An Inverse-regression Method of Dependent Variable Transformation for Dimension Reduction with Nonlinear Confounding

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Abstract

Many model-free dimension reduction methods have been developed for high-dimensional regression data but have not paid much attention on problems with non-linear confounding. In this paper, we propose an inverse-regression method of dependent variable transformation for detecting the presence of non-linear confounding. The benefit of using geometrical information from our method is highlighted. A ratio estimation strategy is incorporated in our approach to enhance the interpretation of variable selection. This approach can be implemented not only in principal Hessian directions (PHD) but also in other recently developed dimension reduction methods. Several simulation examples that are reported for illustration and comparisons are made with sliced inverse regression and PHD in ignorance of non-linear confounding. An illustrative application to one real data is also presented.

Key words: dimension reduction, graphics, non-linear confounding, non-linear regression, principal Hessian directions, sliced inverse regression.