

PhD project: Model hierarchy for bioreactors: From physics-based to data-driven approaches

The Helmholtz School for Data Science in Life, Earth and Energy (HDS-LEE) provides an interdisciplinary environment for educating the next generation of data scientists in close contact to domain-specific knowledge and research. All three domains – life & medical sciences, earth sciences, and energy systems/materials – are characterized by the generation of huge heterogeneously structured data sets, which have to be evaluated in order to obtain a holistic understanding of very complex systems. Visit HDS-LEE at: www.hds-lee.de

Project overview

The Chair for Computational Analysis of Technical Systems at the Faculty of Mechanical Engineering of the RWTH Aachen University seeks a scientific co-worker in the area of incompressible fluid flow modeling, simulation, optimization, and scientific computing. The candidate is expected to conduct research leading to a doctoral thesis, and work closely with project co-supervisors at the IBG-1 Biotechnology institute at the Forschungszentrum Jülich.

Building on recent efforts in the computational fluid dynamics community augmenting classical model reduction with machine learning, we will explore the development of a model cascade for simulation and design of stirred and sparged bioreactors. From the high-resolution CFD models that take days of computing time, through simplifications of the geometry, through compartment models, to an artificial neural network serving as a reduced model, the fidelity and cost will be studied.

This work will exploit synergies with related HDS-LEE projects in the field of data science for energy-saving manufacturing processes.

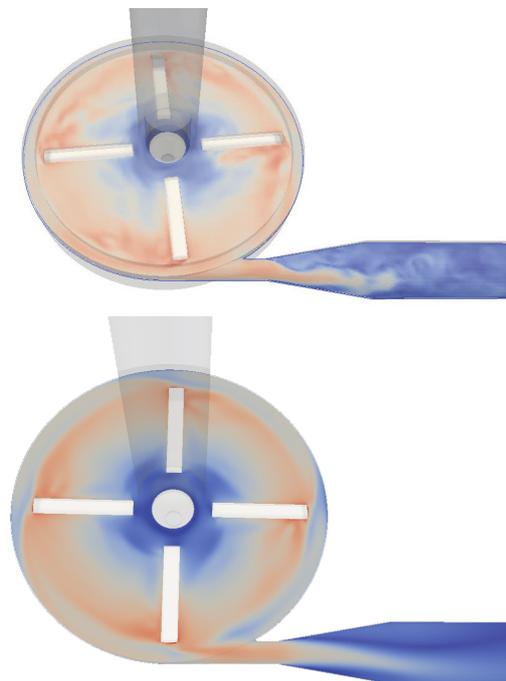


Figure: Sample hierarchy for flow system with rotating components: Fully-resolved moving mesh (ALE, top) vs. averaged steady (MRF, bottom).

Your profile

- Master's degree in computational or mechanical engineering, applied mathematics, or a similar subject with a superior academic record.
- Programming experience in Fortran or C++ as well as parallelization (MPI or OpenMP) are of advantage.
- Familiarity with UNIX operating systems would be ideal.
- We expect you to contribute to general tasks at the institute, such as teaching and advising master or project theses.
- Language skills in German are not required.
- Excellent communication skills in English are mandatory: TOEFL or equivalent evidence of English-speaking skills.
- A high level of scholarship as indicated, for example, by bachelor and master study transcripts and two reference letters.
- Outstanding organizational skills and the ability to work independently.
- Very good cooperation and communication skills and ability to work as part of a team.

Our offer

The candidate will be employed as a regular employee and must meet required personal qualifications. This is a full-time position with salary according to German civil service pay scale TV-L E 13 (ca. 4000 euros/month before taxes). The expected appointment period is three years, with an initial appointment for one year.

At our chair, we consider serious and reliable research an important task. At the same time, we can offer you to become part of a very social and well-functioning team of over 20 scientific staff members. Especially for international students, open doors and regular social events help become acquainted with the German culture quickly. Furthermore, we can assure you that we will support your personal development in all ways possible, thus giving you a good starting point for a future career in both academia or industry. Feel free to contact us for further information!

The HDS-LEE graduate school offers

- Unique graduate school program
- Chance of participating in (international) conferences
- Continuous scientific mentoring by your scientific advisor
- Further development of your personal strengths, e.g. via a comprehensive further training program

Apply to and contact for further information: Marek Behr, phone +49 241 80 99900,
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Apply until: August 31, 2021

Starting date: November 1, 2021