

Danial Davarnia

Assistant Professor, Industrial and Manufacturing Systems Engineering, Iowa State University

Time and location: 11am-12pm on Friday, March 25, 2022 in PBB S401.

Title: **Solving mixed integer programs via decision diagrams.**

Abstract:

Despite successful performance of decision diagrams (DDs) in solving various discrete optimization problems, their extension to model mixed integer programs (MIPs) has been lacking. In this work, we address this gap by introducing a geometric decomposition framework based on rectangular formations that provides both necessary and sufficient conditions for a general MIP to be representable by DDs. As a special case, we show that any bounded mixed integer linear program admits a DD representation through a specialized Benders decomposition technique. As an application for this framework, we develop a novel solution methodology for the unit commitment problem (UCP) in the wholesale electricity market. Computational experiments conducted on a stochastic variant of the UCP show a significant improvement of the solution time for the proposed method when compared to the outcome of modern solvers.

Bio:

Danial Davarnia is an Assistant Professor in the Industrial and Manufacturing Systems Engineering Department at Iowa State University. Prior to this position, he was a postdoctoral fellow in the Tepper School of Business at Carnegie Mellon University. He earned his PhD in Industrial Engineering from University of Florida. His research interests include developing solution methodology for mixed integer nonlinear programs, statistical estimation techniques in stochastic optimization, and interconnections between constraint programming and integer programming, with applications in energy, finance, transportation, and network interdiction. He is the recipient of the Harvey J. Greenberg research award from INFORMS Computing Society, and has published in several journals, including SIAM Journal on Optimization, Mathematical Programming, and Operations Research.