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# Block Linear Discriminant Analysis for Visual Tensor Objects with Frequency or Time Information

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**Abstract**

Recently, due to the advancement of acquisition techniques, visual tensor data have been accumulated in a great variety of engineering fields, e.g., biometrics, neroscience, surveillance and remote sensing. How to analyze and learn with such tensor objects thus becomes an important and growing interest in machine learning community. In this paper, we propose a block linear discriminant analysis (BLDA) algorithm to extract features for visual tensor objects such as multichannel/hyperspectral face images or human gait videos. Taking the inherent characteristic of such tensor data into account, we unfold tensor objects according to their spatial information and frequency/time information, and represent them in a block matrix form. As a result, the block form between-class and within-class scatter matrices are constructed, and a related block eigen-decomposition is solved to extract features for classification. Comprehensive experiments have been carried out to test the effectiveness of the proposed method, and the results show that BLDA outperforms existing algorithms like DATER, 2DLDA, GTDA, UMLDA, STDA and MPCA for visual tensor object analysis.

*Keywords:* visual tensors, discriminant analysis, hyperspectral face recognition, gait recognition, between-class scatter, within-class scatter