PhD – Machine Learning-based Ocean Forecasting

[**School**](https://www.universityofgalway.ie/colleges-and-schools/) **of Engineering**

**JOB ADVERTISEMENT**

Applications are invited from suitably qualified candidates for a full-time, 4-year PhD scholarship in the area of machine learning-based ocean forecasting starting in April 2025. The successful candidate will be based in the [Civil Engineering](https://www.universityofgalway.ie/engineering-informatics/civil-engineering/) in the College of Science and Engineering at the University of Galway, Ireland.

The position is funded by the Irish Marine Institute through the Cullen Fellowship Programme. The candidate will be co-supervised by [Dr Stephen Nash (University of Galway)](https://www.universityofgalway.ie/our-research/people/engineering/stephennash/) and Dr Tomasz Dabrowski (Marine Institute).

**University of Galway**

Located in the vibrant cultural city of Galway in the west of Ireland, the University of Galway has a distinguished reputation for teaching and [research excellence](https://www.universityofgalway.ie/our-research/).

For information on moving to Ireland please see [www.euraxess.ie](http://www.euraxess.ie)

**Detailed Project Description.**

The aim of this project is to investigate the potential for machine learning-based ocean forecast models. Ocean forecast models provide forecasts of ocean variables such as sea surface height (SSH), temperature, salinity and currents and thus play a significant role in human marine activities and the protection of marine and coastal communities. Currently, dynamic, process-based numerical models are used for ocean forecasting, but they are complex and computationally expensive.

The Marine Institute currently produces daily 3-day ocean forecasts for Irish waters using the dynamic ocean model ROMS (the Regional Ocean Modelling System) which covers a domain measuring approx. 1,500 x 2,200 km using a mean horizontal resolution of 1.9 km and 40 terrain-following vertical layers. It produces forecasts of ocean temperature, salinity, sea level and currents. Due to its size and high spatial resolution (circa 1 km near the Irish coastline), the model is very computationally expensive. Recent literature shows that machine learning models can provide an alternative to traditional dynamic numerical models, potentially achieving higher accuracy and shorter run-times.

This PhD will focus primarily on the development of a machine learning-based ocean forecast model for Irish waters and benchmark its performance against Marine Institute’s current dynamic ocean forecast model. The candidate’s duties will therefore include identification of appropriate machine learning algorithms, preparation of training and testing datasets, training, testing and optimisation of machine learning models and benchmarking of model performance.

The candidate is expected to have a great ability of self-learning, very good teamwork skills and to be self-motivated. The candidate should have great interest in computational modelling and computer programming as well as a good background in machine learning. An interest in ocean modelling is also desirable. The candidate will be part of the Marine Modelling Group at University of Galway and will also work closely with staff from the ocean modelling unit in Marine Institute.

**Living allowance (Stipend):** €25,000 per annum, [scholarship award]

**University fees**: Covered by the scholarship in addition to stipend

**Travel Allowance:** up to €3,000 per annum

**Start date**: 7th April, 2025

**Academic Entry Requirements:** 1st class or 2.1honours Bachelor’s or Master’s degree in Ocean Engineering, Computing or a closely related discipline (e.g. civil or coastal engineering). Candidates must possess excellent written and verbal communication skills in English and a strong passion and motivation for research excellence, with a view to publication of their work in scientific journals and at international conferences. Candidates must also possess excellent project management skills and be motivated to work within a team to achieve overall project objectives.

Some specific requirements include:

* Knowledge of computer programming (using such as C++, Python etc.)
* Knowledge of, and ideally experience working with, machine learning models
* Knowledge of (and ideally experience with) computational modelling for oceanographic or fluid dynamics problems
* Problem-solving, critical thinking and troubleshooting skills.

**To Apply for the Scholarship:** Expressions of interest comprising submission of a covering letter, CV, statement of personal research interests, and the contact details of two referees, to be submitted via e-mail to stephen.nash@universityofgalway.ie with the subject title Cullen PhD Fellowship 2025.

**Contact Name:** Dr Stephen Nash

**Contact Email:** stephen.nash@universityofgalway.ie

**Application Deadline:** 7th February, 2025 at 17:00

**Primary Supervisor name**: Dr Stephen Nash (with Dr Tomasz Dabrowski of Marine Institute.

