

## Seminar

### Computational Methods for PDEs

Tuesday, March 12, 2024, 14:30

RICAM, SP2 416-1

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### Dissertation Colloquium: Topology Optimisation of Electric Machines under Electro-Thermal Coupling

The guidelines of this PhD are given by project D02 "Topology Optimisation of Electric Machines under Electro-Thermal Coupling" of the DFG/FWF CRC361 "CREATOR - Computational Electric Machine Laboratory". The goal of this project is to find new designs of electric machines considering multiple physics as electromagnetics, thermics and structural mechanics. We aim to optimize the performance (torque, inertia) subject to constraints (mass, temperature, stresses, demagnetization) by freely distributing iron, magnets of different orientation and air. This results in a multi-physical, multi-material design optimization problem. The tool of choice is the topological derivative which indicates the point-wise variation of some cost functional subject to topological perturbations, i.e. the change of material in a ball of infinitesimal size. The main workpackages of this project are

- Topological derivative for time-dependent problems on moving domains
- Optimization of magnet orientations
- Topological derivative considering hysteresis
- Manufacturing constraints
- Topological derivative for electro-thermal coupled problems
- Application to IGA and 3d models

The challenges include the modeling of these problems, the asymptotic analysis and the numerical implementation and validation of the optimization.