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Weighted Scatter-Difference-Based Two DimensionalDiscriminant Analysis for Face Recognition

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ABSTRACT

Linear Discriminant Analysis (LDA) is a well-known scheme for feature extraction and dimension. It has been used widely in many applications involving high-dimensional data, such as face recognition, image retrieval, etc. An intrinsic limitation of classical LDA is the so-called singularity problem, that is, it fails when all scatter matrices are singular. A well-known approach to deal with the singularity problem is to apply an intermediate dimension reduction stage using Principal Component Analysis (PCA) before LDA. The algorithm, called PCA + LDA, is used widely in face recognition. However, PCA + LDA have high costs in time and space, due to the need for an eigen-decomposition involving the scatter matrices. Also, Two Dimensional Linear Discriminant Analysis (2DLDA) implicitly overcomes the singular- ity problem, while achieving efficiency. The difference between 2DLDA and classical LDA lies in the model for data representation. Classical LDA works with vectorized representation of data, while the 2DLDA algorithm works with data in matrix representation. To deal with the singularity problem we propose a new technique coined as the Weighted Scatter-Difference-Based Two Dimensional Discriminant Analysis (WSD2DDA). The algorithm is applied on face recognition and compared with PCA + LDA and 2DLDA. Experiments show that WSD2DDA achieve competitive recognition accuracy, while being much more efficient.

KEYWORDS

Feature Extraction; Face Recognition; LDA; PCA; 2DPCA; 2DLDA; WSD2DDA

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