A Process Systems Engineering Perspective on Adjustable Robust Optimization

Wednesday, March 27
3:15 PM – Refreshments, 3:30 – Graduate Seminar
Lind Hall 305

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Process systems engineering (PSE) is a subfield of chemical engineering that aims to improve systematic decision making in the design and operation of chemical processes. Optimization plays an integral role in PSE research; hence, there has always been a strong connection between PSE and operations research (OR). In the area of optimization under uncertainty, the PSE community has worked on what is referred to as flexibility analysis since the 1970s, which closely resembles what is now widely known as robust optimization. However, surprisingly, flexibility analysis has not received any attention in the OR community. In the first part of this talk, we establish the relationship between flexibility analysis and two-stage adjustable robust optimization (ARO). We further apply ARO methods to develop more efficient solution approaches to flexibility analysis problems for linear systems. In the second part, we present an application of multistage ARO using affine decision rules. Here, we consider the scheduling of power-intensive processes that can provide interruptible load, which refers to backup load reduction capacity that can be sold to provide additional revenue. However, providing interruptible load introduces uncertainty into the system as one does not know in advance when and how much load reduction will be requested.

BIO:
Qi Zhang is an Assistant Professor in the Department of Chemical Engineering and Materials Science at the University of Minnesota. He received his Ph.D. in Chemical Engineering from Carnegie Mellon University, and worked at BASF in Germany and Houston prior to joining the University of Minnesota. His research lies at the intersection of chemical engineering and operations research, primarily focused on developing optimization models and methods for the design of energy and process systems, production planning and scheduling, and supply chain optimization.