UPASS Project Member Attended the 99th TRB Annual Meeting, January 11-18, 2020, Washington DC

The UPASS Project Member, Dr. Xiqun (Michael) Chen, attended the 99th Transportation Research Board Annual Meeting and presented two papers in poster sessions (Fig. 1 and Fig. 2). The 99th TRB Annual Meeting was held in Washington, DC, during January 11-18, 2020. The theme for the 2020 TRB Annual Meeting is "A Century of Progress Foundation for the Future". There were more than 5,000 presentations in nearly 800 sessions and workshops, addressing topics of interest to policy makers, administrators, practitioners, researchers, and representatives of government, industry, and academic institutions.

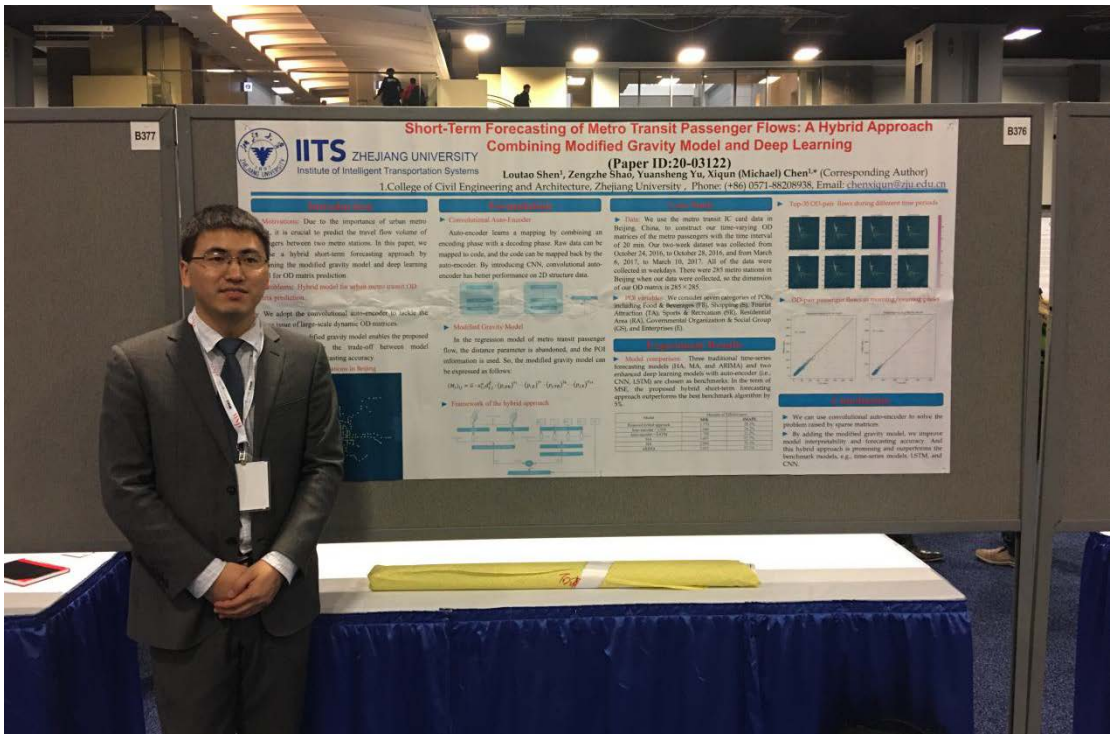

Fig. 1. Dr. Xiqun (Michael) Chen attended the 99th TRB Annual Meeting

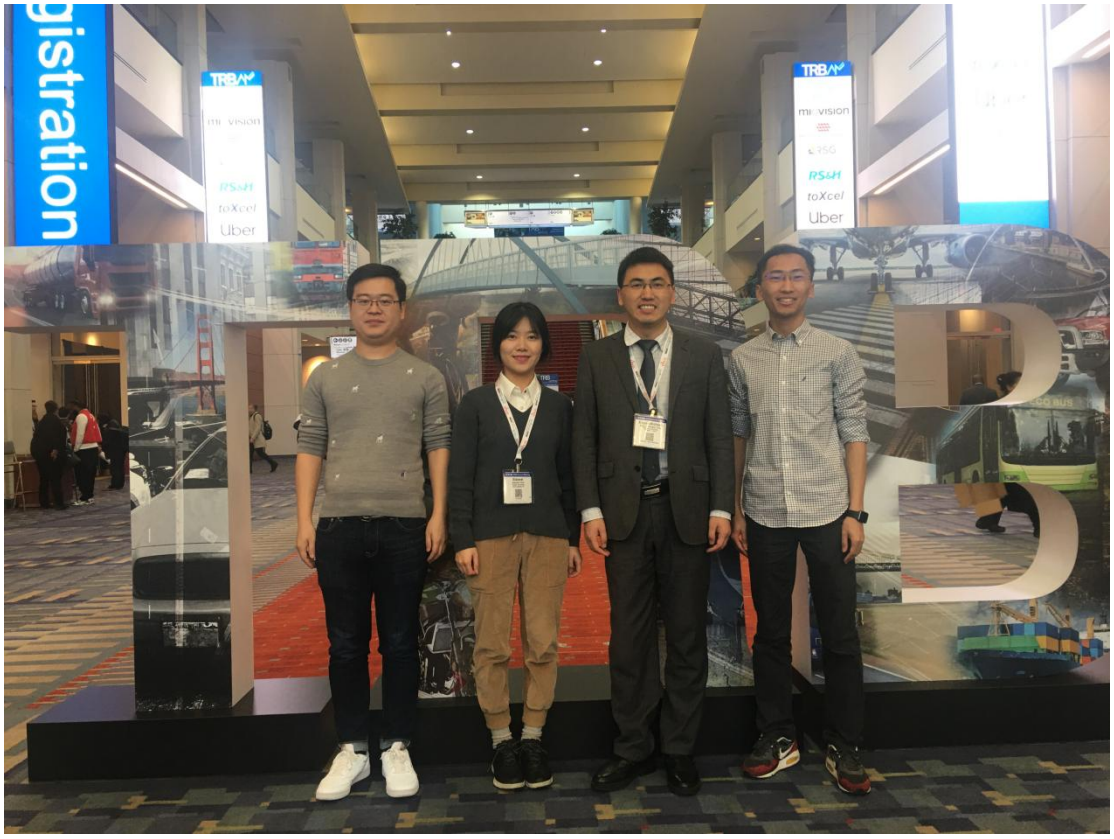

Fig. 2. Dr. Xiqun (Michael) Chen's research team at the 99th TRB Annual Meeting

(a) Network equilibrium analysis of competitive ride-sourcing market

This study proposes an origin-destination (OD) competitive network equilibrium model for RSM based on the non-cooperative game theory. Specifically, the finite-dimensional variational inequality theory is adopted to establish the OD-based ride-sourcing enterprise (RSE) competition equilibrium model (Fig. 3). The model assumes that RSE and individual drivers seek to maximize profits, while demand markets seek utility maximization. The analytical findings include that: (1) the market equilibrium price increases and the market equilibrium travel quantity

decreases in either the transaction cost, driver cost, or RSE cost; (2) the increased number of light-asset RSEs will decrease the market equilibrium price and increase the market equilibrium travel quantity, and (3) increasing RSM entry requirements improves the market equilibrium price and reduces the travel demand on the RSM. The gained analytical insights shed light on RSEs and the government to improve their strategic and operational decisions.

