Professur für
Thermofluiddynamik

Seminarvorträge Sommersemester 2024

Stand: 31. Jul 2024

Thursday, 23rd May, 11:30, MW 1701

Elizabeth Qian, Georgia Tech

Reduced Operator Inference for Nonlinear Partial Differential Equations

Tuesday, 16th July **13:30**, MW 1701

Prof. **Meenatchidevi M.**, IIT Dharwad, India

Effect of ammonia/hydrogen on thermoacoustic instabilities
in laminar and turbulent combustors

Tuesday, 30th July 14:00, MW 1701

Deniz Bezgin, Aaron Buhendwa, TUM

JAX-Fluids: Towards automatically differentiable CFD
for compressible two-phase flows and reactive multi-component flows

Wednesday, 14th August 10:30, MW 7, 1. Stock, Seminarraum 1701

Dr. Anh Khoa Doan, Faculty of Aerospace Engineering, Delft University

Scientific Machine Learning in Fluid Dynamics: application to extreme events prediction and diagnostic augmentations

TU Munich – Seminar– August 14, 2024

Scientific Machine Learning in Fluid Dynamics: application to extreme events prediction and diagnostic augmentations

Dr. Anh Khoa Doan, Faculty of Aerospace Engineering, Delft University of Technology

Abstract:

Machine learning techniques have in recent years seen an explosion in their development and application for fluid mechanics research problems. This is driven, in part, by the ability of machine learning approaches to identify patterns in complex large datasets. Therefore, approaches based on clustering or featurization can support the physical investigation of flows by identifying patterns and mechanisms within large flow datasets generated by simulations or experiments. Additionally, the embedding of physical information into deep learning architecture, to ensure physical predictions of the machine learning models, is an ongoing topic of research and has spurned architectures that can be used to solve inverse problems, and specifically augment the information content of a given dataset by reconstructing missing physical information.

In this talk, we will present machine learning applications along those two directions. First, we will present our attempt at identifying precursors of flashback in a reheat hydrogen combustor by combining a co-kurtosis principal component analysis approach to identify the most relevant features in the thermo-chemical and hydrodynamic state, and a modularity-based clustering technique to identify the states precursor to flashback from those identified features. Second, we will present the use of physics-informed neural networks to augment experimental diagnostics. We will show how these can be used to reconstruct unmeasured quantities in a puffing pool fire and improve the spatial resolution of Particle Tracking Velocimetry measurements in a pulsed jet.

Biography:

Dr. Anh Khoa Doan is an Assistant Professor in AI for Fluid Mechanics at the Faculty of Aerospace Engineering of TU Delft. He received his PhD in Engineering in 2018 from Cambridge University where his research was devoted to the Direct Numerical Simulation of MILD combustion and combustion modeling. Afterwards, he joined TU Munich as a postdoctoral researcher, at the Mechanical Engineering Department and Institute of Advanced Study, working on the development of machine learning techniques for fluid mechanics. In 2021, he joined TU Delft and has been appointed as co-director of the AIFluids lab where his research group is devoted to developing scientific machine learning techniques for the study, modelling and control of turbulent flows.

He has also spent time as a research visitor at the Sandia National Laboratory (Livermore) and Stanford University and is currently a member of the Combustion Institute, the American Physical Society, and the Dutch Association for Flame Research (NVV).