



復旦大學
FUDAN UNIVERSITY

Applied Math Ph.D. Seminar

Functional low-rank tensor approximation via Chebyshev interpolation with applications to multi-particle modeling

Speaker: Bonan Sun (Max Planck Institute Magdeburg)

Time: 2026-07-15, 16:10 to 17:00

Location: Rm 1801, Guanghai East Tower

Advisor: Peter Benner (Max Planck Institute Magdeburg)

Abstract: Functional low-rank tensor formats provide separable rank-structured representations of multivariate functions $f : [-1, 1]^d \rightarrow \mathbb{R}$ in terms of univariate functions and numerical coefficients. In this talk, we discuss how tensorized Chebyshev interpolation can be combined with algebraic low-rank approximation of the tensor of Chebyshev coefficients, for example in Tucker or Tensor Train (TT) format, to obtain functional low-rank tensor representations. We first consider the trivariate case, where the Chebyshev coefficient tensor is approximated in Tucker format. The resulting functional Tucker representation accurately reproduces earlier grid-based low-rank tensor results for electrostatic potentials of multi-particle systems, while significantly reducing storage requirements. We then present a new algorithm for computing TT approximations of Chebyshev coefficient tensors without forming the full tensor. On a broad set of benchmark functions, the method typically reduces the number of function evaluations needed to achieve a prescribed accuracy by more than 50% compared with existing related approaches. This talk is based on joint works with P. Benner, V. Khoromskaia, B. N. Khoromskij, and with D. Kressner and C. Stroessner.