Modeling Policy Decisions in Energy and Transportation Networks Using Multiobjective Programs with Equilibrium Constraints

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Policy is inherently multiobjective and multilevel, in that a set of desired choices often conflict and are made at a higher level than the actors influenced by the choices. For example, when building a new pipeline in a natural gas network, profitable placement often conflicts with safety issues, and the choice between these two often falls in the hands of policy makers and not the natural gas producer, pipeline operator, or consumer. A similar issue also shows up in placement of bicycle lanes within a congested traffic network in urban centers.

Multiobjective optimization problems allow the study of tradeoff between such choices, while equilibrium problems model the networks over which these policies are chosen. Combining these two types of optimization problems produces a formulation called a Multiobjective Program with Equilibrium Constraints (MOPEC). This presentation will introduce MOPECs and look at initial thoughts on algorithms and their solutions.

While algorithms for MOPECs exist, they are not computationally efficient for large data, which is ever present in health, energy, and transportation networks. This presentation will move this research forward, by introducing an algorithm for MOPECs and applying it to simple examples in energy and transportation. Future work also includes applying MOPECs to healthcare settings.

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