

Industrial & Systems Engineering Seminar

Cost-effectiveness Analysis of Colorectal Cancer Screening Under Data Uncertainty

Wednesday, September 28

3:15 PM - Refreshments, 3:30 - Graduate Seminar

Mechanical Engineering Room 4125 A & B



Professor Joel Goh

Assistant Professor

Harvard Business School

Cost-effectiveness studies of medical innovations often suffer from data inadequacy. When Markov chains are used as a modeling framework for such studies, this data inadequacy can manifest itself as imprecision in the elements of the transition matrix. In this paper, we study how to compute maximal and minimal values for the discounted value of the chain (with respect to a vector of state-wise costs or rewards) as these uncertain transition parameters jointly vary within a given uncertainty set. We show that these problems are computationally tractable if the uncertainty set has a row-wise structure. Conversely, we prove that the row-wise structure is necessary for tractability. Without it, the problems become computationally intractable (NP-hard). We apply our model to assess the cost-effectiveness of fecal immunochemical testing (FIT), a new screening method for colorectal cancer. Our results show that despite the large uncertainty in FIT's performance, it is cost-effective relative to the prevailing screening method of colonoscopy.

BIO:

Joel is an assistant professor in the Technology & Operations Management Unit at Harvard Business School. His research interests are in developing mathematical models to provide insights into medical decision-making and recommendations for health policy. Specifically, he is interested in issues of drug safety, workplace stress, healthcare delivery operations, and cost-effectiveness of new medical technology. He also has interest in robust optimization and supply chain management. Professor Goh is the co-creator of ROME (Robust Optimization Made Easy), a freely distributed software package for modeling robust optimization problems.