EFFICIENT MINIMIZATION OF TIKHONOV FUNCTIONALS WITH A SPARSITY CONSTRAINT

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In this talk we consider the stable solution of linear inverse problems $Ax = y$ from noisy measurements y^δ with $\|y - y^\delta\| \leq \delta$. A standard solution approach is Tikhonov regularization, where a solution is computed as the minimizer of the functional

$$J_\alpha(x) = \|y^\delta - Ax\|^2 + \alpha\Omega(x),$$

where $\Omega(x)$ denotes a suitable penalty term. We specifically consider *sparsity penalties* $\Omega(x) = \|x\|_{\ell_p}^p$. The Tikhonov functional is usually minimized iteratively, but in particular if $p < 2$, then the methods converge slowly. In our approach, the Tikonov functional is transformed to a quadratic functional that allows the use of fast minimization techniques. The numerical performance of the method is validated for examples from Tomography as well as from Single Molecule Microscopy.