



Junior Professorship F/H

AI-CORTEX – Artificial Intelligence for Control and Optimization using Real-time biofeedback for Enhanced eXercise (Control, optimization and monitoring of human behaviors and movements for health and sports applications)

Type of contract: 3 to 6-year fixed-term contract, followed by potential integration as Inria research director

Renewable contract: No

Level of diploma required: PhD

Function: Research and teaching

Level of experience required: 6 years minimum

Salary: according to experience

About the Inria center

Inria, the National Institute for Research in Digital Science and Technology is a leading research center in computer science and applied mathematics. Created in 2008, the Inria Saclay research center is located at the heart of the Paris-Saclay scientific and technological excellence cluster. Serving the development of the Université Paris-Saclay (ranked 15 in the latest university ranking), and the Institut Polytechnique de Paris, the Inria Saclay center has 60 people working in research support services and 600 scientists working in around 40 project teams.

Background of the position

Chairs of junior professors (CPJ) are proposed to researchers in the first part of their career, with a strong potential to supervise and lead a research team, as well as to participate in national, European, or international projects.

These positions are based on fixed-term contracts (CDD) for a period of 3 to 6 years before tenure as Inria's (National Institute for Research in Digital Science and Technology) senior researcher.

They are awarded a starting research funding of 200K € and will have to complete teaching service in an Inria partner higher education institution, in this case, Université Paris-Saclay (approximately 28 hours of lectures or 42 hours of hands-on). The gross salary ranges from 3756 to 5075 € per month, depending on experience.

This position is proposed in the context of the creation of a new joint team between Inria and Université Paris-Saclay and the Research Unit "Complexity, Innovation, Motor and Sports Activities", UR CIAMS (attached is the description of the team's activities).

The host laboratory is the CIAMS whose activity is part of the Federative Research Structure in Movement Sciences and Human Factors of the UPSaclay (FéDeV). Taking advantage of the momentum of the 2024 Olympic Games and its partnerships with sports federations, its presence in the hospital environment (Movement Platform at the Paul Brousse Hospital), and its skills in life sciences, CIAMS wants to improve its processing and real-time modelling capabilities of physiological signals, and contribute to responding to societal challenges related to health and well-being, as well as performance, whether in the workplace (such as the factory of the future, which involves new interactions between humans and machines like robots) or high-level sport.

General Information

- Location: Palaiseau
- Inria Saclay center
- Starting date: from Sept 1st 2024
- Contract duration: 3 to 6 years
- Deadline for application:

Contacts

- Inria Dept: direction
- Recruiter: Jean-Yves Berthou
- jean-yves.berthou@inria.fr

About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

The keys to success

- A taste for multidisciplinary research and dialogue between scientific disciplines,
- A solid background in signal/data analysis and an interest in health and sports research,
- Team spirit,
- Ability to work in project mode.

Objectives of the position

Technological advances make it possible to measure human activity at different levels by collecting various types of signals (cerebral, physiological, biomechanical). The analysis and exploitation of these signals make it possible to design control/monitoring systems for enhanced human performance and learning, known as *biofeedback*. A biofeedback system consists of four key components: the sensor(s), the signal analysis and interpretation unit, the control and decision-making unit, and the human who considers these decisions in order to correct, improve, or change their state. For instance, neurofeedback systems combine the exploitation of neurophysiological signals (EEG, ECG, EMG, etc.) in real-time to address fundamental issues relating to the understanding of intrinsic dynamics in healthy and pathological humans, as well as applied research relating to the optimized use of such biofeedback for decision-making, cognitive and physical performance. For applications related to movement and sport, the use of biofeedback typically focuses on performance improvement, gesture kinematics, psychological abilities, as well as assistance and maintenance of physical fitness.

The CIAMS laboratory of the University of Paris-Saclay and INRIA wish to join forces to offer interdisciplinary solutions and advanced tools for signal control and processing and thus make the best use of biological signals from humans for the control of the functions of the human body, the screening and the monitoring of its condition. It is also a question of defining training programs to improve the performance of athletes while respecting their well-being.

Merging machine learning and control theory in the context of biofeedback requires a deep understanding of both fields. In addition, developing sophisticated machine learning algorithms and control strategies that can accurately interpret complex physiological signals, infer hidden state variables, and apply precise control actions is a complex task, requiring advanced expertise, which is the subject of this project. Another challenge will be to ensure the adaptability of the system to different athletes, patients, or individuals, taking into account varying health conditions, fitness levels, and performance requirements, while maintaining a generalized approach.

Main activities

- Conduct research in the fields of control, signal processing, and machine learning with application to health and sports applications;
- Disseminate results and ensure their impact on health and sports stakeholders;
- Supervise students, post-docs and engineers. Set up and participate in collaborative research contracts;
- Participate in the training of students in courses linking control, signal processing, machine learning and health and/or sports;
- Lead and create links between players in the fields of control, signal analysis, machine learning, health and sports with the objective of setting up a new project-team on the subject.

Skills

KNOWLEDGE

- Scientific skills and level required: PhD in applied mathematics, control theory, signal processing, data science or any equivalent option, followed by at least 6 years' research experience;
- Experience of working with neurophysiological signals;
- Fluency in written and spoken scientific English.

How to apply

Online via the SELECT application. Please refer to our website www.inria.fr

No other method of application will be considered.

Defence Security:

This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorization to enter an area is granted by the director of the unit, following a favorable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavorable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy:

As part of its diversity policy, all Inria positions are accessible to people with disabilities.

KNOW-HOW

- Ability to develop a network of contacts and partnerships,
- Ability to work as part of a team or to lead a team,
- Ability to initiate, set up and manage projects.