

PhD Position in Artificial Intelligence in Education at LIP6, Sorbonne University (Paris, France)

Topic: Personalization of learning recommendations and support in simulation-based physiotherapy education using multimodal sensory data generated by a robotic leg

Expected starting date: before end of 2024

Context. *Spasticity* is a motor disorder characterized by muscular hyperactivity caused by impaired nerve conduction. Diagnosis of this pathology relies on the assessment of the degree of resistance of the limb following a passive movement performed by a physiotherapy practitioner, and is used to determine the treatment to be followed. However, this assessment remains subjective and requires practical experience, making it difficult to learn for physiotherapy students.

The overall goal of this research project, called HASPA (<https://www.insa-lyon.fr/en/haspa>), is to develop a spasticity simulator based on a robotic leg capable of reproducing different degrees of spasticity, to enable young practitioners to practice before actually diagnosing patients. To this end, the HASPA project involves a multidisciplinary team with experts in physiotherapy, mechatronics and computer science. A key component of the simulator is the ability to analyze how the practitioners manipulate the robotic leg to infer their underlying skills, and the causes of their errors. To do so, the simulation will provide kinematic data (e.g., acceleration, speed, trajectory) thanks to several sensors embedded in the robotic leg, possibly along with video recordings. The end goal is to personalize the learning activities in the simulation depending on the skill levels of the physiotherapy student.

PhD Description. The PhD research will be primarily in the fields of *Artificial Intelligence in Education*, *Educational Data Mining* and *Learning Analytics*, which deal with the creation and application of AI techniques in educational contexts, by leveraging educational data, with the purpose of understanding and improving teaching and learning. More specifically, in this project, the goal is to analyze the sensory data generated by the simulator while physiotherapy students perform spasticity diagnoses, so as to better understand their errors and personalize their learning.

The PhD research will focus on all aspects of the personalization system, namely:

1. Propose and evaluate algorithms and solutions to make sense of the multimodal kinematic data outputted by the robotic leg to infer the specific skills and errors made by physiotherapy students, based on data mining, machine learning and/or signal processing techniques.
2. Provide feedback on errors as well as recommend personalized spasticity cases and learning activities to the students in the simulation to maximize their learning, based on the inferred skills and past activity of the students.
3. Evaluate the value of the system with both experts and novice practitioners.

Importantly, this project will provide a unique opportunity to tightly collaborate with a multidisciplinary team as said above, as well as to participate in the development and evaluation of the simulator.

Requirements:

- The PhD candidate should have completed (or be close to the completion of) a Master's/ engineering degree in artificial intelligence, data science, or a related discipline,

- Demonstrable experience in designing/evaluating AI-based algorithms and systems, as well as with data wrangling,
- Fluency in Python, or other programming languages relevant for AI such as C++, preferably showcased by a coding portfolio (e.g., on Github) built from past projects and internships,
- Ability to work independently and lead collaborative research projects,
- Excellent communication skills, as well as the ability to write scientific papers in English.

Optionally:

- Experience in working with multimodal data or sensory data would be an asset.
- An interest in multidisciplinary research and education would be a plus.

Work environment. The PhD candidate will be part of the LIP6 laboratory at Sorbonne University, a multidisciplinary, research-intensive and world-class academic institution in Paris. With more than 500 members, 200 of them permanent, LIP6 is one of the largest Computer Science Institute in France. Its 21 research teams cover a wide area of computer science, from electronics to artificial intelligence. Collaborations at LIP6 are as much about fundamental (modelling and resolution of fundamental challenges) as applied research (implementation and validation in real conditions). The scientific output at LIP6 is significant, with around 500 publications and 60 PhD thesis defended each year. This scientific dynamism gives LIP6 opportunities to disseminate its work among varied research and industrial communities, to sustain its existing partnerships as much as developing new ones.

The PhD candidate will be supervised by two researchers at LIP6 and Sorbonne: Vanda Luengo and Sebastien Lalle. Pr. Luengo is a leading expert in the field of AI in education, with extensive experience in designing and evaluating technologies for medical learners. She has supervised over a dozen PhD candidates in her career. Dr. Lalle's research is in Human-Centered AI, with several applications in intelligent learning environments. They are both part of the MOCAH team (<https://www.lip6.fr/recherche/team.php?acronyme=MOCAH>) at LIP6, which is specialized in Technology Enhanced Learning.

The PhD student is expected to work mostly in person on the campus, 4 Place Jussieu, 75005 Paris. The start date is flexible, but ideally by the end of 2024. The position is full-time, paid 2100€/month, plus an allowance for commuting and discounted meals. The candidate will have the opportunity of teaching CS courses (paid) as well as to engage in high-quality training programs.

Application. To apply, please send a CV, Master's academic transcripts, two letters of recommendation, and a motivation statement about your experience and interest in the position to:

- vanda.luengo@lip6.fr
- sebastien.lalle@lip6.fr

Please reach out to the emails above if you have questions about the position.

We strive to create a respectful, positive and safe working environment for people of all backgrounds. We believe that inclusiveness and diversity are essential to academic excellence, and as such encourage everyone who meets the required qualifications to apply, including members of underrepresented groups.

We look forward to receiving your application and will screen it as soon as possible. The position will remain open until it is filled.