der Bundeswehr
Universität München

Forschungskolloquium
Computational Science and Engineering

Einladung zum Vortrag

Numerical Design of Engineering Components and their Production Processes

Univ.-Prof. Stefanie Elgeti, Institute of Lightweight Design and Structural Biomechanics, TU Wien

Zusammenfassung: In recent times, numerical analysis has become essential to engineering design: It provides answers beyond pure engineering intuition, it allows to compute quantities of interest and assess their sensitivity and robustness, and it helps to understand functionality principles. Building on these successes, numerical optimization methods have developed into an important tool in the design of both individualized components and their respective production processes. An iterative design procedure usually consists of the following four components: a geometry representation, a forward simulation, the evaluation of an appropriate objective function, and an optimization algorithm.

The main focus of this presentation will be on geometry representation and definition of objective functions, however, also the other two aspects will be touched. In terms of geometry representation, we will discuss more classic spline-based geometry representations, especially trivariate microstructures, alongside machine-learning approaches such as Variational Autoencoders (VAE). We will demonstrate how VAE can be employed to learn low-dimensional, yet feature-rich shape representations. With respect to objective functions, we will concentrate on the procedure for developing objective functions, pinpointing potential pitfalls. All methods will be illustrated by means of examples from production engineering.

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