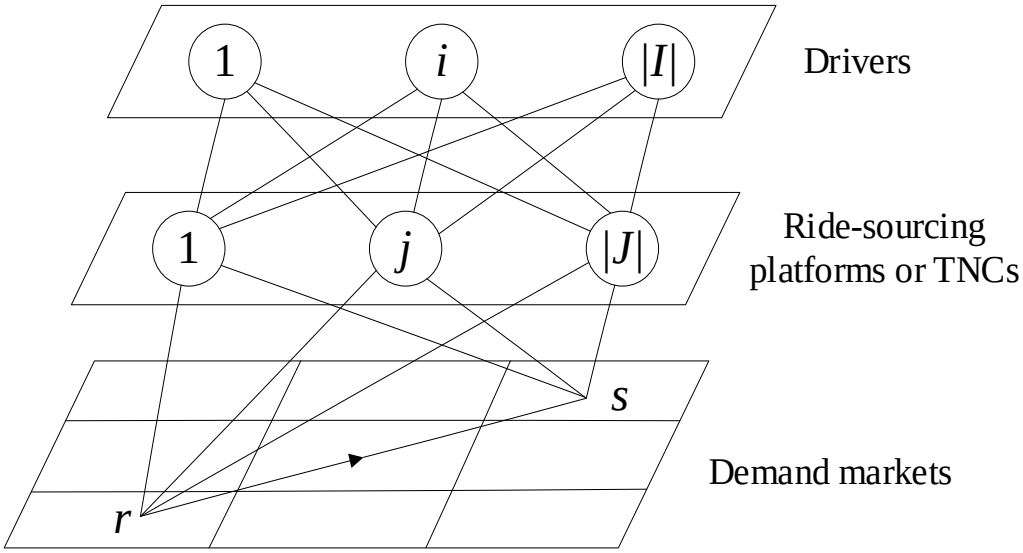

Fig. 3. Competitive network of on-demand ride services

(b) Short-term forecasting of metro transit passenger flows: A hybrid approach combining modified gravity model and deep learning

Due to the importance of urban metro transit, it is crucial to predict the travel flow volume of passengers between two metro stations. In this study, hybrid short-term forecasting approach is proposed by combining the modified gravity model and deep learning model for OD matrix

prediction. To demonstrate the hybrid approach developed in this paper, the metro transit IC card data in Beijing, China, are utilized to construct our time-varying OD matrices of the metro passengers with the time interval of 20 min (Fig. 4). In conclusion, Dr Chen's research team uses convolutional auto-encoder to solve the problem raised by sparse matrices. In addition, by adding the modified gravity model, model interpretability and forecasting accuracy are improved. This hybrid approach is promising and outperforms the benchmark models, e.g., time-series models, LSTM, and CNN.

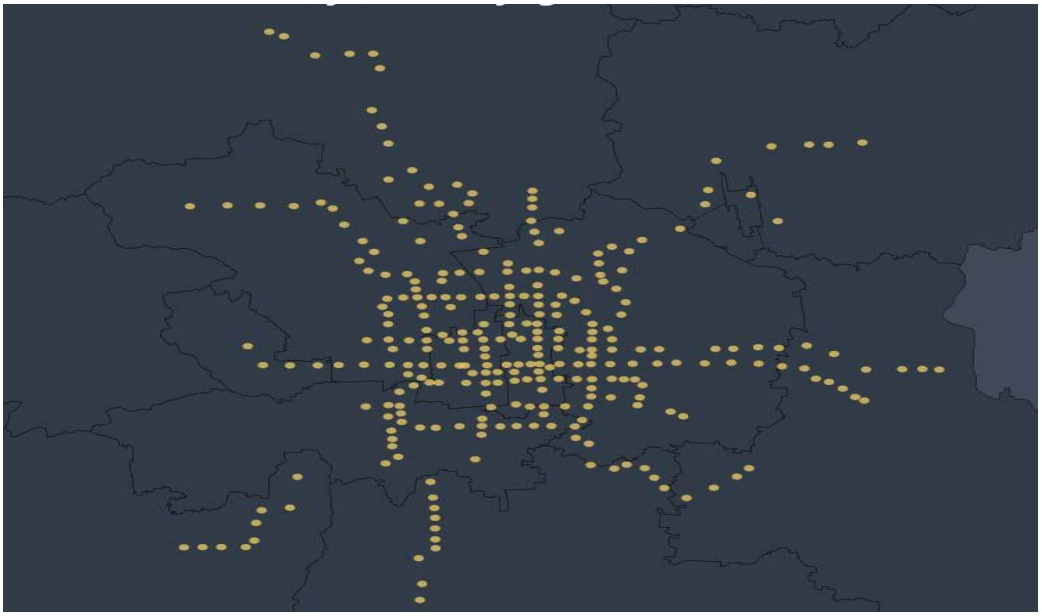

Fig. 4. The layout of metro stations in Beijing

The above research was supported by the joint project of the JPI Urban Europe and National Natural Science Foundation of China "Urban Public Administration and ServiceS innovation for Innovative Urban

Mobility Management and Policy (U-PASS)" (Grant No. 71961137005) and other related projects.