



復旦大學
FUDAN UNIVERSITY

Applied Math
Ph.D. Seminar

Recent Advances on Convergence of Preconditioned Eigensolvers

Speaker: Nian Shao (École Polytechnique Fédérale de Lausanne)

Time: 2025-01-02, 16:10 to 17:00

Location: Rm 1801, Guanghua East Tower

Advisor: Daniel Kressner (École Polytechnique Fédérale de Lausanne)

Abstract: Preconditioned eigensolvers enable the incorporation of preconditioners for eigenvalue computation, but their convergence analysis is intricate. Even for PINVIT, which targets the smallest eigenvalue of an SPD matrix, Neymeyr's celebrated analysis is highly nontrivial and only yields convergence if the starting vector is fairly close to the desired eigenvector. While advanced methods like LOBPCG offer significant practical improvements, there remains no theoretical justification for their accelerations. In this talk, we present some recent theoretical advances on preconditioned eigensolvers, including both provable accelerations and improved convergence guarantees. These results are achieved by establishing novel convexity structures of Rayleigh quotients and analyzing the local properties of preconditioners. This talk is based on joint works with Foivos Alimisis (UNIGE), Zhaojun Bai (UC Davis), Wenbin Chen (Fudan), Daniel Kressner (EPFL) and Bart Vandereycken (UNIGE).