Optimization in inverse problems via inertial iterative regularization

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In the context of linear inverse problems, we propose and study a general iterative regularization method allowing to consider large classes of regularizers and data-fit terms. We are particularly motivated by dealing with non-smooth data-fit terms, such like a Kullback-Liebler divergence, or an L1 distance.

We treat these problems by studying both a continuous (ODE) and discrete (algorithm) dynamics, based on a primal-dual diagonal inertial method, designed to solve efficiently hierarchical optimization problems. The key point of our approach is that, in presence of noise, the number of iterations of our algorithm acts as a regularization parameter. In practice this means that the algorithm must be stopped after a certain number of iterations. This is what is called regularization by early stopping, an approach which gained in popularity in statistical learning.

Our main results establishes convergence and optimal stability of our algorithm, in the sense that for additive data-fit terms we achieve the same rates than the Tikhonov regularisation method for linear problems.

Références

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