# Sparsity of Some Learning Algorithms

Ding-Xuan Zhou
Department of Mathematics, City University of Hong Kong
mazhou@cityu.edu.hk

**Abstract**

A new learning algorithm for regression is proposed. It is a least square regularization scheme with $\ell^1$-regularizer in a data dependent hypothesis space based on empirical features (constructed by a reproducing kernel and the learning data). The algorithm has three advantages. First, it is computationally effective without any optimization process. Second, it produces sparse representations with respect to empirical features under a mild condition, without assuming sparsity in terms of any basis or system. Third, the output function converges to the regression function in the reproducing kernel Hilbert space at a satisfactory rate. Our analysis does not require any sparsity assumption about the underlying regression function. Some extensions will also be discussed.