Sufficient dimension reduction via random-partition for large-*p*-small-*n* problem

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Abstract

Sufficient dimension reduction (SDR) is continuing an active research area nowadays. However, conventional SDR methods can fail to apply when the number of covariates is larger than the available sample size. To overcome the problem of high-dimensionality, some works are developed to project the covariates onto a lower dimensional envelope subspace, on which conventional SDR methods can be directly applied without losing information. On the other hand, random-partition of covariates has been shown to be effective in assisting the detection of influential variables. In this work, we propose a new SDR method to overcome the problem of high-dimensionality, which we call random-partition SDR (RP-SDR). The main idea of RP-SDR is to use random-partition to construct the envelope subspace. The procedure will then be repeated many times, each corresponds to a realization of random-partition. Finally, an integration method is applied to average out the effect of random-partition. Comparing with existing methods, RP-SDR is less affected by the selection of tuning parameters. Moreover, the estimation procedure of RP-SDR does not involve the determination of the structural dimension until the final stage, which makes it more robust in estimating the target of interest.