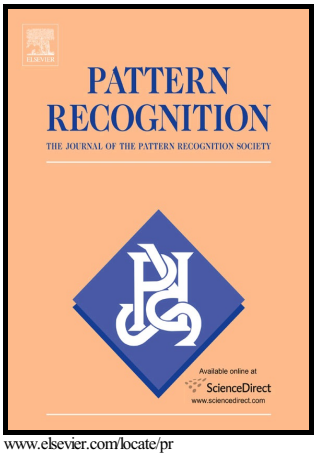

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Structure-Constrained Low-Rank and Partial Sparse Representation with Sample Selection for image classification

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Abstract

In this paper, we propose a novel Structure-Constrained Low-Rank and Partial Sparse Representation algorithm for image classification. First, a Structure-Constrained Low-Rank Dictionary Learning (SCLRDL) algorithm is proposed, which imposes both structure and low-rank restriction on the coefficient matrix. Second, under the assumption that the coefficient of test sample is sparse and correlated with the learned representation of training samples, we propose a Low-Rank and Partial Sparse Representation (LRPSR) algorithm which concatenates training samples and test sample to form a data matrix and finds a low-rank and sparse representation of the data matrix over learned dictionary by low-rank matrix recovery technique. Finally, we design a Sample Selection (SS) procedure to accelerate LRPSR. Experimental results on Caltech 101 and Caltech 256 show that our method outperforms most sparse or low-rank based image classification algorithm proposed recently.

Keywords: Sparse Coding, Low-rank, Dictionary Learning, Image Classification, Structured Sparsity

1. Introduction

Recognition of categories of objects in images and videos is an easy task for humans, however it is proved to be very difficult and complex for computers. Lots of progress has been achieved in computer vision[1], machine learning and pattern recognition[2] field to give visual ability to computers. Among all developed techniques, sparse representation and low rank matrix factorization have been well studied and received considerable attention from researchers recently, many image classification algorithms based on them are proposed[3].

Sparse representation tries to approximate the given signal by sparse linear combinations of elements on a basis or an over-complete dictionary[4, 5, 6]. It achieves inspiring performance on face recognition[7]. The over-complete dictionary plays an important role and has a significant

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