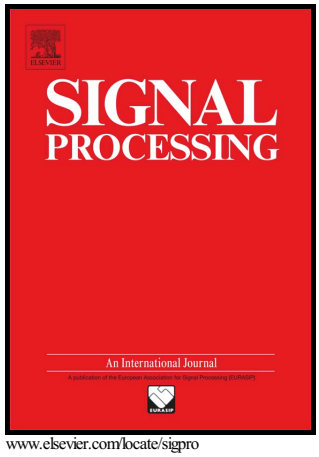

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Convolutional Deep Stacking Networks for Distributed Compressive Sensing

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Abstract

This paper address the reconstruction of sparse vectors in the Multiple Measurement Vectors (MMV) problem in compressive sensing, where the sparse vectors are correlated. This problem has so far been studied using model based and Bayesian methods . In this paper, we propose a deep learning approach that relies on a Convolutional Deep Stacking Network (CDSN) to capture the dependency amongst the different channels. To reconstruct the sparse vectors, we propose a greedy method that exploits the information captured by CDSN. The proposed method encodes the sparse vectors using random measurements (as done usually in compressive sensing). Experiments using a real world image dataset show that the proposed method outperforms the traditional MMV solver, i.e., Simultaneous Orthogonal Matching Pursuit (SOMP), as well as three of the Bayesian methods used for compressive sensing. We also show that the proposed method is almost as fast as greedy methods. The good performance of the proposed method depends on the availability of training data (as is the case in all deep learning methods). In many applications, however, training data is available, e.g., different images of the same class or signals with similar sparsity patterns.

Keywords: Distributed Compressive Sensing, Deep Learning, Deep Stacking

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