Dear Editors,

Please consider our article entitled ``Multiway Spherical Clustering via Degree-Corrected Tensor Block Models'' for publication in the IEEE Transactions on Information Theory.

In this manuscript, we investigate the *degree-corrected tensor block model* (dTBM) for *higher-order clustering*. Higher-order clustering aims to identify the checkerboard structure in the noisy tensor observations collected in social networks, neuroscience, genetics, and computer science. Compared with classical tensor block model, dTBM models both block and individual effects and assumes a more flexible structure in higher-order clustering. However, the theoretical properties of dTBM are not fully studied in prior works yet. Studying the statistical and computational limits of dTBM and developing an optimal algorithm are of necessity and importance to the field of higher-order clustering.

We present the phase transition of clustering performance under dTBM based on the notion of angle separability. We characterize three signal-to-noise regimes corresponding to different statistical-computational behaviors. In particularly, we demonstrate that an intrinsic statistical-to-computational gap emerges only for tensors of order three or greater. Further, we develop an efficient polynomial-time algorithm that provably achieves exact clustering under mild signal conditions. The efficacy of our procedure is verified by two applications on human brain connectome project and Peru Legislation networks datasets.

A previous version of this manuscript has been submitted for the 25th International Conference on Artificial Intelligence and Statistics. Compared with prior submission, we add one new section for the proof sketches and two new sub-sections for the motivating examples and algorithm extension with practical issues. More thorough related works, illustrative explanations and remarks for our procedure, and a new experiment for new parameter selection strategy are also added in our current manuscript. The new contents providing new theoretical and practical discussions are believed to benefit the readers' understanding and the practical usage of our algorithm.

(dataset and software)

We believe our results will be of interest to a very broad readership – from those interested in new theoretical results to those interested in efficient practical algorithm in higher-order clustering with social networks, neuroscience applications.

We appreciate your consideration.

Sincerely,

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