Convergence rates of spectral regularization methods for statistical inverse learning problems*

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Abstract

Consider an inverse problem of the form $g = Af$, where A is a known operator between Hilbert function spaces, and assume that we observe g at some randomly drawn points $X_1, ..., X_n$ which are i.i.d. according to some distribution P_X, and where additionally each observation is subject to a random independent noise. The goal is to recover the function g. Here it is assumed that for each point x the evaluation mapping $f \mapsto Af(x)$ is continuous. This setting as well as its relation to random nonparametric regression and statistical learning with reproducing kernels has been proposed and studied in particular in a series of works by Caponnetto, De Vito, Rosasco, and Odone (between others). In this talk we will first review this setting in some detail, as well as the principle of estimation by so-called spectral methods. We will present some results concerning convergence rates of such methods that extend and complete previously known ones. In particular, we will consider the optimality, from a statistical point of view, of a general class of linear spectral methods.

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