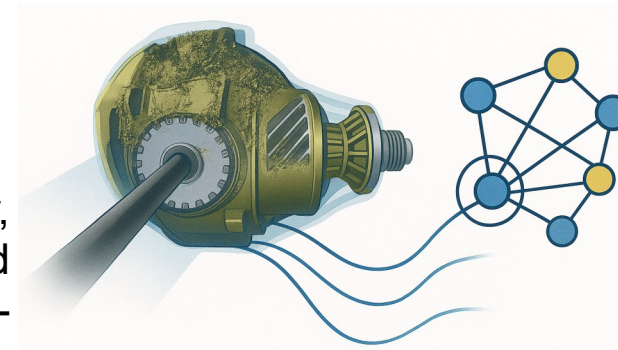


Surrogate Model for Gearbox Oil Flow Distribution

Bachelor Thesis/Semester Thesis/Master Thesis

Current situation:

Fluid flow inside gearboxes is crucial for reliability and efficiency, as it governs lubrication, heat transfer, windage losses, and churning power. However, realistic gear trains with multiple meshing gears, bearings, rotating frames, and complex housings lead to highly unsteady, multi-scale flows that make high-fidelity CFD simulations computationally expensive. This cost limits both design iteration and real-time applications. Recent works in Graph Neural Network (GNN) enable learning flow operators directly on unstructured meshes, preserving mesh topology and supporting complex geometries in fluid and multi-physics modeling.



Work packages:

- Literature review on surrogate modeling approaches and GNN-based methods
- Generation and structuring of simulation data using the current baseline setup
- Further implementation of the recommended GNN model, including training and inference

Prerequisites:

- Good English and German skills
- Basic Machine Learning and CFD knowledge, programming skills in Python

Benefits in future:

- Possibilities as a working student or research assistant



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28.10.2025

