**Spiking Neural Networks for Pediatric Motion Analysis and Rehabilitation**

* Location: CIAD Laboratory – Université Bourgogne Europe, Dijon, France
* Duration: 24 months
* Starting Date: 2025, as soon as possible
* Application Deadline: Open until filled
* Salary : 2 840,45 € (gross) = 2 282,87 € (net) per month

**Project Context**

This postdoctoral position is funded by the European ENABLE project (EvaluatioN of motor cApacities and telerehaBilitation in chiLdren with neuromotor disordErs), which aims to develop an AI-assisted home-based rehabilitation system for children with neuromotor disorders. Within Work Package 6 (WP6), the objective is to build a robust movement analysis framework that compares children's movements—captured via video and skeletal tracking—with reference gestures defined by clinicians, and generates actionable, interpretable feedback.

To address the temporal complexity and real-time constraints of movement analysis, we propose a novel bio-inspired approach based on **Spiking Neural Networks (SNNs)**—brain-inspired AI models that process information using spikes, enabling efficient and biologically plausible temporal reasoning.

**Research Goals**

* Encode children’s movement sequences (e.g., joint angles, skeletal trajectories) into **spike trains**.
* Learn motion "signatures" (correct gestures) using unsupervised SNNs (e.g., STDP-based learning).
* Detect spatio-temporal deviations in children's motions and provide **fine-grained diagnostic feedbac**k.
* Support **online adaptation** of serious games used in rehabilitation, based on real-time motion quality assessment.
* Leverage the low-latency and energy efficiency of SNNs for possible on-device deployment (e.g., mobile or tablet).

**Key Responsibilities**

* Design encoding schemes to convert motion capture data into **spiking representations.**
* Train and simulate **SNN architectures** (e.g., Liquid State Machines, Spiking CNNs) for movement classification and anomaly detection.
* Integrate rule-based clinical constraints into the SNN framework (hybrid symbolic-spiking reasoning).
* Contribute to the development of **adaptive, explainable feedback loops** within the MoveAhead rehabilitation platform.
* Collaborate with a multidisciplinary team including clinicians, physiotherapists, and AI researchers across the EU.
* Contribute to high-impact publications and present results at top-tier conferences.

**Required Skills**

* PhD in Artificial Intelligence, with strong skills in Data Science.
* Solid knowledge of **spiking neural networks** and their implementation.
* Background in **time-series or motion analysis**, ideally with applications in human movement.
* Experience with pose estimation and processing of skeleton-based data.
* Good understanding of **neuro-inspired learning rules** (STDP, Hebbian learning...) and **temporal coding**.
* Strong publication record and autonomy in research development.

**Additional Valuable Skills**

* Familiarity with neuro-symbolic reasoning or hybrid AI models.
* Knowledge ofbiomechanics, clinical movement analysis, or telerehabilitation systems.
* Experience with edge AI / embedded AI systems for low-power applications.
* Background in explainable AI (XAI) for medical or movement-related applications.

**Application Procedure**

* Send the following documents in PDF format to: aurelie.bertaux@ube.fr
* Detailed CV with publications
* Cover letter (max 2 pages) describing your interest and fit

**Host Institution**

You will join the CIAD Laboratory (Connaissance et Intelligence Artificielle Distribuées), a renowned research center in Dijon, France, specializing in artificial intelligence, intelligent agents, and human-centric systems. The position includes close collaboration with CHU Dijon and other ENABLE consortium partners across Europe. Website: https://ciad.u-bourgogne.fr

**Keywords**

Spiking Neural Networks • Motion Analysis • Pediatric Rehabilitation • STDP • Skeleton-based Time Series • Neuro-inspired AI • Edge Computing • Human Movement • Telerehabilitation • XAI