MAX-PLANCK-INSTITUT
FÜR DYNAMIK KOMPLEXER
TECHNISCHER SYSTEME
MAGDEBURG

CSC Seminar

SPEAKER

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TITLE

Eigenvalue backward errors of matrix polynomials and the related distance problems

ABSTRACT

Backward perturbation analysis and condition numbers play an important role in the accuracy assessment of computed solutions of eigenvalue problems. If eigenvalue problems with additional symmetry structures are considered, then the use of structure-preserving algorithms is advisable because, in this way, existing symmetries in the spectrum are preserved even under round-off errors. Therefore, there has been strong interest in the sensitivity analysis of eigenvalues and eigenpairs of structured eigenvalue problems. Structured eigenvalue backward errors for various structured matrix polynomials have been studied in the literature; however, for some structures, it was not, like skew-symmetric, alternating, and T-palindromic polynomials, due to the underlying optimization problem not being known completely. We will briefly discuss this optimization problem of the Rayleigh quotient under symmetric constraints.

Eigenvalue backward errors of matrix pencils/polynomials are closely related to the distance to singularity, i.e., the distance to the nearest singular matrix pencil/polynomial. This is because the distance to the nearest singular matrix pencil is bounded from below by the infimum of the eigenvalue backward error over all the scalars. We will discuss the structured distance to singularity for various structures. Towards the end, I will also discuss some more distance problems: given a structured stable system, find the distance to the nearest non-stable system while preserving the structure.

Tuesday, March 18, 2025 at 2 pm

seminar room Prigogine