

Efficient Solvers for Linear Systems in Graph Laplacians

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This talk will discuss algorithms for solving linear systems in graph Laplacians. These matrices are closely related to symmetric diagonally dominant matrices and M-matrices. They have widespread applications in spectral graph theory, combinatorial optimization, computer vision, and machine learning.

We will focus on two approaches that lead to the current fastest sequential solver and the first parallel solver with polylogarithmic time and nearly-linear work. The former has close connections to combinatorial graph algorithms, while the latter is motivated by numerical methods. These approaches combine tools from numerical analysis, tree approximations of graphs, and random matrix theory, which are of independent interest.