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A WEBINAR PRESENTED BY  
**THE WATERLOO INSTITUTE  
FOR SUSTAINABLE ENERGY**

**Wednesday Dec 16, 2020  
2:30 pm – 3:30 pm**

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## **OPTIMIZING EV OPERATIONS UNDER TIME-VARIANT ELECTRICITY PRICES FOR LAST- MILE DELIVERY**

**Dr. Bissan Ghaddar**, Associate Professor of Management Science, Ivey Business School. Assistant Professor in Data Analytics & Operations Research, Department of Management Sciences, University of Waterloo

The integration of electric vehicles (EVs) with the energy grid has become an important area of research due to the increasing EV penetration in today's transportation systems. Under appropriate management of EV charging and discharging, the grid can currently satisfy the energy requirements of a considerable number of EVs. Furthermore, EVs can help enhance the reliability and stability of the energy grid through ancillary services such as energy storage. In this talk, we present the EV routing problem with time windows under time-variant electricity prices which optimizes the routing of a fleet of electric vehicles that are delivering products to customers, jointly with the scheduling of the charging and discharging of the vehicles from/to the grid. The proposed model is evaluated on the case study of a grocery delivery service at the region of Kitchener-Waterloo in Ontario, Canada. Insights on the impacts of energy pricing, service time slots, as well as fleet size are presented.

### **Biography**



Dr. Bissan Ghaddar is an Associate Professor of Management Science at the Ivey Business School working on problems at the intersection of smart cities, IoT, and optimization models. Prior to joining Ivey Business School, she was an Assistant Professor in Data Analytics at the Department of Management Sciences at the University of Waterloo. She has also worked on energy, water, and transportation network optimization at IBM Research and on inventory management problems at the Centre for Operational Research and Analysis, Department of National Defence Canada. She was invited for extended research visits at the Universität zu Köln in Germany and the University of Avignon in France. Dr. Ghaddar received a Ph.D. degree in operations research from the University of Waterloo, Canada. Her work has been published in prestigious journals such as Mathematical Programming, SIAM Journal on Optimization, Transportation Research, among others. Her research has been supported by national and international scholarships including NSERC, Cisco, H2020, and FP7 IIF European Union Grant.

**ALL ARE WELCOME!**

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