

CO 769 Syllabus (Winter 2023)

Convex Relaxations of Numerically Hard Problems; Efficient Numerical Solutions

The course will be self-contained. The required theory will generally be covered when it arises. We will cover (time permitting) elements from the following:

short syllabus

1. Motivation
 1. Role of cone optimization (LP/SDP/DNN) in solving hard numerical problems.
 2. Examples of hard problems in discrete, combinatorial, engineering optimization.
2. Background
 1. convex analysis
 2. semidefinite programming, SDP
 3. numerical linear algebra
 4. linear and nonlinear programming optimality conditions
3. Interior point methods, implementations, applications
 1. facial reduction and robustness
 2. sparsity, chordal completions
4. First order methods, splitting methods
 1. projections, fractional objectives
5. Applications and Implementations
 1. low rank matrix completions, Euclidean distance matrix completion
 2. clustering, graph partitioning, quadratic assignment, max-cut, quadratic knapsack,
 3. molecular conformation, protein folding,

Henry Wolkowicz, Department of Combinatorics and Optimization, University of Waterloo, 200 University Ave. W., Waterloo, ON N2L 3G1.

(C) Copyright Henry Wolkowicz, 2022. Last update: 11/29/2022 08:38:04, by Henry Wolkowicz