

Modern simulation & data science techniques for computational fluid dynamics problems in the exascale range

Organizers: Stefan Turek¹ and Axel Klawonn²

¹TU Dortmund, Germany, Stefan.Turek@math.tu-dortmund.de

²Universität zu Köln, Germany, axel.klawonn@uni-koeln.de

Short Description

The aim of this minisymposium is to discuss and to share recent ideas from Numerics (w.r.t. discretization and solver techniques), Scientific Computing (w.r.t. computational, algorithmic and implementation aspects) and Data Science (w.r.t. machine learning and neural network approaches) for the highly efficient treatment of partial differential equations (PDEs) that arise in the simulation of problems from computational fluid dynamics (CFD). The presented approaches shall particularly address new ideas regarding future high-performance computing environments which will be in the exascale range and which will include massively parallel, heterogeneous architectures together with specific accelerator hardware (GPUs, TPUs, FPGAs). The minisymposium will concentrate on methods and their foundations and will highlight the interplay of these aspects with computational and algorithmic tools and particularly their realization in simulation software. We shall discuss, for instance, aspects regarding hardware-oriented numerics, energy-efficient and also extremely scalable numerical approaches, scientific machine learning techniques together with artificial neural networks, numerical cloud computing, and massively parallel asynchronous solvers.