Multi-parameter Tikhonov regularization with the ℓ^0 sparsity constraint: ℓ^1 convergence

Shuai Lu
School of Mathematical Sciences, Fudan University, Shanghai China
Email: slu@fudan.eud.cn

IPTA 2014 - Bristol

Abstract

We establish ℓ^1 error estimates for the infinite-dimensional multi-parameter Tikhonov regularization with ℓ^2 and ℓ^0 penalty terms. Lacking of interpolation inequalities within different sequences spaces (i.e. ℓ^2, ℓ^0 and ℓ^1), one cannot directly obtain ℓ^1 error estimates for the proposed multi-parameter Tikhonov functional where no ℓ^1 information appears in the functional form. By building up the variational inequality in ℓ^1 norm, we derive that both *a priori* and *a posteriori* parameter choice rules provide ℓ^1 error estimates of optimal order under appropriate source conditions, and the corresponding constants can be verified in an explicit manner. In the latter case, we have implemented the classic and sequential discrepancy principles respectively. Finally an adopted prime-dual algorithm illustrates the sparsity promoting properties of the considered multi-parameter Tikhonov regularization. It is a jointed work with Wei Wang (Jiaxing University, China), Bernd Hofmann (TU Chemnitz, Germany) and Jin Cheng (Fudan University, China).