

Digital Sensing for Urban Mobility

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City as a complex system is composed of a multitude of interacting actors of different types. But more importantly most of those actors are dynamic and their mobility around the city largely facilitates their interactions and activity. This is why understanding urban mobility is one of the key questions for understanding the entire urban system. Until present days, this transportation research is largely relying on different sources of census data and surveys. However, a technological revolution of the past few decades provides a new unprecedented opportunity - digital sensing. The technological revolution resulted in the broad penetration of digital technologies into everyday life. More and more aspects of human activity now leave digital traces behind them, thus increasing production of big data related to human activity and mobility. Various datasets from the last 5-7 years - landline and cell phone call records, public transportation records, vehicle GPS traces, credit card transactions, geo-tagged social media, WiFi/Bluetooth connections and many others – are now available for research purposes, creating tremendous opportunities for urban research, planning and innovation. Most of those datasets can be characterized as spatio-temporal transactional data, containing information about various types of interactions between urban actors including their location and time. And while the analytic objectives are diverse, the structure of different datasets, basic analytic queries to them as well as the challenges are often pretty similar. In this talk I provide examples of successful utilization of such data in urban mobility research and applications, such as evaluation of the constant travel budget assumption, regional delineation, land use classification, car-pooling and transportation optimization, impact assessment of urban deployments, event detection. I also mention examples of data-driven business applications for tourism, public safety, transportation, banking, retail and other industrial areas. Together with the current advances and further potential of the approach, I will focus on the challenges, biases and limitations typically introduced by big transactional spatio-temporal data and common analytic needs that arise while working with it.