Research proposal for Surge Project 2022

Subject Matter:

This study shall focus on analysing, comparing and explaining real world data pertaining to factors that affect the efficiency of our transportation networks such as mobility (which could be speed or travel time from origin to destination), scale of transportation (the volume of traffic passing through the network; its spatial distribution), safety trends (frequency of crashes, severity of crashes etc).

A transport network (or transportation network) is a network or graph in geographic space, describing an infrastructure that permits and constrains movement or flow. Hence a lot of natural and emergent human-made systems can be described as a transportation network. For this project, the road network will be analysed as a transportation network. Hence, in the context of roads, vehicle movement or traffic can analogously be seen as the ‘flow’. The volume, distribution and speed hence become the characteristics of interest.

Mobility itself can be interpreted in many different ways. In one line of thought, it may be considered as the average speed of the vehicles in the network, while in another it may be the average time taken for a vehicle to go from its starting point (formally, the origin) to its destination. All such conceptualizations offer different kinds of information, and hence it becomes important to understand the dataset and find which measures give more meaningful results.

The above is also true for the scale of transport as well as for safety (which is an ambiguous qualitative property and hence is particularly tricky). These are also some of the avenues one can elaborate on when conducting analysis on a particular dataset.

Under this framework, one can ask questions such as:

* How variations in mobility patterns compare with trends in crash occurrences?
* How do mobility patterns across space and time differ across different cities as a function of street network, socio-demographics and built environment characteristics?

The methods of analysis for this study will involve techniques such as

* Geospatial data processing: with data sourced from various data aggregators such as Uber’s movement and travel duration data.
* Transportation network analysis.
* Machine learning models and statistical learning techniques (supervised and unsupervised learning).

Once the correlations are established, a qualitative approach to understand the causal relationships between various perceived trends can be formulated. Thus, the interpretation of the hypotheses found as a result of quantitative analysis can be found.

Collectively, these methods will integrate data sets pertaining to build environment (e.g., street network, points of interest) and socio-demographic indicators (e.g., census data) to help explain variations in mobility (speeds, origin-destination travel times) and safety (crashes) trends.