

2-year research position on Deep Learning and Oceanography

Supervisor: R. Fablet (IMT Atlantique, Lab-STICC)

Hosting team: IMT Atlantique, INRIA Odyssey team, Brest

Duration: 2-year postdoc position, possibly extended to a three-year position

Expected starting date: fall 2024

Keywords: ocean modelling and forecasting, deep learning, ocean data assimilation

Context and objectives. This position is open in the framework of AI Chair Oceanix (<https://cia-oceanix.github.io/>). It will be hosted on IMT Atlantique campus in Brest by the newly created INRIA team Odyssey (<https://team.inria.fr/odyssey>).

Recent developments in artificial intelligence (AI) open many interesting opportunities in the context of operational oceanography and ocean forecasting systems. Current operational forecasting systems face important challenges. Ocean models and data assimilation methods, which are the scientific underpinning of these operational systems, are highly computationally-demanding when addressing large ensemble simulations with increasingly fine spatial resolution and their ability to fully exploit available data sources remains limited. Deep learning and differentiable programming are opening many opportunities in computational fluid dynamics and ocean science (Vinuesa and Brunton, 2021; Zanna and Bolton 2021) as well as to solve inverse problems (Cranmer et al. 2021; Fablet et al. 2021, Hatfield et al., 2021). Deep learning especially benefits GPU acceleration as well as from an application-centric viewpoint to better address specific application-dependent requirements.

The open position will contribute to the uptake of deep learning paradigms and technologies for the deployment of digital twins of the ocean.

Skills: Applications are encouraged from candidates with a Ph.D in applied math/machine learning/data assimilation with interest in ocean science or a Ph.D in ocean science and a strong interest in deep learning. Candidates should have a strong interest and commitment to research. Creativity with an aim towards independent research is highly emphasized.

We also invite applications from candidates with an engineer degree and a strong interest in ocean science research.

Application: Send CV, statement of research interests and the contact information of at least two references to ronan.fablet@imt-atlantique.fr. Review of applications will begin immediately and continue until the position is filled.

Specs: The position will initially be funded for a 2-year period and could be renewed upon scientific outcome and funding availability. The net annual salary will range from 30,000€ to 36,000€ per year depending on experience.

References

Fablet, R. et al. (2021). Learning variational data assimilation models and solvers. *JAMES*, 13(10). <https://doi.org/10.1029/2021MS002572>

Hatfield, S. et al (2021). Building Tangent Linear and Adjoint Models for Data Assimilation With Neural Networks. *JAMES*. <https://doi.org/10.1029/2021ms002521>

Kochkov, D. et al, S. (2021). Machine learning–accelerated computational fluid dynamics. *PNAS*, 118(21), e2101784118. <https://doi.org/10.1073/pnas.2101784118>

Vinuesa, R., & Brunton, S. L. (2021). The potential of machine learning to enhance computational fluid dynamics. *ArXiv:2110.02085 [Physics]*. <http://arxiv.org/abs/2110.02085>

Zanna, L., & Bolton, T. (2021). Deep learning of unresolved turbulent ocean processes in climate models. In G. Camps Valls, D. Tuia, X. X. Zhu, & M. Reichstein (Eds.), *DL for the Earth Sciences*. <https://doi.org/10.1002/9781119646181.ch20>