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An aggregate matching and pick-up model for mobility-on-demand services

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Venue: Room 612B, 6/F Haking Wong Building, The University of Hong Kong

Abstract
This research presents an Aggregate Matching and Pick-up (AMP) model to delineate the matching and pick-up processes in mobility-on-demand (MoD) service markets by explicitly considering the matching mechanisms in terms of matching intervals and matching radii. With passenger demand, vehicle fleet size and matching strategies as inputs, the AMP model can well approximate drivers' idle time, passengers' waiting time for matching and pick-up by considering batch matching in a stationary state. Properties of the AMP model are then analyzed, including the relationship between passengers' waiting time and drivers' idle time, and their changes with market thickness which is measured in terms of the passenger arrival rate (demand) and the number of active vehicles in service (supply). The model can also unify several prevailing inductive and deductive matching models used in the literature and spell out their specific application scopes. In particular, when the matching radius is sufficiently small, the model reduces to a Cobb-Douglas type matching model for street-hailing taxi markets, in which the matching rate depends on the pool sizes of waiting passengers and idle vehicles. With a zero matching interval and a large matching radius, the model reduces to Castillo model based on an instant matching mechanism, or a bottleneck type queuing model, in which passengers' matching time is derived from a deterministic queue at a bottleneck with the arrival rate of idle vehicles as its capacity and waiting passengers as its customers. When both the matching interval and matching radius are relatively large, the model also reduces to the bottleneck type queuing model. The performance of the proposed AMP model is verified with simulation experiments.

About the Speaker
Dr. LI Xinwei is an Assistant Professor in the School of Economics and Management at Beihang University, China. She received her Ph.D. from the Hong Kong University of Science and Technology in 2018, and B.S. from University of Science and Technology of China in 2013. Dr Li's research interest is in the area of traffic dynamics, traffic economics and shared mobility services. Her research work has been published in various world-leading SCI journals such as Transportation Research Part B, Transportation Research Part C, Transportation Research Part D, Transportation Research Part E, etc. Dr. Li's research has been supported by the National Natural Science Foundation of China (NSFC).

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