Inverse Multiobjective Optimization: Models, Insights and Algorithms

It is always interesting to decode human's behavior and to understand their intentions and reasoning. Inverse optimization is one such technology that utilizes observed human's decisions to infer their underlying decision making scheme. The majority of existing studies assumes that the decision making problem is with a single objective function, which could lead to a corrupted inference when decisions are tradeoffs among multiple criteria. In this talk, we take a data-driven approach and design a more sophisticated inverse optimization formulation to explicitly infer parameters of a multiobjective decision making problem. This framework, together with our mathematical analyses and classical learning algorithms-based solution procedures, demonstrates a strong capacity in estimating critical parameters, decoupling "interpretable" components from noises or errors, deriving the denoised optimal decisions, and ensuring statistical significance. In particular, for the whole decision maker population, if suitable conditions hold, we will be able to understand the overall diversity and the distribution of their preferences over multiple criteria, which is important when a precise inference on every single decision maker is practically unnecessary or infeasible. Extensions to online learning that deal with sequentially arrived data will also be discussed. Numerical results, including a real financial application, will be reported to confirm the effectiveness of our unique inverse optimization model and the computational efficacy of the developed algorithms.

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Faculty host: Xiaoning Qian, ECEN

Biography

Dr. Bo Zeng received his Ph.D. degree from the School of Industrial Engineering at Purdue University, West Lafayette, IN, USA, with an emphasis on operations research. He is currently an Associate Professor at the Department of Industrial Engineering and the Department of Electrical and Computer Engineering, University of Pittsburgh, Pittsburgh, PA, USA. Dr. Zeng's research interests are in the theories and methodologies of optimization and learning, and their applications in energy, logistics, healthcare and other cyber-physical systems. He is a member of IEEE, IISE and INFORMS.

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