Keynote Session (Fri - 11:00-12:00)

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Abstract

While planning service networks to serve spatially distributed customers, we consider the case where facilities are subject to probabilistic failure (due to reasons such as adverse weather or disasters). If a facility fails, its customers either lose service and incur a high penalty, or have to seek farther facilities and bear excessive service costs. We mainly focus on planning optimal facility locations as well as customer assignment strategies for a supply chain, so as to minimize the expected system costs under normal and failure scenarios. We start with the basic case where site-specific and independent facility disruptions occur in the traditional facility location problem context. Then we show extensions where inbound and outbound deliveries are conducted via vehicle routing, and where facility disruptions exhibit positive and/or negative spatial correlations (e.g. when interdependent facilities are exposed to similar hazards or the risks of cascading failures). We will briefly show how to develop compact mixed-integer program models that can be solved by customized algorithms such as Lagrangian relaxation. We will also present a series of continuum approximation models that not only serve as very efficient heuristic method to find near-optimum solutions for large-scale systems, but also help provide useful managerial insights (e.g., solution robustness to input data errors, and effects of system heterogeneity).