

Nonparametric Independence Screening for Ultrahigh-dimensional Sparse Modeling

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A variable screening procedure via correlation learning was proposed in Fan and Lv (2008) to reduce dimensionality in sparse ultra-high dimensional models. Even when the true model is linear, the marginal regression can be highly nonlinear. To address this issue, we further extend the correlation learning to marginal nonparametric learning. Our nonparametric independence screening, NIS, is a specific member of the sure independence screening. Several closely related variable screening procedures are proposed. It is shown that under some mild technical conditions, the proposed independence screening methods enjoy a sure screening property. The extent to which the dimensionality can be reduced by independence screening is also explicitly quantified. As a methodological extension, an iterative nonparametric independence screening (INIS) is also proposed to enhance the finite sample performance for fitting sparse additive models. The simulation results and a real data analysis demonstrate that the proposed procedure works well with moderate sample size and large dimension and performs better than competing methods.

(Joint work with Yang Feng, Columbia University; Rui Song, Colorado State University)