Open PhD position on the use of artificial intelligence to investigate cognitive functions, hallucinations, and apathy in healthy participants and patients with Parkinson's Disease

The Laboratory of Cognitive Neuroscience (https://www.epfl.ch/labs/lnco/), led by Prof. Olaf Blanke, is opening a new PhD position to investigate the brain mechanisms underlying cognitive decline, specific hallucinations and apathy in healthy participants and in patients with neurodegenerative diseases, such as Parkinson's disease (PD). The project project is part of a major research initiative and will use a range of neurotechnologies—such as robotics, virtual reality (VR), and functional magnetic resonance imaging (fMRI), and especially artificial intelligence (AI)—to unravel the neural mechanisms of hallucinations and associated cognitive functions.

Project description:

Apathy is a transdiagnostic symptom present in over 40% of Parkinson's patients (Husain & Roiser, Nature Rev Neuroscience, 2018). Similarly, hallucinations are fascinating phenomena of the human mind, play a key role in the neuroscience of consciousness and are frequent symptoms in several major psychiatric and neurological disorders (Ffytche et al., Nature Reviews Neurology, 2017). Despite their prevalence, little is known about the neural mechanisms underlying these symptoms and how they related to cognitive brain functions (Bernasconi et al., Nature Mental Health, 2023). Research on hallucinations and apathy is further hindered by their unpredictable and private nature, complicating their investigation, quantification, and assessment (Bernasconi et al., Nature Protocols, 2022).

This PhD project builds on our recently developed methods using robotic and virtual reality technologies (Albert et al., Nature Communications, 2024), enabling us to induce and quantify clinically relevant hallucinations under controlled and safe experimental conditions in both healthy participants and patients with Parkinson's disease, who frequently experience hallucinations (Bernasconi et al., Science Translational Medicine, 2021). The project has three main aims:

1. To improve the quantification and repeated measurement of both hallucinations and apathy using new methods that merge generative large language models with neuropsychological interview techniques. This includes exploring ways to automate and standardize semi-structured interviews with chatbots and virtual reality interviewers.
2. To explore the relationship between apathy and the sense of agency, as based on sensorimotor mechanisms and to investigate how different levels of apathy can be modulated/induced experimentally in the laboratory.
3. To develop an online platform to conduct both remote and lab-based experiments comprising behavioral tasks, neuropsychological tests, semi-structured interviews, and questionnaires. This platform will be validated and tested with both healthy subjects and patients with Parkinson's disease in collaboration with the lab's clinical team.

Requirements:

The ideal candidate should hold a master's degree (or equivalent) in computer science, engineering, neuroscience, or neurotechnology and be highly motivated with a strong interest in neuroscience and

neuroimaging/signal analysis. Experience in natural language processing, software engineering, applied machine learning, or non-invasive brain stimulation would be an advantage.

Working environment:
The successful applicant will join the Laboratory of Cognitive Neuroscience, led by Prof. Olaf Blanke, which focuses on the neuroscientific study of consciousness and the development of new diagnostics and therapeutics for patients with Parkinson's disease. The lab is based in Geneva's beautiful Campus Biotech, right next to Lake Geneva. The PhD candidate will be enrolled in the EPFL PhD program in Neuroscience (EDNE).

Start date:
Spring 2025

Application procedure:
Interested candidates must submit their application to the EDRS doctoral school (https://www.epfl.ch/education/phd/edne-neuroscience/edne-how-to-apply/) and contact both Dr. Fosco Bernasconi (fosco.bernasconi@epfl.ch) and Dr. Juan Carlos Farah (juancarlos.farah@epfl.ch).