A Two-stage Stochastic Programming Model for Transportation Network Protection

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Abstract: This talk discusses some modeling and solution methods for the problem of pre-disaster transportation network protection against uncertain future disasters. Given limited resources, the goal of the central planner is to choose the best set of network components to protect while allowing the network users to follow their own best perceived routes in any resultant network configuration. This problem is formulated as a two-stage stochastic program with equilibrium constraints, where the objective is to minimize the total expected physical and social loss caused by potential disasters. Developing efficient solution methods for such a problem can be challenging due to the large size and nonconvexity of the problem. We will demonstrate the applicability of progressive hedging-based method for solving large scale stochastic network problems. The methodologies discussed here may be relevant to other types of networks such as information, energy, and social networks as well.