



Universität Konstanz
Fachbereich Mathematik und Statistik

Einladung im Rahmen des
Schwerpunktkolloquiums

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Deep neural networks for accelerating fluid-dynamics simulations

Donnerstag, 11. November 2021
Beginn: 17:00 Uhr
Raum: F 426

Interessenten sind herzlich willkommen!

Abstract:

In this talk we discuss the use of deep neural networks for augmenting classical finite element simulations in fluid-dynamics.

Classical simulation methods often reach their limits. Even if the finite element method is highly efficient and established for the discretization of the Navier-Stokes equations, fundamental problems, such as the resolution of fine structures or a correct information transport between scales, are still not sufficiently solved. A similar problem arises in the description of fluid-structure interactions, where it is often not possible to accurately represent both the flow field and the detailed interaction with solids simultaneously. For example, consider the interaction of blood plasma with the small, often very irregularly shaped, solid components of the blood. These are too small, too diverse, and too unstructured for coupling models to be known.

We discuss approaches to connect the finite element method with neural networks to overcome these obstacles. The paradigm is to use classical simulation techniques where their strengths are eminent, such as in the very efficient representation of a coarse, large-scale flow field. Neural networks are used where a full resolution of the effects does not seem possible or efficient. In addition to the desired increase in efficiency, the focus is particularly on issues of stability, generalizability and error accuracy.
