Bridging Weak Signals and Sparsity: A Post-Shrinkage Perspective

A seminar by Syed Ejaz Ahmed

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Room BENVENUTI

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In this talk, we present post-shrinkage strategies for high-dimensional semiparametric models in the presence of weak signals. In high-dimensional data settings, many penalized methods have been developed for simultaneous variable selection and parameter estimation under sparsity assumptions. However, in practice, models often contain not only a few strong signals but also a large number of predictors with weak effects. In such scenarios, standard variable selection methods may fail to adequately distinguish between strong and weak signals. To address this challenge, we propose a high-dimensional post-shrinkage strategy aimed at improving the prediction performance of semiparametric submodels. We demonstrate that the proposed approach can outperform existing penalized and machine learning methods in a wide range of settings. Theoretical properties of the method are established through asymptotic analysis, and extensive numerical experiments are conducted to evaluate its performance. These results confirm the effectiveness of the proposed strategy and support the theoretical findings.

We further illustrate the practical utility of our approach through applications to high-dimensional datasets. Finally, the talk will highlight several open research problems and discuss potential directions for future work, along with some preliminary results.

References:

S. Ejaz Ahmed, Feryaal Ahmed and B. Yusbasi (2023). Post-shrinkage strategies in statistical and machine learning. CRC Press, USA.

S. Ejaz Ahmed. Penalty, Shrinkage and Pretest Strategies: Variable Selection and Estimation. Springer, New York, 2014.

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