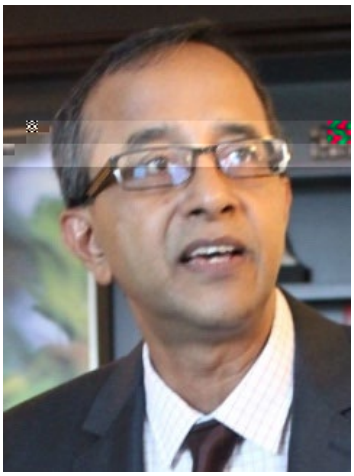
SMU Lyle School of Engineering

Operations Research and Engineering Management

Seminar Series

Research Seminar

Fleet Sizing and Charging Infrastructure Planning for Ride Hailing Services Using Autonomous EVs



Dr. Tapas K. Das
Professor and Chair
Department of Industrial and Management Systems Engineering
University of South Florida

Friday, March 11, 2022
11:00 a.m. – 12:15 p.m.
https://smu.zoom.us/j/97906267193

Abstract
Shared autonomous electric vehicles (SAEVs) are soon expected to serve a significant portion of the public transportation demands in metropolitan cities and suburbs. These demands arise stochastically across the transportation nodes at all hours of operation. Spatio-temporal distribution of demand, trip lengths, battery size, and power supply/transmission constraints will

guide the strategic business decisions regarding fleet sizing and location & sizing of the charging hubs for the fleet. We develop a robust mixed integer linear model. Given the distribution of trip request for the SAEV fleet across the transportation nodes and the electric power supply constraints, our model develops an abstraction of the fleet operation and yields the corresponding business (capacity investment) plan that maximizes gross profit for the ride-hailing company. A sample numerical problem is constructed with data adapted from the City of Tampa, Florida, USA. The city transportation network is represented by a 15 super-node connected graph, which is supported by an illustrative 14-bus radial power supply network. The robust model, implemented on the sample problem, yields optimal capacity investment plans based on the level of conservatism chosen by the decision maker. We demonstrate how our model can be used to determine the capacity expansions for an existing system when demand increases in future. Sensitivities of power network configurations and EV battery capacity are also explored.

Biography

Tapas K. Das serves as a Professor and Chair of the Industrial Engineering Department at University of South Florida. Dr. Das received his PhD degree from Texas A&M University. He is a Fellow of the Institute of Industrial and Systems Engineers and a council member of the Quality Statistics and Reliability (QSR) section of INFORMS. He serves as an Associate Editor of IISE Transactions on Healthcare Systems Engineering. Dr. Das has graduated eighteen (18) PhD students and currently mentoring four PhD students. He has received over $5 million in external funding to support his research and teaching activities.

Dr. Das' current research focus is two pronged: 1) addressing the challenges arising from the confluence of transportation and electric power supply and markets with the increasing adoption of electric vehicles, and 2) developing agent-based models for influenza epidemics caused by respiratory type viruses. Along with his PhD students Dr. Das has published several papers in recent years on EV integration and its impact on electric power markets in journals like *Applied Energy*, *Energy*, and *IEEE Transactions on Power Systems*. His recent work on COVID-19 models and model-based predictions and decision support have appeared on journals like *Global Epidemiology*, *Infectious Disease Modeling*, and *BMC Journal on Medical Research Methodology*.