Universitat de Girona
Institut de Recerca en Visió per Computador i Robòtica

MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES
Cofinanciado por la Unión Europea
AGENCIA ESTATAL DE INVESTIGACIÓN

PhD Position - Deep learning for brain image analysis projects

Two fully funded PhD positions are open at the medical imaging lab of the Computer Vision and Robotics Institute at the University of Girona. The successful candidates will join two new Spanish Ramon y Cajal fellowship projects focusing on deep learning techniques for brain image analysis including atlas and normative model creation, longitudinal analysis and disease progression models, vascular abnormalities and automatic detection of deviations from normative models.

Start Date: September 2026 (tentatively)
Duration: 3 years (full-time, 37.5h/week; PhD enrolment required)
Monthly Gross Salary: Approximately 1.600 EUR (12 payments/year)
Position Project References: RYC2023-042706-I, RYC2024-050753-I

Research Overview

The thesis will align with one (or multiple) of the following topics:

- **Developing a fetal atlas to capture normative brain development from week 10 to 38 of pregnancy on clinical 2D ultrasound planes**. This project will extend a previously published article in collaboration with the University of Yamagata and Hospital Josep Trueta to develop a new longitudinal atlas that cover a larger range of weeks to develop a longitudinal atlas (weekly scans from week 12 to week 38).
- **Constructing an age-specific atlas suited for neuroimaging studies, including healthy aging and predictive models of brain disorders as an extension of the NextBrain atlas**. The new atlas will provide comprehensive description of brain anatomy at different chronological ages, covering a larger population heterogeneity, and will be a stepping stone to develop normative models to a higher scale, from few tissue types to hundreds of brain regions.
- **Developing robust and consistent segmentation models for brain vascular abnormalities and to determine normative vasculature**. That topic will focus on combining annotated datasets from international collaborations and challenges with unlabelled paired data to create a new annotated dataset through semi-supervised and self-supervised segmentation techniques.
- **Developing a comprehensive framework for studying individual deviations from healthy normative models of brain development and/or aging**. This topic will also focus on explainable frameworks that can justify the predictions given by the models, either ad hoc (e.g., gradient-based, permutation-based and counterfactual-based approaches) or self-explanatory schemes such as prototype learning or architectures that incorporate self-explainable blocks (e.g., self-attention)
- **Implementing models to quantify brain changes in longitudinal data for predictive modelling**. This specific topic will focus on two types of strategies: 1) models where longitudinal imaging data is available and is used (more than one timepoint), and 2) models that can predict trajectories from a single point but have been developed using longitudinal data.

Throughout the project, you will produce open-source code and trained models, document algorithmic developments, measure and benchmark report-generation quality, and demonstrate the methods in comprehensive downstream applications such as progression tracking and comparative performance studies.

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Candidate Profile

Applicants should hold a Master's degree (or equivalent) in Computer Science, Biomedical Engineering, Data Science, Medical Physics, or a related discipline, and demonstrate:

- Strong expertise in deep learning for medical imaging (2D & 3D)
- Proficiency with PyTorch (or similar frameworks) and Python
- Familiarity with image registration and atlas-based techniques
- Excellent English communication skills (written and oral)
- Motivation to publish in top conferences/journals and participate in teaching activities

Desirable: Experience with progression models, statistical models for comparisons and hypothesis testing, and longitudinal image analysis.

Offer and Environment

The ViCOROB Lab provides:

- Access to high-performance GPU clusters and medical imaging workstations.
- Collaborative partnerships with hospitals and international research centers.
- Funding for international conference attendance and research stays.
- Options for thesis co-directions with international collaborators.
- A supportive, interdisciplinary community in medical AI and robotics.
- Opportunities for teaching and outreach.

The University of Girona is committed to equality, diversity, and inclusion. Candidates from underrepresented groups are encouraged to apply.

Application Process

Candidates must apply by completing the application form (LINK) and submitting the following documentation:

1. Curriculum vitae
2. Cover letter detailing your research interests and fit for this topic
3. Academic transcripts and diplomas
4. Contact information for two academic referees

Applications will be accepted until May 2027 or until the two positions have been filled, whichever comes first.

For informal inquiries or other questions, do not hesitate to contact Mariano Cabezas and Adrià Casamitjana at mariano.cabezas@udg.edu and adria.casamitjana@udg.edu with the subject "UDG-VICOROB-RyC2027".