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Optimal Estimation for Signal Priors

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We consider the problem of estimating signal priors, which are used in the ℓ_1 -regularization and the resulting inverse problem has a stabilized solution. From a Bayesian viewpoint, we first define a multivariate ℓ_1 -Laplace density function and then solve a maximum likelihood problem with an added ℓ_1 -norm penalty term. The problem as formulated is convex but the memory requirements and the nonlinear non-smooth sub-gradient equations are prohibitive for large-scale problems. We develop an iterative algorithm to efficiently solve such large problems and demonstrate the selected priors generally behave better than those commonly used ones in the signal processing.