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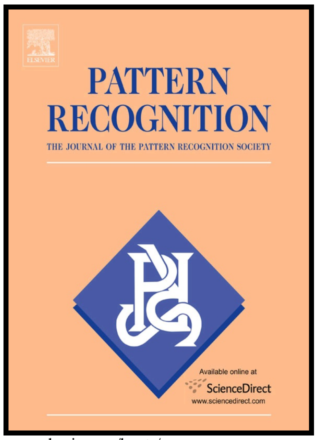

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Locality-constrained Max-Margin Sparse Coding

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Abstract

This work devises a locality-constrained max-margin sparse coding (LC-MMSC) framework, which jointly considers reconstruction loss and hinge loss simultaneously. Traditional sparse coding algorithms use ℓ_1 constraint to force the representation to be sparse, leading to computational expensive process to optimize the objective function. This work uses locality constraint in the framework to preserve information of data locality and avoid the optimization of ℓ_1. The obtained representation can achieve the goal of data locality and sparsity. Additionally, this work optimizes coefficients, dictionaries and classification parameters simultaneously, and uses block coordinate descent to learn all the components of the proposed model. This work uses semi-supervised learning approach in the proposed framework, and the goal is to use both labeled data and unlabeled data to achieve accurate classification performance and improve the generalization of the model. We provide theoretical analysis on the convergence of the proposed LC-MMSC algorithm based on Zangwill's global convergence theorem. This work conducts experiments on three real datasets, including Extended YaleB dataset, AR face dataset and Caltech101 dataset. The experimental results indicate that the proposed algorithm outperforms other comparison algorithms.

Index Terms

Locality; Sparse Coding; Max-margin

I. Introduction

The last decade has witnessed the great success of feature learning, and it has become an important research field in data mining, machine learning, and signal processing. The objective of feature learning is to automatically learn a new feature representation from raw data, so that the subsequent machine learning algorithms can benefit from the new feature representation [3].