POLITECNICO DI MILANO

PhD in BIOINGEGNERIA / BIOENGINEERING - 39th cycle

PNRR 117 Research Field: DEVELOPMENT OF INNOVATIVE DIGITAL MEDICINE SOLUTIONS BASED ON ARTIFICIAL INTELLIGENCE TO IMPROVE DIAGNOSIS AND LONGITUDINAL MONITORING OF PATIENTS AFFECTED BY MOVEMENT DISORDERS.

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0
In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	This doctorate aims to develop pioneering and innovative tools for the multimodal assessment of the neuromotor performance of patients suffering from movement disorders. The integration of clinical data with neuromotor and functional data gathered through innovative digital technologies, both within a clinical setting and also longitudinally in a home enviroment, holds immense potential for the characterization of the movement disorder, guiding the selection of the intervention and assessing of care. In this regard, "grey box" artificial intelligence algorithms can be a valid support for the clinician in the decision-making process.
Methods and techniques that will be developed and used to carry out the research	Starting from a systematic review of the literature and understanding of clinical requirements, the candidate will develop digital solutions based on advanced signal processing to extract biomarkers of interest from wearable technologies, smart devices and mobile applications usable both in clinical context and in home settings to assess the patients with movement disorders. Those biomarkers will be the integrated with multimodal clinical data and will be the data source for explainable AI algorithm aimed at supporting the clinical decisions.
Educational objectives	The PhD candidate will be trained in order to develop digital technologies for biosignal recording and processing

	using m-health devices. The candidate will acquire the essential skills required to proficiently develop technologies, process the recorded data to extract features of interest and apply AI algorithms to support the clinical decision. The joint research Lab in which the candidate will work, offering the collaboration between domain experts of the Besta Istitute and bioengineers experts in the development of digital technologies, signal processing and machine learning, ensures to obtain a co-design aligned to the clinical need and the possibility to assess on the field the clinical validity and reliability of the technologies developed. Throughout the duration of the PhD program, the candidate will actively participate in PhD courses offered by the Bioengineering PhD School at Politecnico di Milano. Additionally, the candidate will will engage in conference attendance, fostering collaboration and expanding the network within the research community.
Job opportunities	At the end of the phd the candidate will have different job opportunities as post doc in international universities, as a researcher in start-ups or companies working in the field of digital medicine and data science, as founder of innovative start-up.
Composition of the research group	0 Full Professors 1 Associated Professors 2 Assistant Professors 3 PhD Students
Name of the research directors	PROF SIMONA FERRANTE

Contacts
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	Fondazione IRCCS Istituto Neurologico Carlo Besta
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	to be defined together with Istituto Carlo Besta
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Educational activity: The student will be encouraged to attend to courses at POLIMI or abroad in International Schools.   **Teaching assistantship:** There are various forms of financial aid for activities of support to theteaching practice. The PhD student is encouraged to take part in these activities, within thelimits allowed by the regulations.   **Computer and desk availability:** the student will be allowed to access facilities of the DEIB.