Adoption of Electric Vehicles in Car Sharing Market
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Date: 28 September 2018 (Friday)
Time: 11:00 am - 12:15 pm
Venue: Room 3003, LSK Business Building

Abstract: Motivated by the news that Car2go in San Diego replaced all of its electric vehicle (EV) fleet with gasoline-powered cars starting in May 2016, we examine the questions of whether it is optimal to use EVs in the car sharing market and what is the environmental impact of the optimal choice on the car mix. We develop a model consisting of a profit-maximizing CSC and a population of utility-maximizing customers and show that it is optimal for the CSC to use EVs only if the charging speed is high enough and both the number of charging stations and the range of EVs are large enough. Among these three conditions, the recharging speed is the most important and the number of charging stations is more important than the range of EVs. We also find that including EVs in the car sharing market may lead to a higher total emission (due to a lower rental price that results in a higher usage rate). We apply our results to the case study of Car2go in San Diego and observe that Car2go replaced EVs with FVs likely due to the slow recharging speed rather than the lack of charging stations or the limited travel distance of EVs.

Bio: Rui David Chen is an assistant professor of operations management at the School of Management and Economics of the Chinese University of Hong Kong (Shenzhen). Prior to joining CUHK (Shenzhen), he was a postdoctoral research fellow at the Rotman School of Management, University of Toronto. He received his Ph.D. in Industrial & Systems Engineering from the University of Minnesota in 2015, and Bachelor’s degree in Computational Mathematics from Peking University. His current research interests are supply chain management, inventory management, sustainable operations, and other applications of stochastic modeling.