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ONE WORLD OPTIMIZATION SEMINAR

May 24th 2021 @ 15:30 CEST (Central European Summer Time)

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Regularized Smoothing for Solution Mappings of Convex Problems, with Applications to Two-Stage Stochastic Programming and Some Hierarchical Problems

Abstract. Many modern optimization problems involve in the objective function solution mappings or optimal-value functions of other optimization problems. In most/many cases, those solution mappings and optimal-value functions are nonsmooth, and the optimal-value function is also possibly nonconvex (even if the defining data is smooth and convex). Moreover, stemming from solving optimization problems, those solution mappings and value-functions are usually not known explicitly, via any closed formulas. Hence, there is no formula to differentiate (even in the sense of generalized derivatives). This presents an obvious challenge for solving the "upper" optimization problem, as derivatives therein cannot be computed.

We present an approach to regularize and approximate solution mappings of fully parametrized convex optimization problems that combines interior penalty (log-barrier) with Tikhonov regularization. Because the regularized solution mappings are single-valued and smooth under reasonable conditions, they can also be used to build a computationally practical smoothing for the associated optimal-value function.

One motivating application of interest is two-stage (possibly nonconvex) stochastic programming. In addition to theoretical properties, numerical experiments are presented, comparing the approach with the bundle method for nonsmooth optimization. Another application is a certain class of hierarchical decision problems that can be viewed as single-leader multi-follower games. The objective function of the leader involves the decisions of the followers (agents), which are taken independently by solving their own convex optimization problems. We show how our approach is applicable to derive both agent-wise and scenario-wise decomposition algorithms for this kind of problems. Numerical experiments and some comparisons with the complementarity solver PATH are shown for the two-stage stochastic Walrasian equilibrium problem.

The link of the zoom-room of the meeting and the corresponding password will be announced the day before the talk on the mailing list of the seminar, to which one can subscribe on https://owos.univie.ac.at.