PacTrans Doctoral Webinar Series

October 5th, 2021 10:00 AM Pacific Time

Title: Deep Learning for Short-term Network-wide Road Traffic Forecasting

Abstract: Traffic forecasting is a critical component of modern intelligent transportation systems for urban traffic management and control. Learning and forecasting network-scale traffic states based on spatial-temporal traffic data is particularly challenging due to the time-varying traffic patterns and the complicated spatial dependencies on road networks. The existence of missing values in traffic data makes this task even harder. With the rise of deep learning, this work attempts to answer: how to design proper deep learning models to deal with complicated network-wide traffic data and extract comprehensive features to enhance prediction performance, and how to evaluate and apply existing deep learning-based traffic prediction models to further facilitate future research? To address those key challenges in short-term road traffic forecasting problems, this work develops deep learning models and applications to: 1) extract comprehensive features from complex spatial-temporal data to enhance prediction performance, 2) address the missing value issue in traffic forecasting tasks, and 3) deal with multi-source data, evaluate existing deep learning-based traffic forecasting models, share model results as benchmarks, and apply those models into practice. To learn localized features from the topological structure of the road network, deep learning frameworks incorporating graph convolution operations are proposed to learn the interactions between roadway segments and predict their traffic states. Further, to fill in missing values in the graph-based traffic network, a graph Markov network is proposed, which can infer missing traffic states step by step along with the prediction process. In summary, the proposed graph-based models not only achieve superior forecasting performance but also increase the interpretability of the interaction between road segments during the forecasting process.

Webinar Registration Link

https://washington.zoom.us/meeting/register/tJ0sdu-prT0rGdeTV_zl8mjYN6iaSG_moMG1

Presenter Bio: Dr. Zhiyong Cui is a Postdoc in the CEE department at UW. He is also a UW Data Science Postdoctoral Fellow. He has a Ph.D. in transportation engineering from University of Washington (2021), a master's degree in software engineering from Peking University (2015), and a bachelor's degree in software engineering from Beihang University (2012). Dr. Cui's active research fields include intelligent transportation systems, transportation data science, short-term traffic forecasting, and smart vehicle and infrastructure control. Dr. Cui also serves as a member of the TRB Standing Committee on Intelligent Transportation Systems and a member of the American Society of Civil Engineers (ASCE) Transportation and Development Institute (T&DI) Artificial Intelligence Committee.

Advisor: Professor Yinhai Wang, UW

About PacTrans Doctoral Webinar Series: The Series will showcase important/promising doctoral research in the Pacific Northwest and beyond. PacTrans' objective is to encourage the early diffusion of innovative research and discussion among and across schools. We are aiming to hold the webinars 3-4 times per year, in early March, May, early October or November (considering that PacTrans yearly conference takes place in October).