THE UNIVERSITY OF CHICAGO

COMPUTATIONAL AND APPLIED MATHEMATICS COLLOQUIUM

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Solving Inverse Problems on Networks: Graph Cuts, Optimization Landscape, Synchronization

THURSDAY, April 18, 2019, at 5:00 PM
Jones 226, 5747 South Ellis Avenue

ABSTRACT

Information retrieval from graphs plays an increasingly important role in data science and machine learning. This talk focuses on two such examples. The first one concerns the graph cuts problem: how to find the optimal k-way graph cuts given an adjacency matrix. We present a convex relaxation of ratio cut and normalized cut, which gives rise to a rigorous theoretical analysis of graph cuts. We derive deterministic bounds of finding the optimal graph cuts via a spectral proximity condition which naturally depends on the intra-cluster and inter-cluster connectivity. Moreover, our theory provides theoretic guarantees for spectral clustering and community detection under stochastic block model.

The second example is about the landscape of a nonconvex cost function arising from group synchronization and matrix completion. This function also appears as the energy function of coupled oscillators on networks. We study how the landscape of this function is related to the underlying network topologies. We prove that the optimization landscape has no spurious local minima if the underlying network is a deterministic dense graph or an Erdos-Renyi random graph. The results find applications in signal processing and dynamical systems on networks.

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