THE UNIVERSITY OF CHICAGO

Department of Statistics

STATISTICS COLLOQUIUM

YIHONG WU

Department of Statistics
Yale University

"Spectral Graph Matching: Theory and Algorithms"

MONDAY, February 14, 2022, at 4:30 PM
In-Person, John Crerar Library, Room 390
and via Zoom
(Zoom details sent via email announcement.)

ABSTRACT

Graph matching aims at finding the vertex correspondence that maximally aligns the edge sets of two given graphs. This task amounts to solving a computationally intractable quadratic assignment problem (QAP). We propose a new spectral method, which computes the eigendecomposition of the two adjacency matrices and returns a matching based on the pairwise alignments between all eigenvectors of the first graph with all eigenvectors of the second. Each alignment is inversely weighted by the gap between the corresponding eigenvalues. This spectral method can be equivalently viewed as solving a regularized quadratic programming relaxation of the QAP. We show that, for a correlated Erdos-Renyi model with average degree at least polylog(n), this method finds the exact matching with high probability if the two graphs differ by at most a 1/polylog(n) fraction of edges. The proposed algorithm matches the state of the art of polynomial-time algorithms based on combinatorial ideas, and exponentially improves the performance of existing spectral methods that only compare top eigenvectors or eigenvectors of the same order. The analysis exploits local laws for the resolvents of sparse Wigner matrices. The superiority of this new spectral method is also demonstrated on a variety of datasets, in terms of both matching accuracy and computational efficiency. Finally, we discuss various open questions in the context of statistical and computational limits of this problem.

Based on joint work with Zhou Fan (Yale), Cheng Mao (Georgia Tech), Jiaming Xu (Duke), and Sophie Yu (Duke) available at https://arxiv.org/abs/1907.08880, https://arxiv.org/abs/1907.08883, https://arxiv.org/abs/2008.10097, https://arxiv.org/abs/2110.11816.

Bio: Yihong Wu is an associate professor in the Department of Statistics and Data Science at Yale University. He received his B.E. degree from Tsinghua University in 2006 and Ph.D. from Princeton University in 2011. He is a recipient of the NSF CAREER award in 2017 and Sloan fellowship in Mathematics in 2018. He is broadly interested in the theoretical and algorithmic aspects of high-dimensional statistics, information theory, and optimization.

For further information and inquiries about building access for persons with disabilities, please contact Yolanda Tyler at 773.702.8335 or by email at yntyler@uchicago.edu. If you wish to subscribe to our email list, please visit the following website: https://lists.uchicago.edu/web/subscribe/statseminars.