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FAKULTÄT FÜR MATHEMATIK
Dekan Univ.–Prof. Dr. Harald Rindler

Einladung zur öffentlichen Defensio von

Masoud Ahookhosh, MSc

Thema der Dissertation:

**High-dimensional nonsmooth convex optimization via
optimal subgradient methods**

Abstract:

In this thesis, motivated by the need for fast and reliable methods to solve general non-smooth convex optimization, we develop some subgradient methods obtaining the optimal complexity of first-order methods that are known to be fast enough to deal with applications involving high-dimensional or big data. More specifically, the novel subgradient framework (OSGA) depends on solving efficiently a related nonconvex subproblem. We show that this subproblem can be solved efficiently for unconstrained (multi-term affine composite functions and objective involving costly linear operators), simply constrained (bound-constrained and simple domains with available projection), and simply functional constrained (sublevel set of simple convex function) problems. In addition, if the non-smoothness of the objective is manifested in an appropriately structured form, a novel optimal subgradient method is presented that can attain the complexity $O(\varepsilon^{-1/2})$, the same optimal complexity as for smooth problems with Lipschitz continuous gradients. OSGA is released as a software package available freely for academic use. Numerical results and comparisons with state-of-the-art schemes regarding a number of interesting problems in application are reported.

Prüfungssenat:

Univ.-Prof. Dr. Josef Hofbauer (Vorsitz)
(Universität Wien)

Prof. Dr. Yurii Nesterov
(Universit catholique de Louvain)

Assoz. Prof. Privatdoz. Radu Ioan Bot
(Universität Wien)

o. Univ.-Prof. Dr.hc. Arnold Neumaier
(Universität Wien)

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