

RECENT ADVANCES IN UNFITTED DISCRETIZATIONS

DANIELE BOFFI*, MANUEL SOLANO[†], SARA ZAHEDI[‡]

*King Abdullah University of Science and Technology (KAUST), Saudi Arabia, and
University of Pavia, Italy
E-mail: daniele.boffi@kaust.edu.sa

[†]Department of Mathematical Engineering, Universidad de Concepción
Av. Esteban Iturra s/n, Barrio Universitario, Concepción, Chile
E-mail: msolano@ing-mat.udec.cl

[‡] Department of Mathematics, KTH Royal Institute of Technology
SE-100 44 Stockholm, Sweden
E-mail: sara.zahedi@math.kth.se

ABSTRACT

The development of finite element discretizations for partial differential equations (PDEs) on non-body-fitted meshes has attracted significant attention due to their flexibility in handling complex and evolving geometries. In these approaches, the PDE is posed on a physical domain, while the numerical discretization is carried out on a computational mesh that does not conform to the boundaries or interfaces of the physical domain. Such methods are particularly well suited for problems involving evolving domains, interfaces, or topological changes. However, this geometric mismatch introduces several analytical and numerical challenges, especially in the design of stable and accurate high-order methods.

This minisymposium aims to bring together researchers working on unfitted and related discretization techniques, including fictitious domain methods, CutFEM, X-FEM, ϕ -FEM, the Shifted Boundary Method, the Transfer Path Method, HHO methods, and the Immersed Boundary Method, among others. Particular emphasis will be placed on recent advances and open challenges in high-order unfitted discretizations, as well as on the analysis, implementation, and applications of such methods more broadly.

SPEAKERS

1. Mats Larson (Umeå University, Sweden): Discrete strong stability for time dependent CutFEM on moving domains.
2. Pei Fu (Nanjing University of Aeronautics and Astronautics, China): High order structure-preserving unfitted discontinuous Galerkin method for hyperbolic conservation laws.
3. Santiago Badia (Monash University, Australia): Divergence-free unfitted finite element discretisations for the Darcy problem.
4. Vanessa Lleras (University of Montpellier, France): Phifem: a high-order approach for the resolution of problems with immersed boundaries.
5. Joar Bagge (KTH Royal Institute of Technology, Sweden): CutFEM for PDEs with stochastic data.
6. Fabien Vergnet (Sorbonne University, France): Optimal a priori error bounds for a smooth extension method.
7. Alexandre Ern (CERMICS, ENPC, Institut Polytechnique de Paris, France): Unfitted hybrid high-order methods.
8. Jaime Manríquez (Lund University, Sweden): The Transfer Path Method for Interface Problems.
9. Fabio Credali (KAUST, Saudi Arabia): Recent advances in a fictitious domain formulation for FSI problems.
10. Christoph Lehrenfeld (The University of Göttingen, Germany): Unfitted Space-Time FEMs for PDEs on moving domains.
11. Gioana Teora (Politecnico di Torino, Italy): A High Order Mixed-VEM for Diffusion Problems on Curved Domains: The Transfer Path Method.
12. Stefano Berrone (Politecnico di Torino, Italy): Fictitious Domain Methods with Enriched Finite Elements.