

Consistent Group selection using Global-Local Prior in High-Dimensional Setup.

Sayantana Paul

Indian Statistical Institute, Kolkata, India

Abstract

Let us consider a problem of model selection when grouping structure is inherent within the regressors. Using a Bayesian approach, we model the group coefficient by a one-group global-local shrinkage prior belonging to a broad class of such priors that includes the horseshoe prior. We have proposed a modified form of usual class of global-local shrinkage priors and the resulting threshold rule selects the active group if within a group, the ratio of the l_2 -norm of the posterior mean of its group coefficient to that of the corresponding ordinary least square group estimate is greater than a half. This rule is named as half-thresholding (HT) rule. Since the global shrinkage parameter plays a pivotal role to capture the sparsity, we have used it either as a tuning one or an empirical Bayes estimate of it depending on the knowledge on the proportion of active groups. When this proportion is known, using the global parameter as a tuning one, under block-orthogonal design matrix, we have proved that, our method enjoys oracle property. In case this proportion is unknown, we propose an empirical Bayes estimate of the global parameter. Even in this situation, the proposed rule captures the true sparse group structure. Our simulation results show that the half-thresholding rule yields results similar to that of Yang and Narisetty (2020) \cite{yang2020consistent}. As a consequence of this, in high-dimensional sparse group selection problem, instead of using the so called 'gold standard' spike and slab prior, one can use the one-group global-local shrinkage priors to obtain similar results. This is a joint work with Dr. Arijit Chakrabarti (Indian Statistical Institute, Kolkata), and Dr. Prasenjit Ghosh (Texas A & M University).

Keywords:

Shrinkage Prior; Half-Thresholding; Oracle Property; Variable Selection Consistency.