



# Hybrid High-Order Methods

Project ITALY — Italian talented young researchers

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## Abstract

Hybrid High-Order (HHO) methods are last generation discretization methods for PDE problems with a number of appealing features: the capability of handling general polyhedral meshes with a construction independent of the space dimension; the possibility of arbitrarily selecting the approximation order; the reproduction of desirable continuum properties at the discrete level (integration by parts formulas, operator kernels, symmetries, commuting properties, etc.); reduced computational cost. HHO methods for diffusive problems rely upon two ingredients: a high-order reconstruction operator inside cells from the cell- and face-based unknowns, and a stabilization operator linking locally cell- and face-based unknowns while preserving the high order of the reconstruction. The discrete problem is assembled cell-wise as in standard finite elements, and cell-based unknowns can be eliminated by static condensation, leading to a symmetric, positive definite linear system coupling the face-based unknowns. We provide here an introduction to HHO methods for model problems relevant in continuum mechanics, highlight the general ideas, and present a panel of theoretical results and numerical examples.