Professor Rahul Mazumder
MIT Sloan School of Management

Time and location: 10:00-11:00 am on Friday, April 8th, 2022 in S121 PBB

Title: Sparse Learning at Scale: Convex, Mixed Integer Programming, and Statistical Perspectives

Abstract: Many fundamental high-dimensional statistics estimators, such as best-subset selection (BSS), can be naturally expressed as discrete optimization problems. Recently, mixed integer programming (MIP) methods have been shown to be promising candidates for formulating and solving, small/moderate instances of these problems. This sheds interesting insights into some less-understood statistical aspects of BSS, suggesting the need to design new estimators. On the computational front, current high-performance commercial integer programming solvers are somewhat black-box and can be challenging to scale to large instances. I will discuss our recent work on tailored branch-and-bound methods to solve, to optimality, a family of regularized BSS problems with up to a million features. For the first time, we employ first-order convex optimization methods within a branch-and-bound framework to solve instances of regularized BSS that show speedups of over 5000X over commercial solvers. If time permits, I will discuss some ongoing work where statistical modeling considerations can lead to the design of computationally attractive MIP formulations in the context of the well-known sparse PCA problem. [This represents joint work with: Hussein Hazimeh, Ali Saab, Antoine Dedieu, Peter Radchenko and Kayhan Behdin]

Biography: Rahul Mazumder is the Robert G James Career Development Associate Professor in the OR and Statistics group at MIT Sloan School of Management. He is affiliated with MIT Operations Research Center, MIT Center for Statistics, and MIT IBM Watson AI Lab. His research interests are at the intersection of statistics and mathematical programming (convex and mixed integer optimization), and their applications to industry, the government, and the sciences. He is a recipient of the INFORMS Donald P. Gaver, Jr. Early Career Award for Excellence in Operations Research (2021), INFORMS Optimization Society Young Researchers Prize (2020), Office of Naval Research Young Investigator Award (2018). He is currently serving as an Associate Editor of the Annals of Statistics and Bernoulli, and an Editorial Board Member of JMLR.