

Independence Structure Test in Ultra High-Dimensional Data

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Abstract: This paper considers testing for independence structure in ultra high dimensional data. This problem includes testing of mutual independence between components of a random vector as a special case. The dependence between two random vectors can be characterized by the projection correlation proposed by Zhu et al. (2017), which has many appealing properties. To test for the independence structure of a random vector X , we propose to use the maximum projection correlations between the subvectors of X as the test statistic. It can be modified as the maximum sum-of-squared type test statistic to increase the power for against the dense alternative. Considering that it is difficult to calculate the V-statistic estimator of the projection correlation when n and p is extremely large, we propose the blockwise computation method, which is conducive to parallel computing. Simulation study shows that the proposed method can greatly reduce the overall computation time. We further demonstrate the performances of the proposed test in simulations, as well as an empirical study on a real application dataset.