Optimization Theory and Applications

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Keywords:
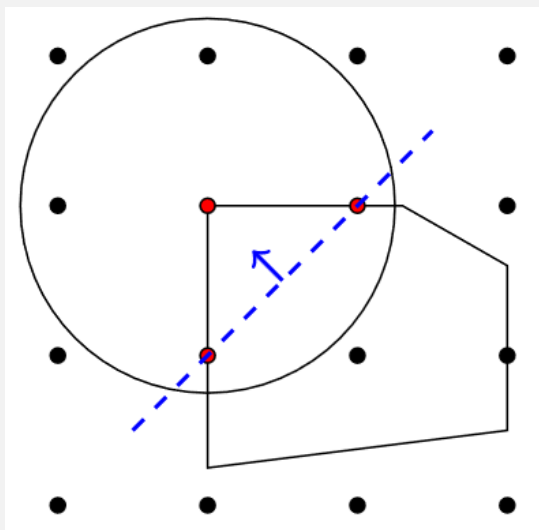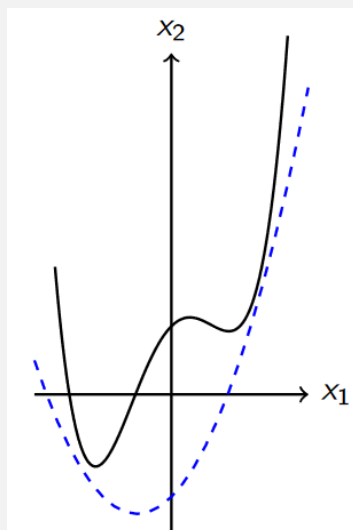global optimization, mixed-integer nonlinear programming, conic programming, optimization under uncertainty, engineering optimization

FACULTY OF ENGINEERING AND NATURAL SCIENCES

Global Optimization in Engineering Applications

Application of **mixed-integer nonlinear programming**, **conic programming**, **convexification**, **cutting plane generation** techniques to the following engineering problems:

