Dimension Reduction for Multivariate Response Regression Data

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Abstract

We consider a regression analysis of multivariate response on a vector of predictors. A major interest in analyzing multivariate data sets is the reduction of dimensionality for visualization the pattern of data structure. In this article, we develop a new two-step dimension-reduction method based on slice inverse regression or Principal Hessian Directions for reducing the dimension of response variables and predictors without requiring a prespecified parametric model. Our proposed method preserves as much regression information as possible. We derive the asymptotic chi-squared test for dimensionality. Several examples are reported and comparisons are made with the most predictable variates method of Li et al. (2003) and classical canonical correlation analysis.

KEY WORDS: Canonical correlation; Dimension reduction; Most predictable variates; Multivariate response; Principal Hessian Directions; Sliced inverse regression; Visualization