Conditional Value-at-Risk Based Approaches to Network Flow, Connectivity and Design Problems Under Uncertainty

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Abstract

This poster provides an overview of the goals and recent results of the current project on *robust flow, connectivity and design problems in networks under uncertainty using mathematical programming approaches*. More specifically, the project deals with uncertainties in the form of probabilistic node or arc failures in the networks, with robustness achieved via appropriate quantification of resulting losses and risk via incorporating the Conditional-Value-at-Risk (CVaR) measure into the considered mathematical programming models. The considered robust network flow problems include classical minimum cost flow and fixed-charge flow problems in networks subject to uncertain arc failures. Recent results include multiple CVaR-constrained models for robust shortest paths under uncertainty and adapting a computationally efficient heuristic algorithm to the case of fixed-charge network flow problems with CVaR constraints, which allows finding near-optimal solutions for large-scale network instances. Models and algorithms for survivable network design using k-cores (to design a network with specified connectivity and low diameter) that is also robust with respect to arc failures have been developed.