

(POST-) DOCTORAL RESEARCHER IN “Bayesian treatment of model inexactness in dynamic inverse problems”

(m/f/d, 100%, TVL-E13, temporary until 31/12/2027)

The project & your career perspective:

This position is funded by the Cluster of Excellence EXC 2075 and is part of the Project Network „Bayesian Inference for Stochastic Models: Generalized Methods for Forward and Backward Uncertainty Quantification (Bayes 2.0)“.

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 many medical or industrial applications, the quantity of interest changes during the data acquisition. Thus, the actual image reconstruction step requires suitable a priori information on the dynamics. This can be incorporated explicitly, e.g. via diffeomorphic motion models, or implicitly by interpreting motion as an inexactness in the forward model. Conventional approaches treat such model deviations deterministically, ignoring their stochastic nature and hindering uncertainty quantification.

This project develops a Bayesian framework for inverse problems with inexact forward operators. Model inexactness will be interpreted first as a random variable and then as a stochastic process to capture time-dependent deviations. The main goal of the project is to explore suitable priors for both the unknown and the model error, and to develop computationally feasible approaches for posterior exploration.

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:

- Stochastic modeling of model inexactness
- Derivation of priors for unknown parameters and model error, e.g. based on physical constraints
- Development of efficient posterior exploration methods and dimension reduction techniques, e.g. via likelihood-informed subspaces
- Close collaboration with our network partners
- Publication of research results
- Active participation in SimTech events (Status seminars, Project Network meetings, further events)

Your qualifications (don't hesitate to apply – enthusiasm can compensate some gaps):

- Very good Master's degree or PhD in mathematics, natural sciences, engineering or a related field, ideally having written the master's or doctoral thesis in the area of applied mathematics
- You have thorough knowledge in one or more of the following mathematical subjects:
 - Inverse problems
 - Bayesian statistics
 - Stochastic processes
 - Uncertainty quantification
- Experience with programming languages and frameworks for Bayesian modeling and uncertainty quantification, e.g. Python or C++/Julia
- 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 (looking for anything else? Ask us!):

- 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

The University and the Cluster of Excellence:

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 multidisciplinary.

The Stuttgart Center for Simulation Science (SC SimTech) constitute a long-standing prime example of establishing and structurally supporting interdisciplinary research. SC SimTech serves as the institutional backbone of the EXC 2075. The SC SimTech, including the 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.

Diversity and work-life balance:

At the University of Stuttgart, 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.

Application procedure:

Please apply via the career portal of the University of Stuttgart and submit your complete application, including one-page motivation letter, academic CV, one letter of reference, as well as academic certificates, **until December 8th, 2025**. The starting date is negotiable. If you have any questions regarding this application, please contact us via Bernadette.Hahn@imng.uni-stuttgart.de.

Information in accordance with Article 13 DS-GVO on the processing of applicant data can be found [here](#).