Mathematics > Statistics Theory

Blockwise SVD with error in the operator and application to blind deconvolution

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We consider linear inverse problems in a nonparametric statistical framework. Both the signal and the operator are unknown and subject to error measurements. We establish minimax rates of convergence under squared error loss when the operator admits a blockwise singular value decomposition (blockwise SVD) and the smoothness of the signal is measured in a Sobolev sense. We construct a nonlinear procedure adapting simultaneously to the unknown smoothness of both the signal and the operator and achieving the optimal rate of convergence to within logarithmic terms. When the noise level in the operator is dominant, by taking full advantage of the blockwise SVD property, we demonstrate that the block SVD procedure overperforms classical methods based on Galerkin projection or nonlinear wavelet thresholding. We subsequently apply our abstract framework to the specific case of blind deconvolution on the torus and on the sphere.

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