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A descent method for nonsmooth multiobjective optimization problems in Hilbert spaces

Thursday, August 15, 2024 11:00 AM (30 minutes)

This talk is dedicated to a common descent method designed for nonsmooth multiobjective optimization problems (MOPs) with objective functions defined on a general Hilbert space that are locally Lipschitz continuous. The only strategy to handle nonsmooth MOPs in infinite dimensions besides the presented method relies on scalarization techniques, which are not suitable for MOPs with nonconvex objective functions or for MOPs with more than two objective functions. The class of nonsmooth MOPs on infinite dimensional Hilbert spaces is particularly important since it allows the formulation of PDE-constrained MOPs.
For the analysis of the presented method, we first introduce optimality conditions suitable for nonsmooth MOPs. We generalize the so-called Goldstein epsilon-subdifferential to the multiobjective setting in Hilbert spaces and describe its main properties.
Then, we introduce the mentioned descent method. The method uses an approximation of the epsilon-Goldstein subdifferential to compute a common descent direction that provides sufficient descent for all objective functions. In the main result, we show that, under reasonable assumptions, the method produces sequences that possess Pareto critical accumulation points.
Finally, we present the behaviour of the common descent method for a (PDE-constrained) multiobjective obstacle problem in one and two spatial dimensions. We show that the method is capable of producing several different optimal solutions and discuss the behaviour of the approximated subdifferential.

Author: Mr SONNTAG, Konstantin (Universität Paderborn)

Co-authors: Dr GEBKEN, Bennet (Universität Paderborn); Dr MÜLLER, Georg (Universität Heidelberg); Prof. PEITZ, Sebastian (Universität Paderborn); Prof. VOLKWEIN, Stefan (Universität Konstanz)

Presenter: Mr SONNTAG, Konstantin (Universität Paderborn)

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