

Signed graphs and Nodal domain theorems for symmetric matrices

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Abstract:

A signed graph is a graph whose edges are labelled by a signature. It serves as a simple model of discrete vector bundle. We will discuss nodal domain theorems for arbitrary symmetric matrices by exploring the induced signed graph structure. This is an extension of the nodal domain theorem of Davies, Gladwell, Leydold, and Stadler for symmetric matrices with non-positive off-diagonal entries. With the fundamental concepts of balance and switching of signed graphs, our approach provides a more conceptual understanding of Fiedler's results on eigenfunctions of acyclic matrices. This new viewpoint further leads to a lower bound estimate for the number of strong nodal domains which generalizes and improves previous results of Berkolaiko and Xu-Yau. This talk is based on a joint work with Chuanyuan Ge (USTC).