Type d'offre : Corporate offer

Post date : 26.01.24

Inria Saclay Center - Ile-de-France

Post-Doctorant F/H - Modèles d'apprentissage profond pour la détection automatique des follicules ovariens à partir de données d'imagerie 2D et 3D

Informations générales

Contract type : Fixed-term contract

Contract length : 2 years

Education level : PhD or equivalent

Experience level : Up to 3 years

Contact :

Inria Team : MUSCA
Romain Yvinec

Starting date : Sun 01/09/2024 - 12:00

Inria Saclay Center - Ile-de-France :

The Inria Saclay research center was created in 2008. Its dynamism is part of the development of the Saclay plateau, in close partnership with the Université Paris-Saclay cluster and the Institut Polytechnique de Paris cluster. In order to build an ambitious site policy, the Inria center in Saclay signed strategic agreements with these two privileged territorial partners in 2021.

The center has 39 project teams, 27 of which are shared with the Université Paris-Saclay or the Institut Polytechnique de Paris. More than 600 scientists and research and innovation support staff of 54 different nationalities work at the center.

Inria Saclay - Île-de-France is a key player in digital science research on the Saclay plateau. It embodies the values and projects that make Inria unique in the research landscape: scientific excellence, technology transfer, multidisciplinary partnerships with institutions with complementary skills to our own, in order to maximize Inria's scientific, economic and societal impact.

Détail de l'offre (poste, mission, profil) :

Context

The aim of the **ANR OVOPAUSE** project (ANR-22-CE45-0017) is to develop a model for automatic detection and classification of ovarian follicles, based on 2D histological sections in mice and 3D transparentized imaging in fish. Ovarian follicles are multi-cellular structures containing female germ cells. Follicles mature through successive stages of growth until, in some cases, ovulation or oviposition and release of the mature oocyte. The distribution of follicles in the different stages of maturity throughout life determines the reproductive status of individuals, and

certain fertility disorders are associated with a disturbed distribution. Ovarian follicle counting and classification is therefore a major challenge for both reproductive biology research and clinical application.

Manual counting of ovarian follicles remains an extremely tedious task, and has led to the recent development of artificial intelligence approaches. However, no method is fully satisfactory to date, and a global improvement in classification and automatic follicle counting is expected in this field.

This post-doctorate will be carried out in a highly interdisciplinary environment, working closely with experts in reproductive biology and modeling. A sufficient corpus of data has already been acquired in two model species, the mouse and the medaka.

The contract can start immediately and, at the latest, before November 1, 2024.

Assignment

An overview of the OVOPAUSE project is available here. The main objective of the post-doctorate is to develop algorithms and codes, freely accessible to the scientific community, to accurately assess the number of ovarian follicles from 2D histological images of ovaries, and to classify follicles according to their different stages of maturity and state of health. This work will be based on a corpus of expert-annotated images available within the team, and will make use of innovative deep learning techniques to solve the challenges of detection due to the fact that (i) there is a large contrast in follicle sizes, with a range of the order of 10^2 between the smallest and largest follicles; (ii) that the same follicles are present on several successive sections (tracking problem); (iii) that the availability of a sufficient number of instances of each category to be classified in the training dataset is limiting.

The person recruited will develop solutions based on existing literature in this and related fields, as well as on solutions developed within the team and in collaboration, an overview of which is available here.

In a second step, the performance of follicle detection and classification from 2D sections will be compared with automatic analysis using 3D imaging, following the

methodology developed by our collaborators on medaka data [*Lesage et al. 2023*]. Several perspectives will then be addressed in the course of this work:

- optimization of follicular counting protocols from 2D histological sections, using available 3D information;
- the use of cell markers to improve 2D and 3D estimates, and/or the transfer of digital markers;
- the statistical analysis of the spatial distribution of ovarian follicles. The person recruited will be responsible for developing the various solutions envisaged, and will be able to interact with the modellers and expert biologists present within the consortium (MUSCA, Université Paris-Cité, INRAE Rennes), as well as the artificial intelligence experts with whom we collaborate.

Main activities

- Analyze existing solutions for ovarian follicle detection using 2D histological sections and 3D imaging;
- Propose, implement and test new solutions for the detection and classification of ovarian follicles from annotated 2D histological section data;
- Develop a program that can be used by expert biologists to detect and classify ovarian follicles on new 2D sections;
- Propose new avenues of research to improve the predictive performance of ovarian follicle detection and classification algorithms, adapted to 2D and 3D data;
- Write up and disseminate the results obtained to the scientific community.

Required skills

- PhD in computer science or computational biology or related fields;
- Experience in machine learning (especially deep learning);
- Strong programming skills (python, C++)

Appreciated:

- Experience with 2D or 3D imaging data, computer vision;
- Experience in developing user-friendly tools and algorithms;
- Solid knowledge of computer vision, object detection;
- Knowledge of spatial statistics.

General information

Benefits

- Subsidized meals
- Public transport partially reimbursed
- Vacations: 7 weeks' annual leave + 10 days' RTT (full-time basis) + possibility of exceptional leave (e.g. sick children, moving house)
- Possibility of telecommuting (after 6 months' seniority) and flexible working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports benefits (Inria social works management association)
- Access to professional training
- Social security

Remuneration

2,788€ gross/month

Closing date for submitting applications : Sat 30/03/2024 - 12:00

URL de l'offre :

https://www.dataia.eu/sites/default/files/2024-07108-offre-en.pdf
Lien vers l'offre sur le site dataia.eu :https://da-cor-dev.peppercube.org/node/850