

Master thesis, Bachelor thesis, Project thesis

FEM automation and AI-supported optimization of a sensor

The “MotorInspector” project involves optimizing a flexible, strain gauge-based gap measurement sensor for robot-assisted automation. To estimate its bending and twisting, the “MFP gapMaster” gap measurement sensor, which consists of a metal lance, is to be equipped with additional strain gauges.

In this thesis, the measurement process is to be simulated under various boundary conditions (torsion/tilting) and with different strain gauge positions, and an AI replacement model of the FEM simulation is to be generated. The AI replacement model can then be used efficiently to predict simulation results and thus optimize the positioning of the additional strain gauges.

ANSYS Mechanical or another software of your choice will be used as the FEM simulation software.

Your tasks

The following tasks await you in your thesis:

- Automation of FEM simulation: In order to efficiently record the data required for training, the FEM simulation should run automatically under various boundary conditions (twist and tilt angles, offsets). This can be done using PyAnsys or ADPL, for example.
- Data generation through simulations with variable strain gauge positions: With the help of automation, numerous simulations with different strain gauge positions are now to be carried out. The results are then prepared for model training.
- Creation of an AI replacement model: Training and validation of an AI model to predict strain gauge elongation as a function of boundary conditions and strain gauge position.
- Optimization of strain gauge position: Numerical optimization of strain gauge position (e.g., using a genetic algorithm).

Your profile

If you have the following, nothing stands in the way of an interesting and interdisciplinary thesis:

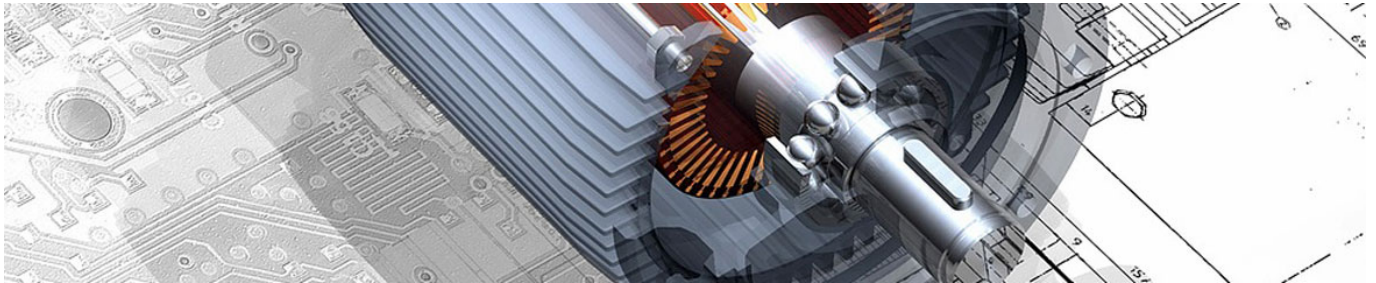
- Knowledge and experience in FEM software (preferably ANSYS Mechanical)
- Programming skills in Python
- Interest in and basic knowledge of AI and data-driven regression models (support vector machines, Gaussian processes, deep learning)
- Interest in optimization methods such as evolutionary algorithms or Bayesian optimization
- Motivation to familiarize yourself with new and innovative topics and contribute to the development of novel measurement methods
- Good written and spoken German and/or English skills

Note: For study projects or bachelor's theses, task packages can be isolated according to interest in order to adjust the complexity.

We offer

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Bitte sende deine aussagekräftige Bewerbung in einer einzigen PDF-Datei an jobs@iph-hannover.de.

Die Bewerbung muss Anschreiben, Lebenslauf sowie Prüfungsleistungen des Studiums / Zeugnisse enthalten.

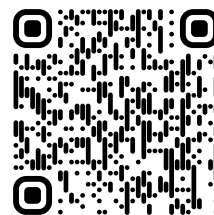
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