Universität Stuttgart
Luft- und Raumfahrttechnik und Geodäsie

SimTech
Cluster of Excellence

Öffentliche Vorträge
(Präsenz)

Computational Fluid Dynamics Frameworks for the next Decade
Prof. Dr.-Ing. Andrea Beck, M.Sc.
Institut für Aerodynamik und Gasdynamik

&

Fluid Dynamics in the Age of Data: From Subsurface Flows to Aerodynamic Turbulence
Prof. Dr. Heng Xiao
Institut für Thermodynamik der Luft- und Raumfahrt & SimTech

KOLLOQUIUM DER LUFT- UND RAUMFAHRTECHNIK UND GEODÄSIE

Mi, 05.07.2023, 16:00
Pfaffenwaldring 7, V7.01

Computational Fluid Dynamics Frameworks for the next Decade (Andrea Beck)
In this talk, I will venture a glimpse into the future of cutting-edge numerical methods and software for computational fluid dynamics (CFD) for many aerospace applications. While established, off-the-shelf commercial solutions for a broad range of applications exist, the current push towards fundamental changes in the fields of energy generation and transport necessitates computational tools that can keep pace and facilitate discovery through computation. This talk will give an overview of the ingredients of modern simulation software for CFD, in particular for multi-scale, multi-physics and multi-fidelity problems. Among these are high-order discretization schemes that can adapt locally in space and time to the underlying resolution requirements and thus combine accuracy and robustness. While the potential of leveraging data-driven approaches has become apparent, I advocate for a shift from a purely data-driven to a data-informed approach, which combines both machine learning models (ML) and classical solution schemes consistently. Last but not least, modern discretization methods and ML/CFD hybrid schemes must produce efficient and reliable results. For this, GPU-parallelization and an incorporation of the FAIR principles into the simulation stack must be part of the next generation CFD solvers.

Fluid Dynamics in the Age of Data: From Subsurface Flows to Aerodynamic Turbulence (Heng Xiao)
disciplines of continuum mechanics, fluid dynamics has traditionally relied on solving partial differential equations, which are typically augmented by closures models that represent unresolved physics or spatial/temporal scales. In the past decade, data science has emerged as a powerful pillar in fluid dynamics and demonstrated synergy with all existing paradigms, i.e., theory, computation and experiment. What roles can data science play in the current and future landscape of fluid dynamics? I will illustrate how data has leveraged to augment and accelerate fluid dynamics simulations with examples ranging from porous media flows to aerodynamic turbulence. A particular emphasis will be placed on embedding invariance and physical constraints into data-driven fluid simulations.

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- Eine Veranstaltung von SimTech, der Fakultät 6 und der DGLR-Bezirksgruppe Stuttgart
- Nach den Vorträgen wird zum Empfang im Foyer des SimTech-Gebäudes (Pfaffenwaldring 5a?) geladen
- **Weitere Infos**: https://www.f06.uni-stuttgart.de/veranstaltungen