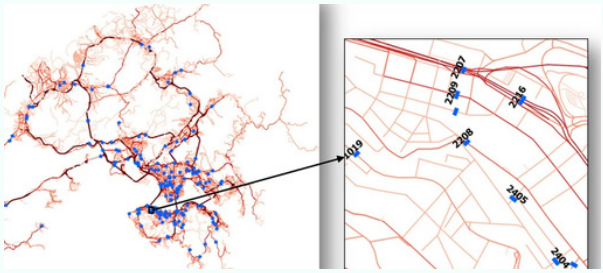
Executive Summary

Problem Statement

Traffic congestion remains a persistent challenge in Singapore's urban landscape, causing significant delays and impacting the daily commutes of thousands. Despite the availability of vast amounts of data generated by urban traffic systems, this valuable resource remains underutilized in decision-making processes for traffic management. Additionally, urban planners often face limitations inherent in the traffic environment when devising solutions to alleviate congestion.



Objective:

The "Adaptive Traffic Learning and Analysis System" (ATLAS) project aims to harness the capabilities of Large Language Models (LLMs) to derive detailed insights into traffic congestion points within Singapore's urban environment. By analyzing data collected from loop detectors and other traffic monitoring tools, the project seeks to identify bottlenecks and propose informed suggestions to improve traffic flow on specific routes..

Methodology:

Data Integration:

- ATLAS utilizes Open Street Map data to replicate street layouts and traffic signals for chosen locations.
- This data is then converted into a network XML file compatible with the Simulation of Urban MObility (SUMO).

Traffic Simulation

SUMO facilitates the simulation of real-time traffic conditions by mapping demand traffic directly onto the virtual network using existing traffic data.

Congestion Detection

SUMO API tracks vehicle positions, and this data is preprocessed to determine the mean and standard deviation of traffic flow to detect points of congestion in the route.

Route Optimization Suggestion by LLM

The statistical insights derived from preprocessing serve as the basis for LLMs to propose optimizations for identified congestion points.

Iterative Refinement

Proposed solutions are iteratively fed back into SUMO, and the LLM assesses their effectiveness, refines the suggestions, and learns to provide increasingly optimized solutions.

Outcome and Impact

Data-driven Recommendations

ATLAS will provide urban planners and traffic managers with specific, actionable recommendations informed by the LLM analysis.

Enhanced Decision-making

These recommendations will support the implementation of new, effective traffic management strategies.

Improved Urban Mobility

The project aims to optimize traffic flow, reducing congestion and directly improving the lives of Singaporean commuters.

Conclusion

ATLAS is a novel idea that merges data analysis and advanced AI technologies to tackle a major urban issue. Its scalable model has the potential to streamline traffic systems in Singapore, contributing to a more efficient and livable city.