



# Practical Tikhonov Regularized Estimators in Reproducing Kernel Hilbert Spaces for Statistical Inverse Problems

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Regularized kernel methods such as support vector machines (SVM) and support vector regression (SVR) constitute a broad and flexible class of methods which are theoretically well investigated and commonly used in nonparametric classification and regression problems. As these methods are based on a Tikhonov regularization which is also common in inverse problems, this article investigates the use of regularized kernel methods for inverse problems in a unifying way. Regularized kernel methods are based on the use of reproducing kernel Hilbert spaces (RKHS) which lead to very good computational properties. It is shown that similar properties remain true in solving statistical inverse problems and that standard software implementations developed for ordinary regression problems can still be used for inverse regression problems. Consistency of these methods and a rate of convergence for the risk is shown under quite weak assumptions and rates of convergence for the estimator are shown under somehow stronger assumptions. The applicability of these methods is demonstrated in a simulation.

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