Cross-Domain Cyber-Physical Systems for Smart Cities: Addressing Mobility Challenges by Urban Systems with Urban Data

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3/25/2016 at 10:30 am
Core A (Room 301)

Abstract

For the first time ever, we have more people living in urban areas than rural areas. Based on this inevitable urbanization, my research aims to address sustainability challenges related to urban mobility (e.g., energy consumption and traffic congestion) by data-driven applications with a Cyber-Physical-Systems approach (CPS, also known as a broader term for Internet of Things), which is a new information paradigm integrating communication, computation and control in real time. Under the context of a smart cities initiative proposed by the White House, in this talk, I will focus on CPS related to large-scale cross-domain urban systems, e.g., taxi, bus, subway, cellphone and smart payment systems. I will first show how cross-domain data from these systems can be collaboratively utilized to capture urban mobility in real time by a new technique called multi-view bounding, which addresses overfitting issues of existing mobility models driven by single-domain data. Then I will show how the captured real-time mobility can be used to design a practical service, i.e., mobility-driven ridesharing, to provide positive feedback to urban systems themselves, e.g., reducing energy consumption and traffic congestion. Finally, I will present real-world impact of my research and some future work about CPS for smart cities.

Bio

Desheng Zhang is a Research Associate at Department of Computer Science and Engineering of the University of Minnesota. Previously, he was offered the Senseable City Consortium Postdoctoral Fellowship from MIT and awarded his Ph.D in Computer Science from University of Minnesota. His research is uniquely built upon 10TB urban data from 10 kinds of cross-domain urban systems, including cellphone, smartcard, taxi, bus, truck, subway, bike,
personal vehicle, electric vehicle, and road networks in 8 cities across 3 continents with 100 million urban residents involved. Desheng designs and implements large-scale data-driven models and real-world services to address urban sustainability challenges. Desheng has published more than 20 papers, featuring 11 first-author papers in premium Computer Science venues, e.g., MobiCom, SenSys, IPSN, ICCPS, SIGSPATIAL, ICDCS, RTSS, BIGDATA and 6 best paper/thesis/poster awards. More Info: http://www.cs.umn.edu/~zhang/ 

Faculty Host: Uli Kremer