



復旦大學  
FUDAN UNIVERSITY

Applied Math  
Ph.D. Seminar

## A locally optimal preconditioned Newton–Schur method for symmetric elliptic eigenvalue problems

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**Time:** 2023-05-11, 16:10 to 17:00

**Location:** Rm 1801, Guanghua East Tower

**Advisor:** Wenbin Chen

**Abstract:** A locally optimal preconditioned Newton–Schur method is proposed for solving symmetric elliptic eigenvalue problems. Firstly, the Steklov–Poincaré operator is used to project the eigenvalue problem on the domain  $\Omega$  onto the nonlinear eigenvalue subproblem on  $\Gamma$ , which is the union of subdomain boundaries. Then, the direction of correction is obtained via applying a non-overlapping domain decomposition method on  $\Gamma$ . Four different strategies are proposed to build the hierarchical subspace  $U_{k+1}$  over the boundaries, which are based on the combination of the coarse-subspace with the directions of correction. Finally, the approximation of eigenpair is updated by solving a local optimization problem on the subspace  $U_{k+1}$ . The convergence rate of the locally optimal preconditioned Newton–Schur method is proved to be  $\gamma = 1 - c_0 T_{h,H}^{-1}$ , where  $c_0$  is a constant independent of the fine mesh size  $h$ , the coarse mesh size  $H$  and jumps of the coefficients; whereas  $T_{h,H}$  is the constant depending on stability of the decomposition. Numerical results confirm our theoretical analysis.