CIRRELT

Séminaire du CIRRELT Seminar

Lijun Sun

Université McGill

BAYESIAN TEMPORAL FACTORIZATION MODELS

Abstract: Spatiotemporal mobility/traffic data, which registers timestamped travel activity/traffic state (e.g., flow and speed) observations from different locations (a network of sensors/zones), is an essential input to a wide range of intelligent transportation systems (ITS) and urban planning applications, such as travel demand prediction, trip planning, travel time estimation, route planning, ride sharing, transit service scheduling, signal control, and disruption management. These applications are critical components of smart transportation of the future, benefiting both travelers and transport agencies. The fundamental of modeling spatiotemporal mobility/traffic data is to characterize the higher-order correlations/dependencies within the data and perform efficient and reliable imputation/prediction for decision making. However, despite the abundance of modeling techniques, emerging issues are constantly challenging existing modeling frameworks, such as small-scale problem, linear system, and stationary, homogeneous and fully-observed data. As a result, in real-world online applications, these methods often suffer from many practical issues, such as limited scalability, failure in capturing multiresolution (short-range and long-range) dependencies, missing/non-stationary data problems, the limited number of sensors, and data heterogeneity. In this study, we develop Bayesian temporal matrix and tensor factorization (BTMF and BTTF) models for both missing data imputation and traffic forecasting. Comparing to the traditional Bayesian matrix or tensor factorization models, BTMF and BTTF take into account temporal dependencies among time slots of time series sequence, and BTTF is a higher-order extension for multi-dimensional data. Both two models are fully Bayesian, which are capable of learning from sparse data and estimating unknown data (i.e., missing data in the past and unknown data in the future).

Bio: Lijun Sun is an Assistant Professor with the Department of Civil Engineering and Applied Mechanics. He obtained his PhD degree in Civil Engineering (Transportation) from National University of Singapore in 2015, and earned his Bachelor degree in Civil Engineering from Tsinghua University (Beijing, China) in 2011. During PhD, he worked at Mobility and Transport Planning module at the Future Cities Laboratory (http://www.fcl.ethz.ch/), Singapore-ETH center, combining smart card-driven public transport modeling and agent-based simulation to improve urban public transport service quality and reliability. Prior to joining McGill, he was a Postdoctoral Associate at MIT Media Lab. His current research centers on the area of smart transportation and urban computing, developing innovative methodologies, tools and applications to address the efficiency, resilience, and sustainability issues in urban transportation systems. His previous work has been featured in some popular media outlets, including Wired, Citylab, Scientific American, and MIT Technology Review. He is now a regular member of CIRRELT.

VENDREDI / FRIDAY
18 janvier 2019 / January 18th, 2019
11h15

Salle / Room 6214
Pavillon André-Aisenstadt
Université de Montréal

Ouvert à tous / Open to all

Organisateur / Organizer
Martin Trépanier

Université Laval · McGill · Concordia University · ÉTS Le génie pour l'industrie · UQÀM · HEC Montréal · Polytechnique Montréal · Université de Montréal