SMU Lyle School of Engineering

Operations Research and Engineering Management
Seminar Series

Research Seminar

Data-Driven Inverse Optimization through the Lens of Machine Learning

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Friday, February 9th
11:00am - 12:15pm
Caruth 384

Abstract
Inverse optimization has received increasing attention as a tool to infer an optimization model using past decision data. This talk will discuss our recent research on data-driven inverse optimization via its integration with recent advances in machine learning. Despite the growing interest, model inference based on inverse optimization can still be highly sensitive to noise, errors, and uncertainty in the input data, limiting its applicability in data-driven settings. We introduce the notion of stability in inverse optimization and propose a novel method that integrates inverse optimization and robust regression to enable a stable model inference under data imperfection. We formulate the new inverse model as a large-scale mixed-integer program and develop efficient solution algorithms by exploiting its connection to classical bi-clique problems. The proposed method will be demonstrated through the diet recommendation application. In the latter part of the talk, we will discuss other recent work motivated by the connection between inverse optimization and machine learning, including how to select a parsimonious set of objectives for a multi-objective optimization problem. We apply this novel

objective selection method to cancer therapy planning to infer planning objectives that are simple yet clinically effective using historical cancer treatment data.

Biography: Dr. Taewoo Lee is an assistant professor of Industrial Engineering at the University of Pittsburgh. Dr. Lee's research interests include data-driven optimization and machine learning with particular emphasis on theory and applications of inverse optimization, as well as applications of operations research in medical decision making and healthcare operations such as cancer treatment planning, organ transplantation, and diabetic eye disease management. His research has been supported by the National Science Foundation and Department of Health and Human Services. He received his PhD in industrial engineering from the University of Toronto in 2015.