- **Power Systems** (Unit Commitment, Optimal Power Flow, Optimal Transmission Switching)
- **Chemical Engineering** (Pooling, Gas/Water Networks)
- **Material Science** (Thin Films)
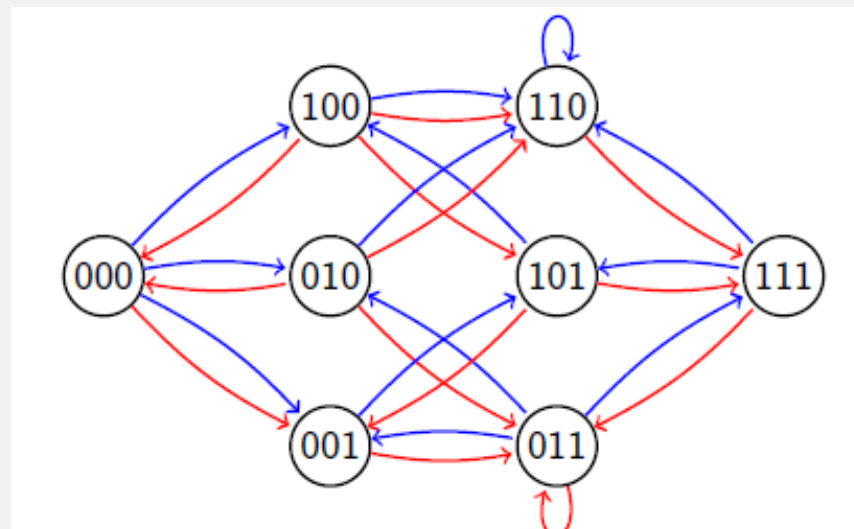- **Geometry Optimization** (Circle Packing)
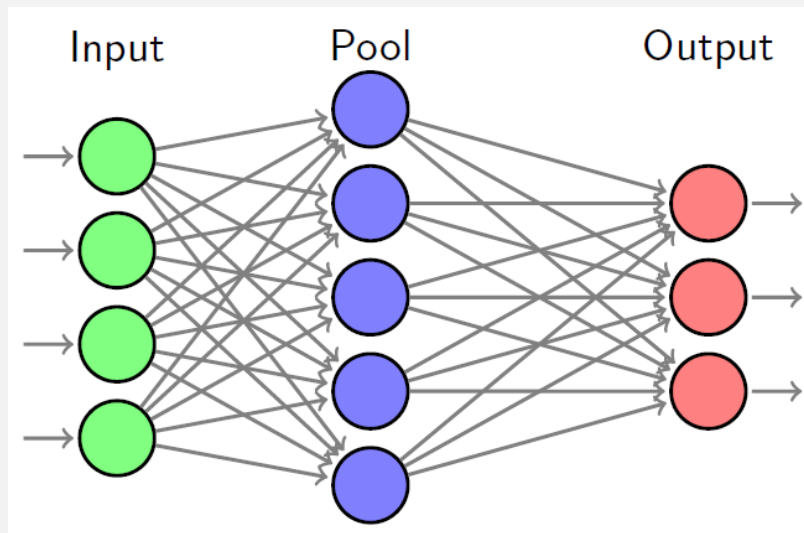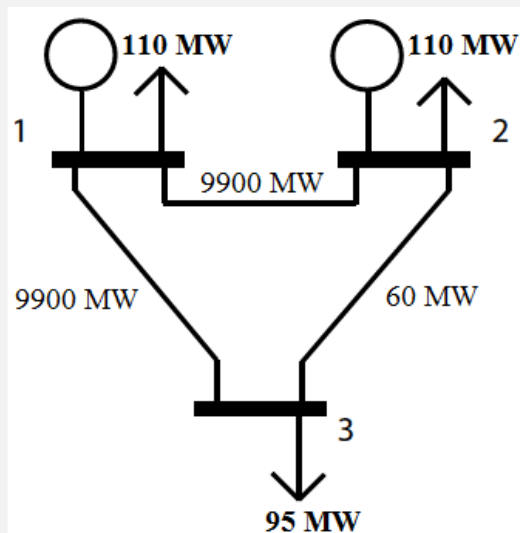
Theory of Mixed-Integer Conic Programming
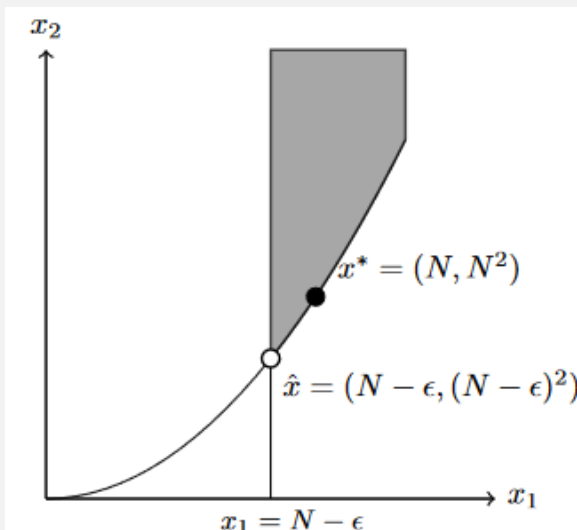
Exploration of the following for **mixed-integer conic programming**:

- **Subadditive duality**
- **Proximity analysis**
- **Approximation of nonconvex/convex/conic sets**
- **Structure-aware conic relaxations**

Optimization under Uncertainty

Application of **stochastic programming**, **robust optimization, distributionally robust optimization** techniques to the following areas:

- **Biology** (Antibiotics Resistance, Experimental Design)
- **Energy Systems** (Clean Energy Transition Planning, Maintenance Planning)
- **Financial Engineering** (Portfolio Optimization)