Postdoc Position on Physics-informed Generative Modeling and Multiscale Learning (m/w/d)

Professorship of Data-driven Materials Modeling

Department of Engineering Physics and Computation - Technical University of Munich

email: contmech@mw.tum.de

A post-doctoral position is available in **Physics-informed Generative Modeling and Multiscale Learning**. The successful candidate will work at the interface of physics-based modeling and probabilistic machine learning, tackling problems that arise in molecular systems and heterogeneous materials. The research combines generative probabilistic frameworks with the mathematical structure of the governing physics, addressing challenges that standard machine learning approaches cannot resolve due to high dimensionality, physical invariances, and the scarcity of data relative to the complexity of the systems involved.

In terms of **Physical Modeling**, this particular position requires experience in one or more of the following areas:

- Molecular dynamics and statistical mechanics of atomistic systems
- Continuum thermodynamics and numerical methods for PDEs, with applications to heterogeneous and multiscale media

In terms of **Computational and Data-driven Modeling**, this particular position requires experience in one or more of the following areas:

- Variational inference and generative modeling (e.g. normalizing flows, VAEs, diffusion models)
- Numerical solution of (stochastic/deterministic) PDEs/ODEs, including multiscale and homogenization methods
- Fundamentals of probability and statistics with preference given to candidates with experience in Bayesian formulations
- Scientific programming (independently of language)

The Professorship of Data-driven Materials Modeling is part of the Department of Engineering Physics and Computation in the School of Engineering and Design at the Technical University of Munich. The research efforts of the group target open problems in the predictive modeling of materials and molecular systems: how does microstructure dictate macroscopic material behavior, how

can we design materials with targeted properties under uncertainty, and how do atoms collectively reorganize across vastly different timescales? Addressing these questions requires methods that go well beyond standard machine learning, embedding physical laws, symmetries, and probabilistic reasoning directly into the learning framework. Interested candidates should consult our latest work here.

What to expect:

- The postdoc will have significant autonomy in shaping their research agenda within the group's thrusts, including the opportunity to develop independent research proposals and pursue their own scientific directions.
- There will be close daily interaction with Prof. Koutsourelakis and PhD students in the group.
- Opportunities to co-supervise PhD students and to collaborate with researchers at TUM and at partner institutions internationally.
- The position offers the opportunity to present work at leading international conferences and workshops.

Qualifications:

Candidates should be proficient in scientific computing and probabilistic modeling and should have a Ph.D. by the time of appointment in any Engineering discipline, Applied Mathematics/Statistics, Computational Physics, or Machine Learning. Experience in generative modeling, or multiscale numerical methods is very desirable.

Interested candidates should apply by emailing **Prof. P.S. Koutsourelakis** at the following address:

contmech@mw.tum.de

with the Subject: **Postdoc Position — Physics-informed Generative Modeling and Multiscale Learning** and include (in PDF format):

- A CV with the names of up to three references.
- A statement of research experience, interests and goals. This should describe **specific instances of physics-informed machine learning that you have worked on. Generic statements that do not address these matters will result in the automatic rejection of the application without further consideration.**
- Up to 3 indicative publications/preprints.

Evaluation of applications will start immediately. The initial contract duration will be up to 2 years and will depend on the candidate's qualifications. The salary is in accordance with the German public service salary scale (100% TV-L E13). Teaching duties will be in accordance with TUM

regulations. TUM is an equal opportunity employer. TUM aims to increase the proportion of women and therefore particularly welcomes applications by women. Applicants with severe disabilities will be given priority consideration given comparable qualifications.

As part of your application for a position at the Technical University of Munich (TUM), you submit personal data. Please note our privacy policy in accordance with Art. 13 General Data Protection Regulation (DSGVO) http://go.tum.de/554159 for the collection and processing of personal data in the context of your application. By submitting your application, you confirm that you have read the privacy notice of TUM.