



UNIVERSITÄT
SALZBURG

SALZBURG MATHEMATICS COLLOQUIUM

Winter 2026/27

Carsten Carstensen (HU Berlin)

„Nonconforming Approximation of Ginzburg-Landau-Type Semilinearities“

December 3, 2026

Abstract: The Landau-de Gennes model for nematic liquid crystals provides computational challenges within a non-convex minimization problem. The associated Euler-Lagrange equations form a semi-linear secondorder elliptic boundary value problem with reduced regularity in nonconvex domains as well as additional topological singularities called vortices. The energy landscape in this non-convex minimisation problem is unexpectedly rich with many stationary points of the energy functional and severe difficulties for local solve. Nonconforming Crouzeix-Raviart finite elements allow for lower energy bounds in the asymptotic range of sufficiently fine meshes and immediate approximation of inhomogeneous Dirichlet data.

The presentation departs with 2D computational benchmark examples and explains the origin of vortex singularities for Dirichlet data of non-zero winding number for larger Ginzburg parameters ℓ for this is a novel aspect in the mandatory adaptive mesh-refining. A priori existence of discrete solutions and their weak or strong (global) convergence towards stationary points along subsequences is illuminated. An asymptotic a priori and a posteriori local error analysis with optimal rates for appropriate adaptive algorithms concludes the presentation.

Thursday, **15:00-15:45**
Hörsaal 414, 1. Stock