Research Recap

Mobility21
A USDOT NATIONAL UNIVERSITY TRANSPORTATION CENTER

User-centric interdependent urban systems: using energy use data and social media data to improve mobility

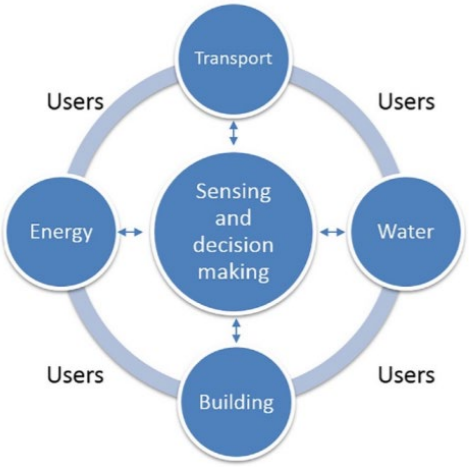
Purpose: The purpose of this project was to predict the congestion on a particular road segment in the traffic network between 5:00 AM/6:00 AM and 10:59 AM, using electricity or social data available until early morning, which is defined as before 5:00 AM on that day. This project is the first step to achieve the ultimate goal of developing a reliable traffic prediction framework which makes use of inter-correlations among urban systems for increasing forecasting accuracy and horizons.

Approach: The first phase of the project was to use time-of-day electricity usage data to predict morning roadway congestion. The data included electricity usage, traffic data, and geocoded social media data. The next phase was feature extraction, where the team explored cluster analysis and feature encoding. The final phase was to construct models and examine the relationship between electricity usage patterns and morning congestion to predict performances with aggregate and disaggregate feature encodings.

Key Findings: The team showed that using sampled household-level electricity data from midnight to early morning can reliably predict congestion starting time of many highway segments that are otherwise hard to predict using only real-time travel time data (through time series or the historical mean).

For using social media data for morning congestion prediction, the resulting relationships are surprisingly simple and powerful. Generally, the team discover that the earlier people go to sleep, which can be sensed by social media platforms, the more congested roads will be in the next morning. The early-sleeping patterns are represented by high tweeting activities last evening together with low tweeting activities at night, which results in the early activities drop in selected spatial areas.

Conclusion: This project proposes a general framework to explore the spatial and temporal correlation among usage patterns of energy systems and social media platforms with roadway systems, and make use of such relationships to increase the forecasting accuracy and horizons of morning congestion predictions, which has huge practical values for helping travels' plan travel choices and supporting active traffic control.



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Project Record:

- https://ppms.cit.cmu.edu/media/project_files/34_-_user-centric-report.pdf

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