

HIGH-ORDER METHODS FOR PDES: PERSPECTIVES FROM YOUNG RESEARCHERS

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ABSTRACT

The accurate numerical approximation of partial differential equations on complex geometries remains a major challenge in scientific computing. General polygonal and polyhedral meshes, curved boundaries, heterogeneous materials, and multiphysics interfaces require discretization techniques that combine geometric flexibility, robustness, and high-order accuracy.

This mini-symposium aims to highlight recent advances in high-order numerical methods, from the perspective of early-career researchers. Contributions may involve finite element, virtual element method, spectral element method, discontinuous Galerkin, hybrid-high order, isogeometric analysis, together with developments in adaptivity and refinement strategies. Particular attention will be devoted to the application of these approaches to challenging problems, including eigenvalue problems, multiscale and multiphysics models, contact and interface phenomena, and fluid–structure interaction.

These applications raise fundamental questions related to accuracy, stability, and computational efficiency on complex domains. Particular emphasis will be placed on novel ideas and emerging trends, such as the interplay between standard methods and machine learning techniques, that exploit high-order discretizations to achieve accurate and efficient simulations on general computational meshes.

By bringing together young scientists working across different numerical frameworks, the mini-symposium seeks to foster interactions among research communities and provide a snapshot of emerging trends and future directions on high-order computational methods for PDEs.

SPEAKERS

1. Clarissa Astuto (Università di Catania, Italy): “Unfitted Ghost-FEM for elliptic interface problems with applications to low-dimensional semiconductor devices”
2. Stefano Bonetti (Politecnico di Milano, Italy): “Coupling thermo-viscoacoustics and acoustics phenomena via polygonal discontinuous Galerkin methods”
3. Davide Collato (Politecnico di Torino, Italy): “Virtual element approximation of boundary integral operators in acoustic scattering”
4. Davide Fassino (Politecnico di Torino, Italy): “Recent advances in adaptive polytopal methods”
5. Emil Hössjer (Université de Montpellier, France): “Multigrids for Hybrid High-Order methods”
6. Edgar Mauricio Munar Benitez (Universidad Militar Nueva Granada, Spain): “Mixed Virtual Discretizations for the Brinkman–Forchheimer Problem”
7. Roberto Nuca (KAUST, Saudi Arabia): “Entropy stable high-order treatment of non-conforming interfaces”
8. Harpal Singh (IIT Roorkee, India): “Structure-Preserving Numerical Methods for Control-Constrained Linear Elasticity Equations”
9. Tommaso Sorgente (IMATI–CNR Genova, Italy): “Polyhedral mesh generation and refinement”
10. Giovanni Testa (KAUST, Saudi Arabia): “Machine learning enhanced solutions of DGSEM algorithms”
11. Jay Tushar (Louisiana State University, USA): “Local Orthogonal Decomposition Methods Based on Virtual Element Spaces for Multiscale Problems on Polygonal Meshes”
12. Fabio Vicini (Politecnico di Torino, Italy): “Recent Advances in the Zipped Finite Element Method”