Post-doctoral or research engineer position (18 months) in deep learning for floating wind turbine mooring lines health monitoring

Contexte

IMT-Atlantique, an engineering school under the supervision of the Ministry of Industry, is looking for a post-doc or research engineer for 18 months, to start at the earliest from November 2020. The position is based on the Brest campus of the school. The candidate will join the Signal and Communications department, within the TOMS team of the Lab-STICC (signal and image processing from natural signals), whose research activities include signal and image processing for remote sensing, and learning dynamical models using artificial intelligence.

The open position is part of the SUBSEE4D project co-sponsored by Cervval, a company specializing in digital simulation and decision support in complex systems, France Energies Marines, the national research institute dedicated to Offshore Renewable Energy (ORE), and IMT Atlantique.

Despite a significant offshore experience coming from the oil and gas (O&G) industry, several specificities of offshore renewable energy systems induce uncertainties of their subsea dynamics. Today, as any emerging technology, the efforts are focused on the system efficiency and robustness as part of the design stage. Very few works are dedicated to the in-service follow-up and the maintenance strategy which represent a critical point both technically and financially for the very next commercial farms.

Within SUBSEE4D project, FEM is in charge of the development of a mooring lines health monitoring software module. A multidisciplinary team including this position is being set-up to deliver software which will be offered to a floating wind farms operator for further customization and deployment on a scale 1:1 floating wind turbine pilot project. The software aims at improving the estimation of the fatigue life of the mooring components as well as the related alert systems using machine learning techniques. IMT Atlantique brings to the project its expertise in machine learning and dynamical systems: data assimilation, identification of equations governing the dynamics of observation data, interpolation / reconstruction of time series, emulation of physical models, forcing by explanatory variables...

In this context, the candidate will take an active part of the IT development of the data-processing platform. He / She will provide technical expertise and ensure that state of the art methodology is used for statistical, probabilistic models used for variables estimation and related uncertainties. The methodology will involve development of regression algorithm as well as supervised and unsupervised classification algorithms. It will involve model skills evaluation techniques, coupled with growing data set training philosophy. The available data sets for training will be progressively enriched with sensors data and a training philosophy is to be developed to optimally combine theory with observations, and to include physical constraints or information to the learning algorithms.

Methodological developments will also be expected, to complement and further improve research on dynamical systems learning from data performed in the IMT team. Publications in international conferences and journals will be issued from this work.

Floating wind turbine global simulation involve coupled aero-hydro-servo-elastic physical models. The candidate will need to work in close collaboration with the project team to ensure the physical consistency the developed models from learning phase to validation phase. This position requires the ability to implement multidisciplinary approaches.

Candidate

The candidate must have (preferably) a PhD or possibly a Masters/Engineering degree in image or signal processing, machine learning or related fields, or equivalent experience. Qualifications required:

- Machine/Deep Learning, Signal and Image Processing, Applied Mathematics, Dynamical Systems

- Programming in Python

- Experience in deep learning methods and associated libraries in Python (Keras, Tensorflow, Pytorch)

- An experience related to physical modeling of complex systems or renewable energies will positively appreciated

Contact

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