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Network Resilience and Vulnerability: Protecting the Critical Infrastructure

We will study the critical topics of network resilience and vulnerability, focusing on the mathematical modeling and optimization of network interdiction and fortification problems. Attendees will be introduced to Mixed-Integer Programming (MIP) formulations that capture the trade-offs involved in disrupting or protecting network infrastructures under budget constraints. We will examine both attacker-defender (bilevel) and defender-attacker-defender (trilevel) games. We will see how to reformulate them into single-level problems, while focusing on applications arising in transportation, communication or utility networks. We will discuss decomposition methods, cutting planes, and heuristic strategies, aimed at solving large-scale instances efficiently.