

## Optimization Research in Integrated Systems Engineering

Optimization is a scientific approach to decision-making that seeks to best design and operate a complex system under conditions requiring the allocation of scarce resources. It utilizes mathematical models that are abstract representations of the actual system. Due to its versatility and wide ranging impact, optimization is employed in a diverse array of problems in industry and government, from power systems to cloud computing, from homeland security to disaster relief.

In the increasingly complex and interconnected world, the need to develop and solve sophisticated optimization models and methods is more than ever. The emerging science and engineering systems are invariably large-scale, and they often involve nonlinear dynamics and discrete choices that make the solution space hard to explore without advanced techniques. The decision-making process is further complicated by the inherent uncertainty in problem parameters.

Our research in optimization involves developing theory and methodologies for

- Linear/network/nonlinear optimization, complementarity
- Mixed-integer programming
- Large-scale optimization
- Optimization under uncertainty (Stochastic programming, Robust optimization, Data-driven optimization, and Simulation optimization)

In addition, we are interested in applications of these methods to a variety of problem domains.

