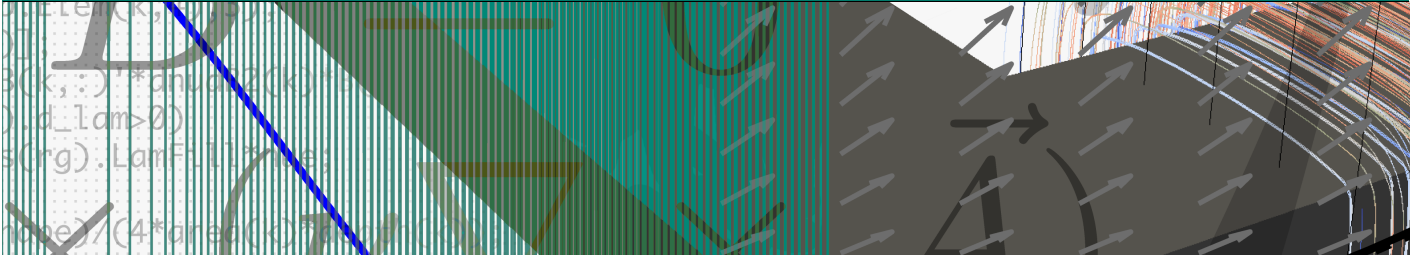


# Assessing Recycled Permanent Magnets in Magnetocaloric Cooling via Uncertainty Quantification



TECHNISCHE  
UNIVERSITÄT  
DARMSTADT

Proposal for a Master's or Bachelor's thesis  
Study field: Computational Engineering, Electrical Engineering or similar  
April 8, 2026



## Description

Magnetocaloric refrigeration is a promising alternative to conventional vapor-compression cooling technology. The company MAGNOTHERM develops such systems based on high-performance permanent magnets. Recently, recycled magnets, for example from decommissioned MRI systems, have become available as a more sustainable alternative to newly manufactured magnets. However, these recycled magnets exhibit altered and uncertain material properties, such as reduced remanence and increased variability in magnetic characteristics. Understanding how these uncertainties affect the performance and robustness of magnetocaloric devices is essential for assessing the feasibility of recycled materials in industrial applications.

## Objectives

The goal of this thesis is to systematically investigate the impact of uncertain magnetic material properties on the performance of magnetocaloric cooling systems. The student will develop and apply methods from uncertainty quantification (UQ) to analyze how variations in magnet properties propagate through computational models and influence key performance indicators.

## Prerequisites

Interest in computational electromagnetics as well as some experience in scripting (for example Python) are beneficial. Prior exposure to numerical methods or uncertainty quantification is an advantage but not required.

## Supervisors:

Boian Balouchev, M. Sc.  
Prof. Dr. Sebastian Schöps  
Tim Sittig, MAGNOTHERM

## Contact:

boian.balouchev@  
tu-darmstadt.de

## Weighted Core Areas:

