

ADVANCES IN FUNDAMENTALS OF SPECTRAL METHODS

MARCO FASONDINI*, LI-LIAN WANG[†]

*University of Leicester
University Road, Leicester, LE1 7RH, United Kingdom
m.fasondini@leicester.ac.uk

[†]Nanyang Technological University
21 Nanyang Link, Singapore, 637371
LiLian@ntu.edu.sg

ABSTRACT

This mini-symposium focuses on recent advances in the fundamentals of spectral methods, including new transforms for univariate and multivariate orthogonal polynomials, fast matrix decompositions and structured algorithms for systems arising from spectral discretisation, methods for fractional-order equations, approximation theory for spectral expansions, and novel spectral methods on non-standard and unbounded domains. Further topics include spectral approximation of singular functions, scaling strategies for Hermite and Laguerre methods, sparse spectral methods on geometries described by algebraic curves and surfaces, and stable high-order time-stepping schemes. The goal is to provide a platform for exchanging ideas, identifying common analytical and computational challenges, fostering collaboration, and advancing the state of the art in spectral methods.

SPEAKERS

1. Keaton Burns (MIT): TBC
2. Tao Chen (Imperial College London): Fast QR Decomposition for Banded-Plus-Semiseparable Matrices
3. Daniel Fortunato (Flatiron Institute): TBC
4. Jing Gao (Xi'an Jiaotong University): TBC
5. Timon Gutleb (University of Leeds): TBC

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6. Georg Maierhofer (University of Cambridge): Stable Hermite transforms and the reliable computation of scattering operators
 7. Wenjie Liu (Harbin Institute of Technology): Polynomial approximations in new fractional spaces with applications
 8. Richard Mikael Slevinsky (University of Manitoba): Computing multivariate orthogonal polynomials via matrices with displacement structure
 9. Xian Wen (Eastern Institute of Technology, Ningbo): A fully decoupled divergence-free spectral method for the Navier-Stokes equations in two-dimensional complex geometries
 10. Haiyong Wang (Huazhong Science and Technology University): Hermite spectral approximation for singular functions
 11. Shuhuang Xiang (Central South University of China): Optimal spectral convergence for Jacobi, Laguerre and Hermite expansions and their applications
 12. Kuan Xu (University of Science and Technology of China): Fractional Calculus via Variable Transforms
 13. Jiajie Yao (University of Leicester): Sparse spectral methods on geometries described by algebraic curves and surfaces
 14. Lijun Yi (Shanghai Normal University): Unconditional stability and hp-convergence of multi-interval spectral collocation time-stepping for parabolic equations
 15. Haijun Yu (Chinese Academic of Sciences): Scaling Optimized Hermite and Laguerre Methods for Problems in Unbounded Domains.