Newton Methods for Nonlinear Inverse Problems with Random Noise

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joint work with Frank Bauer and Axel Munk

We study the convergence of regularized Newton methods applied to nonlinear operator equations in Hilbert spaces if the data are perturbed by random noise. We show that under certain conditions it is possible to achieve the minimax rates of the corresponding linearized problem if the smoothness of the solution is known. If the smoothness is unknown and the stopping index is determined by Lepskiĭ's balancing principle, we show that the rates remain the same up to a logarithmic factor due to adaptation. The performance and the statistical properties of the proposed method are illustrated by Monte-Carlo simulations.