

GEOMAR Helmholtz Centre for Ocean Research Kiel is a foundation under public law jointly financed by the Federal Republic of Germany (90%) and the State of Schleswig-Holstein (10%). It is one of the internationally leading institutions in the field of marine research.

Through our research and our commitment to the transfer of knowledge and technology, we contribute significantly to the preservation of the function and protection of the ocean for future generations.

The research unit Marine Geodynamics of the research division Dynamics of the Ocean Floor is offering a position as a

Doctoral researcher (m/f/d)
in Computer Science and Marine Data Science in the
project “*Combining smart underwater monitoring systems*
***with cloud-based digital twins*”**

starting at the earliest possible date. The position offers the possibility to attain a doctoral degree in computer sciences as member of the graduate school “Helmholtz School for Marine Data Science” (MarDATA). MarDATA aims to define and educate a new type of “marine data scientists” by introducing and embedding researchers from computer sciences and mathematics into ocean sciences, covering a broad range from supercomputing and modelling, (bio)informatics, robotics, to statistics and big data methodologies. Education of doctoral researchers in joint block courses, international summer schools and colloquia goes beyond a single discipline towards genuine scientific insight into and a more systematic treatment of marine data. (<https://www.mardata.de/>)

Job Description

The transition of the energy sector to renewable sources like offshore wind and the submarine CO₂ storage are imperative for meeting greenhouse gas emission targets. However, implementing these technologies at an industrial scale presents challenges like safeguarding marine ecosystems, managing conflicts with established economic sectors, and addressing the increasing vulnerability of coastal communities to climate change impacts and environmental stressors and natural hazards. To effectively address these challenges, underwater observation capabilities need to be made available to a large user base, which requires novel, easy-to-use and cost-effective approaches. In this project, we focus on the application of resource-efficient embedded machine learning in distributed sensor networks for submarine monitoring and data acquisition systems. While remarkable progress has been made in terrestrial Internet of Things (IoT) applications, underwater monitoring is currently mainly performed by passive, unconnected sensor platforms that are incapable of performing autonomous monitoring tasks, required to meet the ever-increasing demand for real-time underwater data. Target applications include (1) tracking of ships, whales, and other marine life, (2) measuring of underwater noise and pollution, (3) monitoring and early warning for geological and environmental hazards, and (4) monitoring of underwater infrastructure and operations.

This is a joint research project of GEOMAR and the Institute of Computer Science at Kiel University. The PhD student will work at the interface between computer science, data science and marine geosciences, but will have a research focus on the computer science aspects. The overarching research question of the PhD thesis will be **how to develop machine learning models and communication protocols to save resources while ensuring accuracy and reliability in distributed computing systems, and how to effectively use digital twin**

simulations to fine-tune our models.

Our approach to bridge the gap and to enable smart, underwater sensor networks is based on devising resource-efficient on-device machine learning algorithms for automated data analysis and event detection. Building on algorithms for embedded machine learning, the project will develop networks of intelligent and interconnected underwater sensor devices that collaboratively monitor the environment, detect events and send out early warnings. Via gateway communication buoys at the sea surface or cabled connections, we allow data transfer from the submarine environment to onshore. This enables devising a cloud-based digital twin, which will constantly monitor the system for concept drift and using online-learning, will fine-tune our machine learning models during deployment. Our envisioned approach enables AI-driven event detection and system characterization in distributed sensor networks, offering significant potential for seafloor-based monitoring and early warning systems for submarine environmental and geological hazards, as well as monitoring sub-seafloor operations.

QualificationRequired:

- a Master's degree (or equivalent) in Computer Science or a related field by the beginning of the project with a focus on Networked, Distributed and/or Embedded Systems.
- knowledge in Data Science and Artificial Intelligence is a requirement
- fluently in spoken and written English
- experience in software development in C/C++, Python, or related programming languages

Desired:

- interest or experience in one or more of the fields of (marine) geoscience and electronic engineering
- willingness to participate in coastal and sea-going expeditions

At a workplace, directly on the Kiel Fjord with many leisure and recreational opportunities, we offer you:

- Good conditions for work-life balance: We offer, among other things, the possibility of mobile working and individual working time arrangements, vacation courses for the children of our employees, and good support in finding a place in a daycare center at the Kiel site
- Support services for professional and personal life situations
- An exciting work environment with the opportunity to provide important impetus for the development of sustainable solutions
- Exciting topics in an international environment
- Work in the field of marine and climate research, a forward-looking area with social significance
- 30 vacation days + additional time off at Christmas Eve and New Year's Eve
- Company pension plan and capital-forming benefits

The position is available for a funding period of three years. The salary depends on qualification and could be up to the class 13 TVöD-Bund of the German tariff for public employees. This is a full-time position. The position can not be split. The fixed-term contract shall comply with Section 2 Paragraph 1 of The Act of Academic Fixed-Term Contract (German WissZeitVG).

GEOMAR Helmholtz Centre for Ocean Research Kiel seeks to increase the proportion of

female scientists and explicitly encourages qualified female academics to apply. GEOMAR is an equal opportunity employer and encourages scientists with disabilities to apply. Qualified disabled applicants will receive preference in the application process.

Please send your application for this post **not later than October 2nd, 2024** under the following link:

[Online application](#)

As soon as the selection procedure has finished, all your application data will be removed according to data protection regulation.

For further information regarding the position and research unit please contact Dr. Jens Karstens (ikarstens@geomar.de) or Prof. Dr. Olaf Landisiedel (ol@informatik.uni-kiel.de).

We will answer all your questions if you send us an e-mail to bewerbung@geomar.de. In doing so, please refer to the keyword “MarDATA – Smart Networks”.

For further information on GEOMAR Helmholtz Centre for Ocean Research Kiel or the Helmholtz Association, please visit www.geomar.de or www.helmholtz.de.

GEOMAR is committed to an objective and non-discriminatory personnel selection. Our job advertisements address all people. We expressly renounce the submission of application photos.



The TOTAL E-QUALITY award is presented to GEOMAR for efforts in terms of human resource management aimed at providing equal opportunity.