A Two-Step Supervised Dimension Reduction with Applications to Face Recognition

Shih-Hao Huang
Department of Mathematics, National Central University

Abstract

Face recognition has long been viewed as an important part of the human perception system. The linear discriminant analysis is a renowned feature extraction technique in this field. However, it often suffers from the small sample size problem, since the image dimensionality is usually much higher than the sample size. In this article, we propose a two-step dimension reduction method for obtaining a linear discriminant subspace. Then, discriminant analysis can be carried out in this linear subspace. Our two-step method combines the multilinear principal component analysis (MPCA) in the first step and the partial inverse regression estimate (PIRE) in the second step to resolve the problem of high dimension and small sample size (HDSSS). We also present a strategy for choosing the MPCA rank. In numerical study, the proposed two-step method is shown to outperform the direct PIRE and the competing approaches on benchmark image data sets.

Keywords: feature extraction; linear discriminant analysis; multilinear principal component analysis; partial inverse regression estimate.

Work done jointly with Y.-H. Sun, S.-Y. Huang, and T.-L. Chen.