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Structured sparsity in inverse problems and support recovery with mirror-stratifiable functions

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Résumé. We consider inverse problems in separable Hilbert spaces where the prior on the data is an assumption of structured sparsity. We look at a class of regularizers for which minimization algorithms identify in finite time the extended support of the original data. This is a direct consequence of a more general identification theorem, involving the mirror stratifiability of the regularizer, a notion developped in [1], and based on duality arguments. As a by-product, we derive improved rates of convergence for the minimization algorithms, like a new linear rate result for the soft-thresholding algorithm in $\ell^2(\mathbb{N})$ with no assumptions.

We then provide necessary and sufficient conditions for norm regularizers to be mirror stratifiable, and show its tight relationship with the geometry of the corresponding unit ball. We apply this characterization result to show that norm regularizers inducing group sparsity with overlap are not mirror-stratifiable. We then discuss how to adapt the notion of mirror-stratifiability to treat these regularizers.

Mots-clefs : Sparse inverse problems, support recovery, group sparsity, optimization algorithms

Références

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[3] G. Garrigos, L. Rosasco and S. Villa. *Characterization of mirror-stratifiability for sparsity inducing norms*. Work in progress.