

A Model-free Conditional Screening Approach via Sufficient Dimension Reduction

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Abstract: Conditional variable screening arises when researchers have prior information regarding the importance of certain predictors, such as treatment effects in biological studies and market risk factors in financial studies. It is natural to consider feature screening methods conditioning on these known important predictors. Barut et al. (2016) proposed conditional sure independence screening (CSIS) to address this issue under the context of generalized linear models. While CSIS outperforms the marginal screening method when few of the factors are known to be important and/or significant correlations between some of the factors exist, unfortunately, CSIS is model based and might fail when the models are misspecified. We propose a model-free conditional screening method under the framework of sufficient dimension reduction for ultrahigh-dimensional statistical problems. Numerical studies show our method easily beats CSIS for nonlinear models, and performs comparable to CSIS for (generalized) linear models. Sure screening consistency property for our method is also proved.