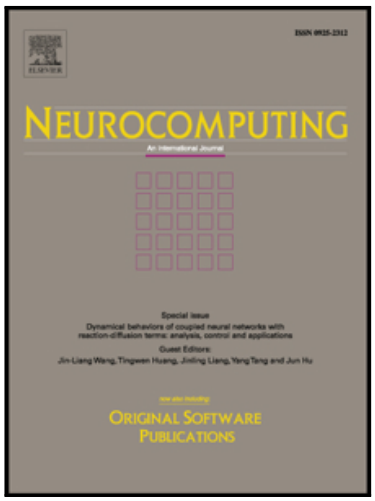

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Image Categorization using Non-negative Kernel Sparse Representation

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Abstract. Sparse representation of signals have become an important tool in computer vision. In many computer vision applications such as image denoising, image super-resolution and object recognition, sparse representations have produced remarkable performances. Sparse representation models often contain two stages: sparse coding and dictionary learning. In this paper, we propose a non-linear non-negative sparse representation model: NNK-KSVD. In the sparse coding stage, a non-linear update rule is proposed to obtain the sparse matrix. In the dictionary learning stage, the proposed model extends the kernel KSVD by embedding the non-negative sparse coding. The proposed non-negative kernel sparse representation model was evaluated on several public image datasets for the task of classification. Experimental results show that by exploiting the non-linear structure in images and utilizing the 'additive' nature of non-negative sparse coding, promising classification performance can be obtained. Moreover, the proposed sparse representation method was also evaluated in image retrieval tasks, competitive results were obtained.

Keywords: Non-negative sparse coding; kernel methods; dictionary learning; image classification

1 Introduction

In recent years, sparse representation of signals have become an important tool in computer vision. In many applications in computer vision, such as image denoising, image super-resolution and object recognition, sparse representations have produced remarkable performance [1–3]. It has also been verified that sparse representation or sparse coding can achieve good outcomes in many image classification tasks [4–6]. The reason of the success of sparse coding is that a signal Y can be well represented by a linear combination of a sparse vector x and a given dictionary D, namely, if x and D can be properly found, then Y can be well approximated as: $Y \approx Dx$.

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