Research Engineer/Post doctorate position
Deep learning for marine megafauna monitoring from acoustic data

https://www.france-energies-marines.org/nous-rejoindre/

N/Ref: *FEM_SAS_2022_324*

France Energies Marines institute

France Energies Marines is the French Institute for Energy Transition dedicated to offshore renewable energies. Its mission: to define, set-up and apply a scientific and technical framework necessary to remove the obstacles facing this rapidly developing sector. With a multidisciplinary team of 60 employees and a model of public-private collaboration, the Institute has one purpose: R&D, whether collaborative or carried out as part of a service activity. France Energies Marines provides support for the various offshore renewable energy technologies by relying on four cross-disciplinary and complementary R&D programmes: site characterisation, design and monitoring of systems, environmental integration and farm optimisation.

Of the four main programs around which R&D projects are conducted at FEM, the « Environmental Integration of ORE » has two main objectives: to identify the real ecological and socio-economic challenges posed by the different phases of the ORE projects, and to develop tools and methodologies to measure, qualify, analyze and predict the environmental and socio-economic impacts of ORE.
In order to meet these objectives, the research program covers a wide spectrum of R&D themes in environmental, biological and socio-economic fields, including habitat modifications, benthic ecology, marine megafauna (including seabirds and marine mammals), fisheries, human activities / uses at sea, etc.

Context and objectives

The post doctorate will work in the « Environmental Integration of ORE » Program and contribute to the OWFSOMM project, which aims to standardise tools for monitoring marine megafauna at the scale of offshore windfarms.

Offshore wind has emerged as one of the most dynamic technologies in the energy mix and is rapidly expanding. Offshore windfarms may have impacts on marine megafauna, impacts that have to be estimated and reduced in the context of environmental policies. For any offshore wind farm, monitoring of marine megafauna is thus crucial at each step from consenting to construction and operation. Environmental platforms at sea are being increasingly developed and deployed to monitor various environmental parameters, together with monitoring the marine megafauna. Each sensor has its own limitations and data are usually post-processed with the help of data catalogues used to label and identify species, behaviour, etc. With the significant breakthrough of Artificial Intelligence, especially with deep neural networks (e.g. recurrent and/or convolutional), automatization of these monitoring processes have become a realistic objective as well as crucial to deal with continuous recordings and large datasets.
This R&D proposal is part of the OWFSOMM project (Offshore Wind Farm Surveys of Marine Megafauna: standardization of tools and methods for monitoring at OWF scales) among several academic research laboratories and industrial partners. One of the work-packages of this project is to develop deep learning frameworks for automatic detection of megafauna using multimodal data with the final aim of estimating high-level ecological indicators. Among several data sources, underwater

passive acoustic signals appear to be the most significant ones that should be exploited within the automatic detection framework.

Preliminary works have been conducted to develop deep networks for marine mammal detection based on spectrograms generated from acoustic data. Current results show that this approach is promising and needs deeper investigation to provide more fruitful results. Therefore, the objective of this proposal is to design effective deep learning models that could improve the detection and classification of marine megafauna. In this context, advanced deep models based on supervised, semi-supervised as well as self-supervised learning will be considered to adopt the best solution.

Job description

In order to address the afore mentioned objectives, a tentative work program is given below.

- Bibliographical study of deep learning-based methods for marine mammal detection and classification using spectrograms from acoustic data.

- Evaluation and benchmarking of state-of-the-art methods.
- Improvement of existing solutions (including the current in-house methods developed by the team) and development of new models based on supervised/semi-supervised learning approaches.

- Dissemination: recommendation report to the ORE sector, publication, source codes.

The successful candidate will join the team "Environmental Integration of ORE" of France Energies Marines (FEM) in Brest, France. He/She will be jointly supervised by **Dr. Karine Heerah** (Permanent researcher at FEM, coordinator of the OWFSOMM project), **Dr. Dorian Cazau** (Associate professors at ENSTA Bretagne) and **Dr. Minh-Tan Pham** (Associate professor at Université Bretagne-Sud/IRISA).

Profile and skills

Initial training

PhD/M.Sc/M.Eng in Signal Processing or Computer Science or related.

Specific knowledge and experiences

Required:
- Experience in signal and image processing, applied machine learning.
- Excellent programming skills in Python (familiar with one of deep learning packages, such as PyTorch or Tensorflow, is a must).
- Experience with acoustic data, spectrogrammetry.
- Interest for applied environmental issues.

Desirable:
- Work experience and knowledge on marine megafauna.
- Knowledge of environmental and conservation issues in the context of the European Marine Directive Strategy Framework and OREs.

Professional Assets

- Great scientific rigor.
- Spirit of initiative and multidisciplinary openness.

- Taste for applied research (industrial research).
- Ease of expression, argumentation and communication in a partnership context.
- Taste for teamwork but ability to work autonomously as well.

Practical information

- **Type of contract:** temporary **(**CDD, "Contrat à Durée Déterminée »).
- **Duration of the contract:** 12 months.
- **Status:** Research engineer/Post-doctoral fellow.
- **Workplace:** The candidate will be hosted at France Energies Marines Headquarters, Bât Cap Océan, 525, avenue Alexis de Rochon, F-29280 Plouzané, with weekly visit at ENSTA (Brest) and regular visits at UBS (Vannes). Travel expenses will be supported when in FEM headquarters, according to FEM policy).
- **Starting date:** as soon as possible.
- **Deadline for application:** 30/08/22

This position is open to people with disabilities.

How to apply

- Applications must consist of a **CV** and a **cover letter**.
- In the case of a candidate being seconded by a member of France Energies Marines, the application must mention the agreement of the current employer.
- **To apply, please go to the France Energies Marines website under the Join Us section.**
- **For further information you contact us via contact@france-energies-marines.org with the title of the job offer as subject.**