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Dimension Reduction using Kernel Collaborative Representation based Projection

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Abstract: Dimension reduction plays a key role in pattern recognition. Sparsity preserving projection (SPP) and collaborative representation based projection (CRP) are two up-to-date dimension reduction methods. SPP uses sparse representation for dimension reduction and CRP uses collaborative representation. SPP and CRP both have good performances in dimension reduction and CRP is computationally more efficient than SPP. To make CRP more effective for linear inseparable data, we propose kernel collaborative representation based projection (KCRP) in this paper. In KCRP, the original data is mapped into a higher dimensional space by a nonlinear mapping and collaborative representation is performed in this new space by using kernel trick. Then, the low dimensional features are obtained by preserving the collaborative reconstructive relation. Experiments on AR, ORL and FERET databases show that KCRP performs better than SPP, CRP and some other popular dimension reduction methods.

Key words: Dimension Reduction; Collaborative Representation; Kernel Method; Face Recognition

1. Introduction

Dimension reduction[1] could find the effective low dimensional features from the original high dimensional data and improve the efficiency of classification. It is an essential procedure for pattern recognition. Principal component analysis (PCA)[2] and linear

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