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Fiche de poste / Job advertisement

Fonctions / Function : Postdoctoral Research Associate in Plankton Imaging and Machine Learning

Les activités qui composent la fiche de poste sont appelées à évoluer en fonction des connaissances du métier et des nécessités de service.

Présentation de Sorbonne Université / Presentation of Sorbonne Université

To transmit knowledge, understand the world and meet the challenges of the 21st century, a new university was born on January 1, 2018, as a result of the merger between the universities of Paris-Sorbonne and Pierre and Marie Curie. Sorbonne University is a multidisciplinary, research-intensive and world-class university. Anchored in the heart of Paris and present in the regions, it is committed to the success of its students and strives to meet the scientific challenges of the 21st century. www.sorbonne-universite.fr

Présentation de la laboratoire / Presentation of the laboratory

Description:

The Laboratory of Oceanography of Villefranche-sur-mer (LOV; https://lov.imev-mer.fr/web/) is located close to Nice, on the French Riviera. It belongs to one of the three marine stations of Sorbonne Université. With about 90 permanent staff, the LOV generates and analyses a large quantity of marine data, including imaging, genomic, and satellite data to study the ocean.

The COMPLEx (COMPutational PLankton Ecology; https://lov.imev-mer.fr/web/team-complex/) team gathers ~30 members studying marine plankton and particles by collecting data with quantitative imaging instruments and high throughput genomics and using numerical data analysis methods (modeling, statistics, machine learning). COMPLEx strongly interacts with the Quantitative Imaging Platform of Villefranche (PIQv; https://sites.google.com/view/piqv), which oversees the operation of tools that the team develops. Those tools include imaging sensors, such as the Underwater Vision Profiler or the ZooScan, and software packages, such as ZooProcess or the EcoTaxa web application (https://ecotaxa.obs-vlfr.fr/) that uses machine learning to assist taxonomists to sort plankton and particle images. We also have a long experience in interacting with computer scientists, in academia (e.g. LS2N in Nantes, I3S in Nice, ENSTA in Paris, MIP in Kiel), but also in the private sector (e.g. Google Brain lab in Paris).

Localisation / Location: Laboratoire d'Océanographie de Villefranche sur mer (IMEV-FR7093), équipe COMPLEX.

181 Chemin du Lazaret -06230 VILLEFRANCHE SUR MER

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Missions et activités principales

Mission: Plankton is the major driver of oceanic biogeochemistry and plays several essential roles in the ocean (Oxygen production, Carbon storage, food web input, etc.). Plankton is the food base for fish and the livelihood of millions of people depends on plankton dynamics. Blooms of harmful algae or jellyfish on the other hand endanger aquaculture or even energy production. The rise of ocean optical technologies has yielded a diversity of underwater imaging tools (e.g. the Imaging Flow Cytobot, the Underwater Vision Profiler and the In situ Ichthyoplankton Imaging System) that enable the visualization of plankton and detritus ranging multiple orders of magnitude in size. Broad deployment of these imaging tools yielded datasets spanning the global oceans, yet few efforts have been made to bring these datasets together to evaluate and improve earth system models. The COMPLEx team at LOV, the Geophysical Fluid Dynamics Laboratory at Princeton University (USA) and the NOAA National Marine Fisheries Service (NMFS, USA: https://www.fisheries.noaa.gov/) are initiating a project to compile a global dataset of plankton and particle size structure, examine the biogeography of plankton/particle traits, and improve model-data intercomparisons for Earth System Models (ESMs).

We seek a postdoctoral researcher (0 – 1 year after the PhD) to work at the interface between marine ecosystem observations and machine learning. The ideal candidate would have a strong background in data management and machine learning approaches, with experience or interest in plankton imaging. We seek an individual proficient in scientific computing (e.g. Python, git, shell scripting) and with strong communication and project management skills. The individual will work with another postdoctoral researcher to be employed at GFDL and associated scientists, and will join an active group at LOV studying the biogeochemistry and ecology of the ocean. The researcher is expected to collate data from various locations and sources, focusing on data from five main imaging systems: Underwater Vision Profiler (UVP), Zooscan, In-situ Ichthyoplankton Imaging System (ISIIS), FlowCam, and Imaging Flow CytoBot (IFCB). He/She will develop a methodological framework for imaging data to be harmonized, compared against each other and collected in the Pelagic Size Structure database (PSSdb). The dataset should then be evaluated using different machine-learning approaches (niche-modelling, regression approaches, kriging, deep-learning) to assess the spatial and temporal representation and uncertainties associated with different regions and seasons and to establish patterns in the data that can be used for gap-filling.

Activités principales (10 maximum) / Main activities :

- collect image data (UVP5, UVP6, Zooscan, FlowCam, ...) from international colleagues and assist in their upload to EcoTaxa (https://ecotaxa.obs-vlfr.fr)
- program and apply data quality control algorithms (e.g. outlier detection)
- develop and apply algorithms to evaluate the consistency of image classification across different image datasets
- evaluate and apply published size-to-biomass conversions for plankton and particles
- program data aggregation and transfer from EcoTaxa to PSSdb (API-based)
- combine image and environmental data (Temp., Oxygen, Satellite data) and use multivariate regression (e.g., generalized linear mixed models, generalized additive models) and machine-learning (e.g., RandomForest, neural networks) techniques to extrapolate data onto a global grid
- publish the results of these analyses in a scientific journal
- participate in international conferences and workshops to present the results of the project

Encadrement / Permanent employment : Non / No

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Connaissances et Compétences* / Knowledge and Skills

Connaissances transversales requises / Transversal knowledge required:

  - Biological oceanography

Savoir-faire / Skills required:
  - geospatial data analysis
  - processing of pelagic imaging data (e.g. Zooscan, UVP5, FlowCam, Cytosense, ...)
  - Python, Shell and SQL programming
  - Machine learning (krigging, niche modelling, deep learning)

Savoir-faire transversaux / Cross-cutting skills :
  - presentation of research results at international conferences
  - preparation of scientific articles
  - interdisciplinary and open mindset
  - strong networking skills
  - experience with outreach activities will be beneficial

Savoir être / Know how:
  - Strong ability for teamwork
  - Autonomy to suggest and implement solutions
  - Fluent in English (French language skills are beneficial)

Conditions particulières d'exercice / Special conditions *:*

A PhD is required in either oceanography, marine ecology, marine biogeochemistry, or related field. The appointment is for at least 2 years.

Application deadline: 15.9.2021

Intended start date of employment: 1.12.2021

To apply, please send your cover letter and curriculum vitae to Rainer Kiko (rainer.kiko[at]imev-mer.fr)

PSSdb team members:

   Rainer Kiko, Lars Stemmann, Jean-Olivier Irisson, Fabien Lombard (all LOV), Jessica Luo Charles Stock (GFDL), Todd O'Brian (NOAA NFMS)

Please contact Rainer Kiko in case of any further questions.

A second PostDoc position to work on PSSdb is available at GFDL. Please see the job advertisement here: https://puwebp.princeton.edu/AcadHire/apply/application.xhtml?listingId=20841