Postdoctoral researcher, IGDR, Rennes, France:
use of deep learning and simulation to extract geometric parameters
of filaments in microscopy images.

We wish to welcome a highly motivated postdoctoral researcher in our multi-disciplinary team at the Institute of Genetics and Development of Rennes (https://igdr.univ-rennes.fr/en/). Research in the team focuses on the robustness of cell division through fluorescence microscopy and quantitative biophysical approaches, using the nematode model organism *Caernorhabditis elegans*. The ongoing development of an automated microscope allows the team to extend its studies to human cell lines in culture, without synchronization, a key requirement for the studying division robustness.

Project description:
The recruited postdoctoral researcher will be an integral part of the on-going research project, funded by the ANR and focused on the study of the regulatory role of microtubule rigidity in cell division. He/she will work on the development of a tool based on artificial intelligence to extract microtubule curvatures from 3D fluorescence microscopy images. In particular, the candidate will use synthetic image generation through simulation (e.g., Cytosim) and deep learning techniques. For this, he/she will have access to local computing servers as well as remote ones (e.g., Jean Zay). Filament curvature measurements will help reveal potential disruptions in microtubule rigidity during genetic perturbation or across cell lines with deregulated expression of candidate proteins involved in regulating microtubule rigidity.

Job activities:
- Follow the bibliography and the technical developments related to the research project.
- Programming/coding in compliance with FAIR principles
- Generate synthetic images to train deep learning architectures.
- Build new deep learning architectures, which incorporate innovative mechanisms from recent publications, to achieve the mission objective.
- Annotate synthetic and real fluorescence microscopy images.
- Use transfer learning or fine-tuning tools.
- Identify relevant datasets to test the developed architectures in order to see their applicability to other fields.
- Participate in the traceability and transmission/communication of data and analysis protocols to project members and international collaborators.
- Collect, record and analyze data.
- Present results in the team, within the institute and at conferences.

Duration and salary:
24-month full-time fixed-term contract. Gross monthly salary of around 2990 euros.

Expected skills:
- Hold a PhD degree in computer science, machine learning or applied mathematics.
- Have strong theoretical and practical skills in deep learning.
- Master programming languages such as Python.
- Have proven experience in implementing deep learning in image analysis.
- Be able to work collaboratively within a research team ; be a team player.
- Have strong organizational and communication skills, including the ability to express oneself and write in English.
- Ability to work independently.

- Have an interest in working in a multidisciplinary environment (cellular biology, fluorescence microscopy, soft matter physics, bioinformatics)

Professional environment:
The IGDR is a dynamic institute, with 16 teams comprising approximately 200 people (including researchers, teacher-researchers, engineers, assistant engineers and technicians, post-doctoral fellows, doctoral students, and apprentices or interns). The members of the institute come from diverse international backgrounds, with around fifteen different nationalities represented. Research at the IGDR spans a wide range of disciplines, including molecular biology, cell biology, developmental biology, genetics, genomics, bioinformatics, microbiology, structural biology, immunology, advanced microscopy, epigenetics, chemistry, cancer biology and biophysics. The institute strongly encourages interdisciplinary approaches, particularly at the interface of physics, computer science and biology. Furthermore, the institute benefits from cutting-edge equipment within the Biosit federative structure, in particular a microscopy facility (Microscopy Rennes Imaging Center, MRic, https://microscopie.univ-rennes.fr/) and a microscopy image quantification facility (FAIIA, https://faiia.univ-rennes.fr/en/facility).

The CeDRE team is composed of 7 people: 2 CNRS researchers, 1 CNRS research engineer in bioinformatics, 2 assistant biologist engineers, 2 PhD students (one in biology and one in computer science). Th team is currently recruiting a postdoctoral fellow in machine learning in addition to the current recruitment. The team also regularly welcomes student for internships. Research in the team focuses on the robustness of cell division by quantitative fluorescence microscopy and biophysics approaches, using the model organism of the nematode *Caenorhabditis elegans* as well as human cell lines, the latter being imaged by the use of the roboscope. The team has its own computing servers to carry out developments and learnings requiring NVIDIA GPUs (H100, V100 and P100). In addition, we have access to national supercomputer infrastructures (Jean Zay/Idris, Irene Joliot-Curie/CEA) allowing large-scale multi-GPU H100/A100 calculations, for tasks such as hyperparameter optimization for deep learning architectures.

Rennes is the capital of Brittany (north-west France), with easy and direct access to Paris (1.5 hours by train). Its rich tradition of cultural, musical and artistic events, as well as its proximity to the coast, make it a very welcoming and pleasant city to live in.

Application procedure:
Interested candidates should provide a CV showcasing relevant expriences, a cover letter outlining project interest and position suitability, as well as at least two recommendation letters. The latter should be sent directly by at least two referees to helene.bouvrais@univ-rennes.fr

To apply: https://emploi.cnrs.fr/Offres/CDD/UMR6290-HELBOU-005/Default.aspx

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