



復旦大學
FUDAN UNIVERSITY

Applied Math Ph.D. Seminar

On a Shrink-And-Expand Technique for Symmetric Block Eigensolvers

Speaker: Yuqi Liu (Fudan University)

Time: 2025-06-05, 16:10 to 17:00

Location: Rm 1801, Guanghai East Tower

Advisor:

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Abstract: In symmetric block eigenvalue algorithms, such as the subspace iteration algorithm and the locally optimal block preconditioned conjugate gradient (LOBPCG) algorithm, a large block size is often employed to achieve robustness and rapid convergence. However, using a large block size also increases the computational cost. Traditionally, the block size is typically reduced after convergence of some eigenpairs, known as deflation. In this work, we propose a non-deflation-based, more aggressive technique, where the block size is adjusted dynamically during the algorithm. This technique can be applied to a wide range of block eigensolvers, reducing computational cost without compromising convergence speed. We present three adaptive strategies for adjusting the block size, and apply them to four well-known eigensolvers as examples. Detailed theoretical analysis and numerical experiments are provided to illustrate the efficiency of the proposed technique. In practice, an overall acceleration of 20% to 30% is observed.