

Nonlinear Regression Modelling in Business and Economics via Parametric, Semi-parametric, and Adaptive Techniques

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ABSTRACT

The paper studies the relative model fit and forecasting performance of several parametric, semi-parametric, and adaptive nonlinear regression techniques, including nonlinear regression, generalized additive models, regression trees, bagging, random forests, boosting, and multivariate adaptive regression splines (MARS). Common algorithms for implementing these techniques and their relative merits and shortcomings are discussed. Performance comparisons among these techniques are carried out via their application to the current population survey (CPS) data on wages and Boston housing data. Overfitting and post-selection inference issues associated with these techniques are also investigated. Our results suggest that the recently developed adaptive techniques of random forests, boosting, and MARS outperform nonlinear regression model with Gaussian errors and can be scaled to bigger problems by exploiting massive data sets by fitting a rich class of functions almost automatically.

Keywords: Boosting; Generalized Additive Models; Multivariate Adaptive Regression Splines (MARS); Random Forests; Regression Trees; Semi-parametric Regression.