# Immersed isogeometric analysis with boundary conformal quadrature

TECHNISCHE UNIVERSITÄT DARMSTADT

**Bachelor thesis, Master thesis, or ADP**
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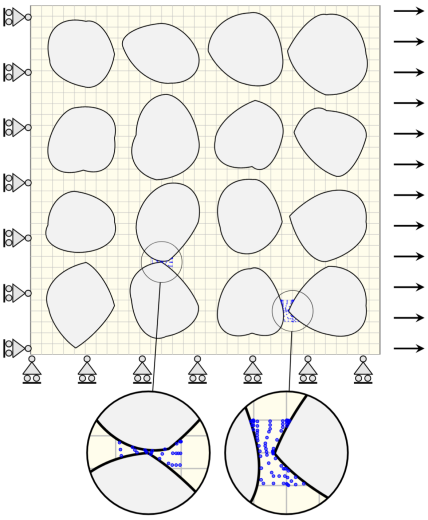

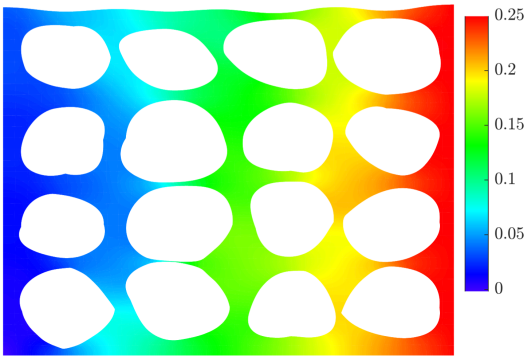


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## Introduction

Isogeometric analysis (IGA) offers superior accuracy in numerical simulations compared to the classical finite element method due to its exact representation of geometry through smooth spline functions such as B-splines and NURBS. However, automating mesh generation for IGA on complex geometries is a challenge. Thus, alternative techniques such as fictitious domain methods have been introduced, in which the geometry is immersed into a Cartesian grid and only the quadrature rule, but not the basis functions, are adapted to the geometry. The combination of these methods with IGA results in **immersed isogeometric analysis (immersed IGA)**, a promising approach known for its high convergence rates and efficient integration schemes, such as the **boundary-conformal quadrature** (BCQ) method. This synergy between immersed IGA and BCQ has demonstrated robustness in various applications, including linear elasticity, thermo-elasticity, and large deformation elasticity.

## Potential topics

- Develop and implement immersed IGA with boundary-conformal quadrature in the context of **coupled magnetic, thermal and elastic field problems**
- Extend the immersed IGA with boundary-conformal quadrature to **parametric and shape optimization** with gradient based optimization methods