Optimization and Learning Methods for Rebalancing Electric-Vehicle Sharing Systems

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Abstract: This talk will introduce Free-floating electric vehicle sharing (FFEVS) systems require nightly relocation and recharging operations to better meet the next day's spatial demand with sufficient battery levels. Such operations involve not only a crew of drivers to move the shared electric vehicles (EVs), but also a fleet of shuttles to transport those drivers. To determine EV relocation decisions and shuttle routing decisions, we need to solve a complicated optimization problem. To solve this problem, this talk introduces three different approaches, namely, an exchange-based (local) neighborhood-search method, a neural combinatorial optimization method based on deep reinforcement learning, and an adaptive large neighborhood search method. These optimizations and learning methods are compared and discussed in a case in Amsterdam, the Netherlands.

Bio: Changhyun Kwon is an associate professor in Industrial and Management Systems Engineering at the University of South Florida. His research interests include transportation systems analysis and service operations problems. On various topics on routing, network design, pricing, and equilibrium problems, he has published more than 60 research papers in journals such as Operations Research, Transportation Science, Transportation Research Part B, and European Journal of Operational Research. He received the NSF CAREER award in 2014. Before joining the University of South Florida, he has been with the University at Buffalo, where he received the UB Exceptional Scholar: Young Investigator Award in 2015. He received a PhD in Industrial Engineering in 2008 and an M.S. in Industrial Engineering and Operations Research in 2005, both from the Pennsylvania State University. He also received a B.S. in Mechanical Engineering from KAIST in 2000. He is an active member of INFORMS and TRB. Currently, he is Chair of Urban Transportation Planning and Modeling SIG of the INFORMS Transportation Science and Logistics Society.