

Testing a Single-index Hypothesis for a High-dimensional Regression Model by Structural Adaptation

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This talk discusses a new method of analysis of high dimensional multi-index or partially linear models with unknown structure. The target of analysis is identification of effective nonlinear dimension of the model or a test of hypothesis that this dimension does not exceed the prescribed value. As particular cases we develop a test of a single index or a classical partially linear model with only one nonlinear component. The method of analysis goes back to the idea of structural adaptation from Hristache, Juditsky and Spokoiny (2001) and Hristache, Juditsky, Polzehl and Spokoiny (2001), where the problem of dimension reduction was considered for single and multiple index models, respectively. The proposed approach is fully adaptive to the unknown model structure and applies under mild conditions on the model. The only important assumption is that the dimensionality of nonlinear component is relatively small. The theoretical results indicate that the test procedure provides a prescribed level of the identification error and minimizes (in rate) the separation distance between the null and the general alternative. A numerical study demonstrates a very good performance of the method even for small or moderate sample sizes.

References

- Hristache, M., Juditsky, A., and Spokoiny, V. (2001). Direct estimation of the index coefficient in a single-index model. *Ann. Statist.* **29** 595–623.
- Hristache, M., Juditsky, A., Polzehl, J., and Spokoiny, V. (2001). Structure adaptive approach for dimension reduction. *Ann. Statist.* **29** 1537–1566.