Structure-adaptive signal denoising
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We consider the problem of recovering a signal observed in Gaussian noise. If the set of signals is convex, compact, and known beforehand, one can use classical linear estimators that achieve a risk within a constant factor of the minimax risk. However, when the set is unspecified, designing an estimator which is adaptive to the hidden structure of the signal remains a challenging problem. We propose a new family of such adaptive estimators. Instead of specifying the set where the signal lives, we simply assume the existence of a well-performing linear estimator – a linear oracle. Proposed estimators manage to adapt to the unknown structure of the signal, performing essentially as good as the oracle. Moreover, they can be efficiently computed through first-order convex optimization methods. Finally, we present several numerical illustrations that show the potential of the approach.