Community detection with adaptive weights

Consider a random graph with the vertex set V and an edge matrix $\boldsymbol{Y} = (Y_{ij})$: $Y_{ij} = 1$ means an edge between the vertices i, j, otherwise $Y_{ij} = 0$. The Erdos-Renyi model assumes that all Y_{ij} are independent Bernoulli with the success probability $p_{ij} \in [0, 1]$. The stochastic block model means that the set of vertices V can be split into blocks $V_1, \ldots, V_M$ and

$$p_{ij} = q_{st} \qquad i \in V_s,\ j \in V_t\,,$$

for some values q_{st}, $s, t = 1, \ldots, M$. The goal is to apply the methods of adaptive weights AWCD (community detection) to recover the community set from the observed edge matrix $\boldsymbol{Y}$. Apriori the number of blocks M as well as the block probability values q_{st} are unknown.

Workpackages:

1. Efficient scalable implementation of the AWCD that would work for large datasets
2. Exploring the theoretical properties of the AWCD including propagation, separation, and consistency
3. Extending to the case of overlapping communities
4. Application to social, medicine, bio, and financial data

Literature:

- Efimov, Adamyan, Spokoiny (2017) Adaptive nonparametric clustering. arxiv 1709.09102.
- Cristopher Moore (2017) The Computer Science and Physics of Community Detection: Landscapes, Phase Transitions, and Hardness. arXiv:1702.00467
- arXiv:1507.04118 Oracle inequalities for network models and sparse graphon estimation Olga Klopp (MODAL'X, CREST), Alexandre B. Tsybakov (CREST), Nicolas Verzelen (MISTEA)

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