A comparison of procedures based on inverse regression

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Abstract: Sliced inverse regression (SIR) was introduced by Li (1991) and Duan and Li (1991) as a dimension reduction technique that determines the number of linear combinations of the predictor variables needed to obtain a parsimonious regression model. It is well known that SIR is not robust to the effects of outliers nor can it always detect symmetric dependence. In this paper, we briefly outline another technique based on inverse regression which potentially overcomes these shortcomings of SIR in an important special case. Finally, we compare the effectiveness of the new technique with that of SIR on some real data sets.

Key words: Dimension reduction, sliced inverse regression, robustness.

1 Introduction

Regression analysis is arguably one of the most widely used statistical techniques. A regression model expresses the mean of a response variable y as a function, f, of an explanatory variable $\mathbf{x}$, a p-dimensional column vector. Traditional parametric regression methods assume that the functional relationship between y and $\mathbf{x}$ is known apart from some parameters, which must be estimated. When the assumed functional form is correct, a variety of methods (including least squares and robust methods) can be used to estimate the unknown parameters. However, in many applications any parametric model is at best an approximation to the true one and the search