

PhD position:  
**Simulation of hydrogen combustion with  
machine learning approaches.**

The Institute for Simulation of Reactive Thermo-Fluid Systems (STFS, [www.stfs.tu-darmstadt.de](http://www.stfs.tu-darmstadt.de)) at the University of Technology Darmstadt invites applications for a position as a **research assistant (PhD position)** to be filled as soon as possible.

In the Simulation and Data Laboratory Energy Conversion of the National High Performance Computing Center for Computational Engineering Sciences (NHR4CES<sup>1</sup>), the Institute STFS together with the Institute for Technical Combustion (ITV, RWTH Aachen University) develops algorithms and methods for simulations of energy conversion processes on high-performance computers. High-performance simulation methods for fluid flows are coupled with new approaches from artificial intelligence (AI) such as machine learning. The research results contribute directly to the rapid realization of the energy transformation.

In June 2020, the German government announced the National Hydrogen Strategy. The goal is the widespread use of hydrogen as an energy carrier. The advantage over conventional fossil fuels (natural gas, petroleum) lies in its CO<sub>2</sub>-free combustion. Hydrogen is therefore suitable as the fuel of the future. The combustion of hydrogen differs significantly from other fuels due to its thermophysical properties, e. g. low density and high diffusivity. This poses special challenges for modeling. In order to exploit the potentials of artificial intelligence (AI) in this context, hybrid (physical-KI) approaches for high-performance computing are being developed at the Institute STFS.

Simulation reaktiver  
Thermo-Fluid Systeme

Simulation of reactive Thermo-  
Fluid Systems



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<sup>1</sup> <https://www.nhr4ces.de/>

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**Key tasks:**

The position holder is expected to work on AI-based modeling and 3D simulation of hydrogen flames. For the model development and the 3D simulations, a powerful software environment based on OpenFOAM and PyTorch is available at the department. The department STFS with more than 25 scientific staff members is specialized in modeling and simulation of thermo-fluid dynamics. The position holder will be closely involved in this dynamic structure.

**Requirements:**

Applicants should have a degree in mechanical engineering, computational engineering, techno-mathematics, process engineering or equivalent. We are looking for applicants with a very good M.Sc. degree who are characterized by their ability to work in a team, creativity, independence of action and communication skills. Programming skills (preferably C++) are required. English language skills are required. Knowledge and experience in the following areas are desirable:

- Numerical thermo-fluid dynamics (CFD) and / or combustion
- OpenFOAM
- Python

Applications should be sent with the usual documents to Prof. Dr.-Ing. Christian Hasse, Simulation of Reactive Thermo-Fluid Systems, Otto-Berndt-Str. 2, 64287 Darmstadt, Germany, or by e-mail to [sekretariat@stfs.tu-darmstadt.de](mailto:sekretariat@stfs.tu-darmstadt.de).