Research Recap

Mobility21
A USDOT NATIONAL UNIVERSITY TRANSPORTATION CENTER

Real-World Data Driven Characterization of Urban Human Mobility Patterns

Purpose: The way people travel varies from city to city. It also changes with time. This project explores how to formally analyze and understand human mobility using large sets of real-world ride-hailing services data from more than a dozen cities. The main goal is to understand patterns and structural properties of human mobility applicable to cities or urban areas across the globe. Such insights may also help identify typical human movement in cities and how it will evolve with time.

Approach: The team introduced a new graph model for human mobility to capture the evolution of mobility patterns. The approach uses Generative Adversarial Networks to autonomize the data by creating a synthetic data sets (based on the real ride request data sets). Then the ride requests are viewed as a (temporal) sequence of (spatial) images of ride request locations.

Key Findings: The team highlighted how these mobility patterns can be applied to applications like ride hailing, pooling and vehicle placement. The team also derived performance bounds for online algorithms using city-level characterizations. Finally, the team produced an open-source framework to understand the properties of human movement, generate synthetic human mobility data, and apply it to different what-if scenarios for real-world applications.

Conclusion: The project team looked at city-scale conditions, but the same approach can be used to analyze events that occur in smaller cities around the world. For example, special events involving high attendance of people can cause heavy traffic congestion. By using the processes proposed in the report, entities providing ride-hailing services, cabs, or even private car owners can adjust their plans for when to visit or leave an event to reduce travel delay and improve efficiency. Analysis of the traffic entering or leaving congested areas can also provide insights into the causes. This information, coupled with mapping and routing information can be used for recommending alternative routes.

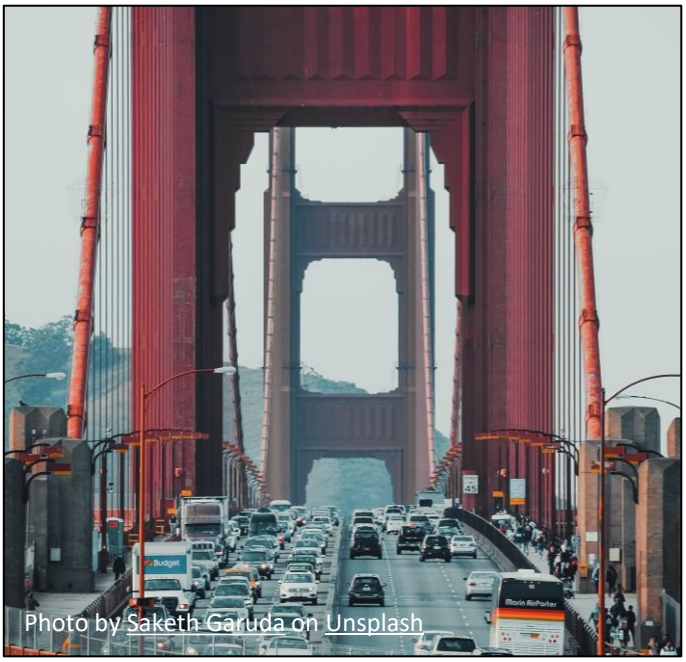
Photo by Saketh Garuda on Unsplash

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Project Record:

- https://ppms.cit.cmu.edu/projects/detail/180

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