PHD RESEARCHER POSITION
(m/f/d, 100%, E13 TV-L, temporary until 31/12/2025) on the topic

"Combining imaging, physics and analysis for rheological experiments"

The University of Stuttgart represents outstanding, world-renowned research and first-class teaching in one of Europe's most dynamic industrial regions. As a reliable employer, the university supports and promotes the academic careers of its researchers. It is proud of its employees, who currently come from over 100 different countries. The university is a partner for knowledge and technology transfer and focuses on multidisciplinarity.

The Cluster of Excellence "Data-Integrated Simulation Science" (EXC 2075) is an interdisciplinary research center with more than 200 scientists of different ages, gender identities, nationalities and different subject areas, jointly performing research towards a common goal: We target a new class of modeling and computational methods based on available data from various sources, in order to take the usability, precision and reliability of simulations to a new level.

The project / The position:

This position is funded by the Cluster of Excellence EXC 2075 and is part of the Project Network 1 „Data-Integrated Models and Methods for Multiphase Fluid Dynamics".

Imaging modalities, such as computerized tomography (CT), are concerned with recovering information about the interior structure of a studied object in a non-invasive way. In modern applications, they are increasingly utilized to visualize structural changes of a specimen, e.g. fluid flow in porous media, the behaviour of materials during tensile tests or under rheological experiments. From the recovered series of images, the goal is to study and analyze the underlying physical process. For this to be possible, a high spatial and temporal resolution needs to be achieved by the imaging process, which in turn requires suitable data acquisition protocols and reconstruction algorithms.

Motivated by rheology and the issue of imaging fast fluids, this project addresses the problem of image reconstruction when high spatial and/or temporal resolution data are not possible. To this purpose, data-driven techniques, offering a flexible framework to deal with the inherent limitations in the data, shall be combined with a physical process, such as the optical flow equation and microlocal analysis. The latter is a powerful tool to understand, analyze and characterize the singularities in the data and in the reconstruction.

You will be a member of Prof. Bernadette Hahn-Rigaud's working group "Optimization and inverse Problems" at the Institute of Mathematical Methods in Engineering, Numerical Analysis and Geometric Modeling (IMNG).

Your tasks:

- Characterization and estimation of temporal deformations in 4D CT-datasets
- Development of reconstruction strategies for the dynamic scenario
- Enhancement based on microlocal analysis and application to rheology
- Close collaboration with our project partner Prof. Dr. Holger Steeb
- Publication of research results
- Active participation in SimTech events (Status seminars, Project Network meetings, further events)

Your qualifications:

- Very good Master degree in mathematics, natural sciences, engineering or a related field, ideally having written the master thesis in the area of applied mathematics.
- You have thorough knowledge in one or more of the following mathematical subjects:
  - Inverse problems
  - Image reconstruction
  - Dynamic modelling
  - Big Data
  - Machine Learning
- Previous experience in at least one of the following programming languages: Python, MATLAB, or C++
- You are motivated to work in an interdisciplinary project team
- Proficiency in English is required, knowledge in German is welcome but not compulsory
- We search for an open-minded person with good communication skills

We offer:

- An inspirational and supportive research environment at the Cluster of Excellence SimTech with ample networking opportunities
- A nationally and internationally well-connected research group
- Fully funded conference visits and a fully funded research stay abroad
- Diverse and responsible tasks in a growing interdisciplinary and intercultural team
- You will be part of the SimTech Graduate School
- Training programs to support your first steps as an early career scientist

Please submit your application in English or German (motivation letter, curriculum vitae, transcript of records and names of 2 references) via the JoinUS portal (https://careers.uni-stuttgart.de/) **until January 20th, 2023.** If you have any questions regarding this application, please contact us via Bernadette.Hahn@imng.uni-stuttgart.de. Please be aware that we cannot reimburse any costs arising from the performance of job interviews.

At the University of Stuttgart and the Cluster of Excellence EXC 2075, we actively promote diversity among our employees. We have set ourselves the goal of recruiting more women scientists and employing more people with an international background, as well as people with disabilities. We are therefore particularly pleased to receive applications from such people. Regardless, we welcome any good application.

Women who apply will be given preferential consideration in areas in which they are underrepresented, provided they have the same aptitude, qualifications and professional performance. Severely disabled applicants with equal qualifications will be given priority.

As a certified family-friendly university, we support the compatibility of work and family, and of professional and private life in general, through various flexible modules. We have an employee health management system that has won several awards and offers our employees a wide range of continuing education programs. We are consistently improving our accessibility. Our Welcome Center helps international scientists get started in Stuttgart.

Information in accordance with Article 13 DS-GVO on the processing of applicant data can be found at https://careers.uni-stuttgart.de/content/privacy-policy/?locale=en_US