

# FUNCTIONAL INEQUALITIES IN PIECEWISE SOBOLEV SPACES AND APPLICATIONS TO (HYBRID) DISCONTINUOUS METHODS

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ABSTRACT. In this talk, we will investigate several functional inequalities that are instrumental to establish the stability and convergence analysis of discontinuous finite element methods supporting polyhedral meshes for a wide class of nonlinear problems. Starting from some preliminary results concerning broken Sobolev spaces, we will develop novel arguments to prove the broken version of Poincaré, Korn, trace inequalities and Sobolev embeddings. The main ingredient is a generalization of the local continuous trace inequality allowing to establish the results without restricting to piecewise polynomials or other discrete functional spaces and without requiring the definition of an interpolator mapping the discontinuous functions to continuous ones. We will apply the functional tools to derive the a priori analysis for discontinuous Galerkin and Hybrid High-Order discretizations of nonlinear creeping flow problems.

**Keywords:** discontinuous Galerkin, polyhedral meshes, functional inequalities, broken Sobolev spaces

**Mathematics Subject Classifications (2010):** 65J15, 65N30

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