basque center for applied mathematics

EXCELENCIA SEVERO OCHOA

IC2025_08_2 BCAM International Call

PhD Position in Predictive Sensing for Energy-Efficient Biosignal Analysis

Job Offer	
Topics:	**The Basque Center for Applied Mathematics (BCAM) is pleased to announce a fully funded, 4-year PhD position in the context of the project "*PrediSense* - Predictive Sensing as a New Paradigm for Efficient Data Acquisition on the Internet-of-Things Era", funded by AEI (Spanish State Research Agency).** **Project Summary:** *PrediSense* aims to transform the way data is acquired and processed in Internet-of-Things (IoT) devices, focusing particularly on health-related applications (the Internet-of-Medical-Things). The project introduces a novel predictive sensing framework to minimize redundant data acquisition and energy consumption, inspired by human attention and expectation mechanisms. By predicting the evolution of physiological signals, sensors can dynamically adjust their data collection strategy, enabling continuous monitoring in energy-limited and data-intensive environments such as wearable healthcare devices. **Position Context & Supervision:** The selected PhD candidate will be supervised by Dr. Tomás Teijeiro Campo (BCAM Ramón y Cajal Researcher), with collaborations at both national (UPV/EHU, Biocruces Bizkaia) and international (EPFL, Switzerland) level. The candidate will be embedded in a stimulating research group at the forefront of artificial intelligence, signal processing, and biomedical applications, with strong mentoring and opportunities for both academic and industrial collaboration. **Core Research Topics:** The doctoral research will be focused on the following themes:

- *Abductive reasoning* and formal models for predictive sensing in time-series data.
- *Self-supervised machine learning* for motif and grammar discovery in biosignals.
- *Event-based sampling* strategies for energy-efficient and information-rich data acquisition.
- *Bayesian methods* for model uncertainty estimation and prediction in physiological time series.
- Applications to cardiovascular, musculoskeletal, and neurological monitoring using wearable IoT devices.

Main Objectives and Tasks:

The successful candidate will contribute to several research lines and practical tasks within *PrediSense*, including:

- Developing formal reasoning algorithms capable of predicting biosignal behavior from partial and noisy observations.
- Designing and implementing self-supervised learning methods for discovering motifs and regularities in physiological signals, with a focus on energy and data efficiency.
- Proposing and testing event-based sampling schemes (e.g., level-crossing, polygonal approximation) that adaptively reduce the sampling rate in response to predictable signal behavior.
- Quantifying and leveraging predictive uncertainty using Bayesian inference approaches to guide data acquisition strategies.
- Evaluating the developed methodology across diverse real-world biomedical use cases, such as:
    - Electrocardiogram (ECG) and Photo-plethysmogram (PPG)-based cardiovas-cular monitoring,
    - Wearable sensor-based musculoskeletal monitoring from inertial measurement unit (IMU) sensors,
    - Electroencephalogram (EEG)-based neu-rological monitoring (epilepsy).
- Integrating domain knowledge into model validation and adaptation procedures.

	• Publishing results in high-impact journals and conferences and contributing to the open-source software ecosystem developed by the team. **What We Offer:** • A 4-year PhD contract with full social security coverage at BCAM (starting date as soon as possible). • Supervision by leading researchers in biomedical signal processing and artificial intelligence. • Access to advanced computational resources and datasets, as well as the opportunity for research stays with international partners (e.g., EPFL, Switzerland). • Involvement in collaborations with industry and clinical research partners. • Financial support for international travel and conference attendance. • Integration in the UPV/EHU Doctoral program and access to BCAM's extensive training, networking, and career development opportunities. **Join us at BCAM to shape the future of predictive sensing and contribute to the next generation of smart, efficient, and personalized healthcare!**
PIs in charge:	Dr. Tomás Teijeiro
Salary and conditions:	**The gross annual salary of the PhD student will be: 20.258 € - 25.395 € according to experience.** *It will then be on your own responsibility to make your yearly income declaration at the Bizkaia Treasury Agency.* Additionally, we offer a moving allowance up to 500€. Should the researcher have a family at the time of recruitment: 1. 1.000€ gross in a single payment will be offered (you must be married-official register or with children and the certificate to prove it must be sent).

	2. 600€ gross per year/per child (up to 2 children) will be offered (the certificate to prove it must be sent). *Free access to the Public Health System in Spain is provided to all employees.*
Nº Positions offered:	**1**
Contract and offer:	**4 years**
Deadline:	**October 3rd, 2025, 14:00 CET (UTC+1)**
How to apply:	Applications must be submitted on-line at: https://joboffers.bcamath.org

Scientific Profile Requested	
Requirements:	• Holder of a master's degree (or equivalent) in applied mathematics, computer science, biomedical engineering, electrical engineering, or related disciplines.
Skills and track-record:	• Good interpersonal skills. • Fluency in spoken and written English. • Ability to work independently and as part of a collaborative research team. • Ability to present and publish research outcomes in spoken (talks) and written (papers) form. • Ability to effectively communicate and present research ideas to researchers and stakeholders with different backgrounds.
Scientific Profile:	In the selection procedure we will appreciate: • Strong interest/background in artificial intelligence, data science, or statistical learning, preferably with skills in time series analysis, signal processing, or probabilistic modeling. • Good scientific programming skills (e.g., Python, MATLAB, or similar).

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Application and Selection Process	
Formal Requirements:	The selected candidate must have applied before the application deadline online at the webpage: https://joboffers.bcamath.org The candidates that do not fulfil the mandatory requirements will not be evaluated with respect to their scientific profile.
Application:	Required documents: ▪ CV ▪ Academic transcript ▪ Letter of interest ▪ 2 recommendation letters ▪ Statement of past and proposed future research (2-3 pages)
Evaluation:	Based on the provided application documents of each candidate, the evaluation committee will evaluate qualitatively: the adaption of the previous training and career to the profile offered, the recommendation letters, the main results achieved (papers, proceedings, etc.), the statement of past and proposed future research and other merits; taking in account the alignment of these items to the topic offered.

Incorporation:	**1st January 2026**

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