
GEOMAR Helmholtz Centre for Ocean Research Kiel is a foundation of public law jointly financed by the Federal Republic of Germany (90 %) and the state of Schleswig-Holstein (10 %) and is one of the internationally leading institutions in the field of marine sciences. Currently GEOMAR disposes over an annual budget of approx. 80 million Euro and has approx. 1000 employees.

The research unit Ocean Dynamics of the research division Ocean Circulation and Climate Dynamics is offering a position as

**Doctoral researcher (m/f/d) MarDATA11
in Computer Science and Marine Data Science in the
project “Neural networks reveal evolving patterns of
ocean carbon uptake”**

preferably starting on September 1st, 2021.

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), financed by the Helmholtz Association. 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/>)

Project Description

The ocean plays a crucial role in absorbing atmospheric carbon and thus in counteracting anthropogenic climate change. The evolving patterns of the ocean carbon uptake depend on complex relationships with physical, chemical, and biological processes. Owing to the non-linear relations, identifying patterns and robust relationships between changing carbon uptake and its drivers is a challenge. In this project, artificial neural networks (ANNs) will be examined to train the relation between the regional patterns of ocean carbon uptake (simulated by an Earth System Model) and their main bio-physical drivers. A clustering algorithm will first be used to define a discrete set of biogeochemical provinces. For each biogeochemical province, ANNs will then be used to reconstruct the non-linear relationship between the input variables, i.e. the physical drivers, and the target, i.e. ocean carbon uptake. A novel aspect of the project, which is currently a topic of intense research in deep machine learning, will be the incorporation of the prior (domain expert) knowledge from the Earth System Model simulations into the ANNs. The project will explore methods to model the expert knowledge (e.g. using Knowledge Graphs) and to integrate this expert knowledge into the learning procedure. The derived set of relations will be applied to historical observations in order to provide an additional estimate of the – otherwise sparsely observed – air-sea CO₂ flux.

This is a joint research project of GEOMAR and the Department of Computer Science at Kiel University. The PhD student will work at the interface between Computer Science, Data Science and Marine Sciences, but will have a research focus on the Computer Science aspects. Supervision will be jointly provided by Prof. Dr. Peer Kröger (CAU Kiel and Munich Center for Machine Learning), Dr. Lavinia Patara (GEOMAR) and Prof. Dr. Arne Biastoch (GEOMAR).

Qualification

Required:

- University degree (MSc., Diploma or equivalent) in Computer Science, Applied Mathematics/ Statistics, Data Science or related at the time of employment
- Be able to communicate fluently in spoken and written English

If the required degree is not completed at the time of application, the degree certificate must be handed in before the above start date of the contract and the application must contain plausible evidence that the degree can be finished before that date

Desired:

- Practical experience in working with ANNs
- Experience with data analysis and visualisation
- Motivation to work at the interface between Computer Sciences and Marine Sciences
- Willingness to work in an interdisciplinary team
- Scientific writing and communication skills

The position is available for a funding period of 36 months. 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 cannot be split. Flexible working time models are generally possible. 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 via email **in a single pdf-file** mentioning the keyword "**MarDATA-OceanCarbon**" in the subject line. Please send your application not later than **July 25, 2021** to the following email address:

bewerbung@geomar.de

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 units please contact Dr. Lavinia Patara (lpatara@geomar.de) and Prof. Dr. Peer Kröger (pk@informatik.uni-kiel.de).

Please do not contact us by phone about the present state of procedures. However, 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.

GEOMAR is a member of the Helmholtz Association and the German Marine Research Consortium (KDM). For further information 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.