Spectral Theories And Algorithms For Graph Cut Problems

Speaker: Chuan Yang (Peking University)

Time: 2023-06-01, 16:10 to 17:00

Location: Rm 1801, Guanghua East Tower

Mentor: Sihong Shao

Abstract: In this talk, our focus is on the spectral theories and the algorithms for the graph cut problems similar to the maxcut. We begin by investigating the dual Cheeger problem, denoted as h^+, and the modified dual Cheeger problem, denoted as $\hat{h}^+$, which are regarded as the "three-cut" versions of the maxcut. Meanwhile, we introduce and develop the nonlinear spectral theory of the signless 1-Laplacian on graphs and its combination with the graph 1-Laplacian, which are closely related to the two problems. Then we present a local analysis of an inverse power method for determining h^+ and $\hat{h}^+$, which enables an efficient implementation of the recursive spectral cut algorithm for the maxcut, yielding improved numerical results.

Next, we explore the anti-Cheeger cut as a judicious correspondence to the classical maxcut, and develop a continuous iterative algorithm for it through an equivalent continuous formulation. It does not need rounding at all and has advantages that all subproblems have explicit analytic solutions. The objective function values are monotonically updated and the iteration points converge to a local optima in finite steps via an appropriate subgradient selection. Numerical experiments on Gset demonstrate the performance.