

A Consistent Independence Test via Projected Mutual Information

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Abstract: We propose a nonparametric independence test based on mutual information. Distinguished from the previous work, we estimate the mutual information in a conditional density form, whose dimension could be reduced to 1 with novel projection methods. The optimal projection direction, which we name as maximum unit direction, is estimated by maximizing a penalized mutual information. An independence test is later on carried out via the newly estimated mutual information and is shown to be insensitive to the dimensions. The test is consistent against all global alternatives, and can detect local alternatives at a fast rate as if the model is univariate. Numerical results indicate that the test is more powerful compared with other existing independence tests, especially when the sample size is small or the dimension is large.