Keynote Speaker

Feature Line Embedding(NFLE) Transformation and Its Applications

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Abstract

In image classification or retrieval applications, algorithms often have to solve problems such as view-angle change from camera, large illumination variation, and object deformation, etc. To reduce these impacts, many researchers have been trying to find the best discriminant transformation in eigenspace projection, either linear or nonlinear, to obtain better results. In this talk, I would like to introduce the feature line embedding transformation and its applications on image classification and retrieval. Generally, the discriminant power of transformation highly depends on the constructed within-class and between-class scatters in eigenspace decomposition methods. A small number of samples are collected during the training phase, and the point-based relationship is poorly modeled like the traditional LDA method. Feature lines can be considered to be the linear combinations of image features in feature spaces. Infinite possible combinations are generated by various weights. The point-to-line measurement is directly embedded in the transformation in the discriminant analysis phase, not in the classification phase. Second, the sample selection is addressed during the computation of scatter matrices. Two strategies, symmetric and asymmetric rules, are discussed according to the classification problems. Consider the simple two-class classification problem, all images, positive and negative classes, are both considered in scatter matrices using the symmetric rule. The symmetric rule is also easily extended to multi-class classification problems like face recognition. On the other hand, the asymmetric rule is used in relevance feedback-based image retrieval due to the different semantic concepts. The within-class scatter is calculated from the samples within the positive class, whereas the between-class scatter is calculated based on the negative samples to the feature lines of positive images. Finally, we integrated these two techniques and applied to face recognition, color classification of cars, hyperspectral image classification, and relevance feedback-based image retrieval.