Minisymposium 25 - Inverse Probleme und Inkorrektheits-Phänomene

Convergence rate analysis of regularized Newton methods with random noise

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We consider the problem to estimate a quantity a in a separable Hilbert space given measurements of a function u related to a by $F(a) = u$ with a nonlinear operator F. The measurements are perturbed by random noise. In typical applications a is an unknown coefficient in a partial differential equation, and u is (part of) the solution to the differential equation.
We show that for regularized Newton methods the same rates of convergence can be achieved as for the underlying linear regularization method if the smoothness of the solution is known. For unknown smoothness we show that Lepskij's method yields a rate of convergence which differs from the optimal rate only by a logarithmic factor. The theoretical results are illustrated by numerical experiments.