Reduced-rank Stochastic Regression with a Sparse Singular Value Decomposition

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Abstract

For a reduced-rank multivariate stochastic regression model of, say, rank r, the regression coefficient matrix can be expressed as a sum of r unit-rank matrices each of which is proportional to the outer-product of the left and right singular vectors. For improving predictive accuracy and facilitating interpretation, it is often desirable that these left and right singular vectors be sparse or enjoy some smoothness property. We propose a regularized reduced-rank regression approach for solving the afore-mentioned problem. Computation algorithms and regularization parameter selection methods are developed, and the properties of the new method are explored both theoretically and by simulation. In particular, the proposed regularization method is shown to be selection consistent, asymptotically normal and enjoy the oracle property. We apply the proposed approach to analyzing the Norwegian Skagerrak coastal cod abundance data for simultaneously capturing the spawning peak and identifying significant North Sea larval drift effects among coastal fjords. We also apply the proposed model to solving the biclustering problem with microarray gene expression data.

The talk is based on joint work with Kun Chen and Nils Christian Stenseth.