



Einladung zur öffentlichen Defensio von  
**Dang-Khoa NGUYEN**

Thema der Dissertation

**Numerical algorithms for structured nonsmooth and nonconvex optimization problems**

**Abstract:** A large number of applications in real-world can be formulated and designed as optimization problems. These models are usually large-scale, complexly structured, and exhibit features like nonsmoothness and nonconvexity, which require specific solution methods when addressing them. Such numerical algorithms are preferable first-order methods, due to their simplicity and low iteration and memory storage costs, but also to be formulated in a full splitting spirit, meaning that every element involved in the formulation of the underlying optimization problem is evaluated separately and in an efficient way.

The main purpose of this thesis is to formulate and investigate the convergence properties of full splitting algorithms for different nonsmooth optimization problems, ranging from bilevel convex to structured nonconvex. We focus in particular on the study of the convergence behavior of the developed algorithms and, in some situations, on their rate of convergence.

In the preliminaries, we introduce basic notions and results of convex analysis, maximal monotone operators, variational and nonsmooth analysis, which are of relevance for the thesis. Further, we propose a forward-backward splitting algorithm of penalty type with inertial effects for a complexly structured monotone inclusion problem, which provides a general setting for solving convex bilevel minimization problems. The last three chapters of the thesis are dedicated to the design and analysis of algorithms for nonsmooth and nonconvex optimization problems. They share the feature that, along with the subsequence convergence analysis, the global convergence and converge rates are discussed in the setting of the Kurdyka-Lojasiewicz property. In this context, we first propose a projected gradient algorithm for the factorization of a completely positive matrix with parameters that take into account the effects of relaxation and inertia. Then we consider the proximal and the proximal linearized alternating direction method of multipliers for a nonsmooth and nonconvex optimization problem involving compositions with linear operators. Finally, we develop a proximal approach for nonsmooth problems with block structure coupled by a smooth function.

**Prüfungssenat:**

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**Zeit:** Donnerstag, 22. April 2021, 09:00 Uhr

**Ort:**

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