HEURISTIC PARAMETER CHOICE RULES IN INVERSE PROBLEMS

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The choice of the regularization parameter is one of the most important part when computing a regularization for ill-posed problems. It strongly determines the quality of the reconstructed approximate solution and optimal convergence is only obtained by an appropriate selection of the regularization parameter.

One can distinguish between different types of parameter choice rules, namely those that use additional information on the exact solution or the noiselevel and those that only require the given data. The latter ones are called *heuristic* (or data-driven, noiselevel-free) parameter choice rules. Although they are the most practical ones from an application point of view, by a well-known result of Bakushinskii such methods cannot converge in the worst case. Nevertheless, a recent fruitful convergence theory for certain heuristic methods has been established by postulating additional properties of the noise in form of noise condition. In many situations, such noise conditions are satisfied both for random and also deterministic noise, such that the theory covers both deterministic and stochastic inverse problems.

In this talk we would like to give an overview on these rules and the philosophy behind and discuss the main convergence results for the most useful minimization-based heuristic rules, such as the heuristic discrepancy, the Hanke-Raus, and the quasioptimality rules for linear regularization theory. We end with an outlook on the extension of these results to convex Tikhonov regularization.