

Helmholtz-Zentrum Dresden-Rossendorf e.V.



With cutting-edge research in the fields of ENERGY, HEALTH and MATTER, around 1,500 employees from more than 70 nations at Helmholtz-Zentrum Dresden-Rossendorf (HZDR) are committed to mastering the great challenges facing society today. The Institute of Resource Ecology performs research to protect humans and the environment from hazards caused by pollutants resulting from technical processes that produce energy and raw materials. The Department of Thermodynamics of Actinides is looking for a PhD Student (f/m/d) - Machine Learning for Modelling Complex Geochemical Systems. The job posting is subject to approval of the associated third-party funded project.

PhD Student (f/m/d) - Machine Learning for Modelling Complex Geochemical Systems

City: Dresden; Starting date (earliest): 01/03/26; Duration: 36 Months;

Remuneration: TVöD-Bund; Reference number: 2025/133; Closing date: 21/11/25

Working field

You will help modelling complex geochemical systems, which are typically limited by extremely high computational demands. To break this bottleneck and cut simulation time by orders of magnitude, you will design and implement surrogate models that learn the behavior of full-physics codes using modern machine-learning techniques. These surrogates will be tuned for rapid, uncertainty-aware predictions and integrated into decision-support tools for deep geological repositories of nuclear waste—one of the most pressing challenges facing modern societies.

Specifically, the tasks are:

- Identify state-of-the-art machine-learning (ML) methods that can be applied to geochemical systems in geological contexts
- Assess these methods for traceability, robustness, and physicochemical correctness
- Implement and adapt the most promising algorithms to model radionuclide migration in crystalline host rocks
- Execute proof-of-concept ML simulations and perform a risk analysis of the resulting model outputs
- Present your scientific results at conferences, workshops, and seminars, and publish the work in peer-reviewed journals
- Collaborate with project partners at CASUS (HZDR), TU Bergakademie Freiberg, and TU Darmstadt

Requirements

- Completed university studies (Master/Diploma) in the field of Chemistry, Chemical

Engineering, Environmental Chemistry, Data Sciences, Geosciences or related field

- Possess a solid background in geochemical processes (e.g., sorption, speciation, radionuclide transport)
- Complement the chemical expertise with some experience in machine-learning or data-analytics tools
- High-level programming skills (Python, R, Julia) to build, test, and optimize models of geochemical systems
- Interest in large-scale computational simulations (e.g., reactive transport, sorption processes)
- Capability to work in a structured, solution-oriented manner, demonstrating analytical thinking and a strong commitment to project goals
- Motivation to work collaboratively in an interdisciplinary and international team-oriented environment
- Excellent communication skills in English

What we offer

- A vibrant research community in an open, diverse and international work environment
- Scientific excellence and extensive professional networking opportunities
- A structured PhD program with a comprehensive range of continuing education and networking opportunities - more information about the PhD program at the HZDR can be found [here](#)
- Salary and social benefits in accordance with the collective agreement for the public sector (TVöD-Bund) including 30 days of paid holiday leave, company pension scheme (VBL)
- We support a good work-life balance with the possibility of part-time employment, mobile working and flexible working hours
- Numerous company health management offerings
- Employee discounts with well-known providers via the platform Corporate Benefits
- An employer subsidy for the "Deutschland-Ticket Jobticket"

Application

We look forward to receiving your application documents (including cover letter, CV, diplomas/transcripts, etc.), which you can submit via our online-application-system: <https://www.hzdr.de/db/Cms?pNid=490&pLang=en&pOid=75810>

More information at <https://stellenticket.de/198803/TUBS/>
Offer visible until 15/11/25

