# The $1$-Laplacian Cheeger Cut: Theory and Algorithms

(Dong Zhang)

Abstract:
In this talk, we focus on both theory and algorithms for the Cheeger cut based on the graph 1-Laplacian. The Courant nodal domain theorem for graphs is extended to graph 1-Laplacian for strong nodal domains, but for weak nodal domains it is false. Further, a graph with 6 vertices and 9 different eigenvalues is given to confirm that the critical values obtained by the minimax principle may not coincide with the eigenvalues of graph 1-Laplacian. In virtue of the cell structure of the feasible set, we propose a cell descend framework for achieving the Cheeger cut. While plugging the relaxation to guarantee the decrease of the objective value in the feasible set, from which both the inverse power method and the steepest descent method can also be recovered, we are able to get two specified cell descend methods.

Dong Zhang is currently a Ph.D. student under the direction of Professor Kung-Ching Chang in Peking University. His research direction is nonlinear analysis, and his main research interest includes the theory of graph 1-Laplacian and Cheeger cut and the prescribed mean curvature equation.

Two related publications:

K. C. Chang, S. Shao, and D. Zhang. The 1-Laplacian Cheeger cut: Theory and algorithms. J.
Comput. Math., 33:443–467, 2015

K. C. Chang, S. Shao, and D. Zhang. Nodal Domains of Eigenvectors for $1$-Laplacian on Graphs. Arxiv: 1602.07472