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Robust and Constrained Dimension Reduction

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Abstract

Dimension reduction is usually performed for high-dimensional data prior to other statistical analyses to alleviate the well-known "curse of dimensionality" and to conduct analyses in a parsimonious way. The canonical correlation method, a variant to the Sliced Inverse Regression (SIR) method, reduces the dimensionality of high-dimensional data by identifying a small number of informative linear combinations of the predictors. We consider robustification of the canonical correlation method to guard against gross outliers. Furthermore, we propose the constrained canonical correlation method to aim for directions that involve a small number of predictors and are therefore more useful and interpretable.

The developed weighted and constrained canonical correlation methods are applied to the Boston housing data for illustration. The constrained method may also be used in high-dimensional microarray data to single out a small number of signature genes for classifying different experimental conditions.

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