Abstract
As an alternative to traditional integer programming (IP), decision diagrams (DDs) provide a new solution technology based on the combinatorial structure of discrete problems using basics of dynamic programming. While the literature mainly focuses on the competitive aspects of DDs as a stand-alone solver, we study IP techniques that can be derived from DDs and used in conjunction with IP to enhance its performance. We develop linear programming and subgradient-type methods to generate valid inequalities for the convex hull of the feasible region described by DDs. For convex IPs, these cutting planes dominate the so-called linearized cuts used in the outer approximation schemes. These cutting planes can also be derived for nonconvex IPs, which allows for an adaptation of the outer approximation framework. Computational experiments show significant gap improvement upon the traditional cutting plane methods employed in the state-of-the-art solvers.

About the Speaker
Danial Davarnia is an Assistant Professor in the IMSE Department at Iowa State University. Prior to this position, he was a post-doctoral fellow of Operations Research in Tepper School of Business at Carnegie Mellon University. He received his Ph.D. from University of Florida in Industrial and Systems Engineering. He obtained his M.Sc. and B.Sc. in Industrial Engineering, both from Sharif University of Technology, Iran. His research interests lie in deterministic and stochastic optimization, with applications in transportation and network interdiction. In particular, he develops solution methods and convex relaxations for mixed integer nonlinear programs. He investigates interconnections between logical inference and integer programming. He also studies parameter estimation techniques and statistical analysis of risk in stochastic optimization.