On optimal rates for nonparametric regression via kernel partial least squares regularization

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Conjugate gradient (CG) with early stopping for least-squares fitting is a form of regularization which is used in practice in the so-called Partial Least Squares algorithm. We study convergence rates of this type of regularization when applied in a reproducing Hilbert kernel space. One important difference with other approaches (regularized risk minimization or linear regularization schemes) is that even for a fixed number of steps k, the obtained estimator is nonlinear.

We prove optimal (up to log factor) rates of convergence in the statistical sense under source conditions (assumed to be known) on the true regression function, and when this function belongs the the reproducing kernel Hilbert space. If the latter assumption is not fulfilled, we also obtain comparable convergence rates if additional unlabeled data are available. The rates in these two cases match those obtained in earlier literature for linear regularization schemes in the same setting.