POLITECNICO DI MILANO

PhD in BIOINGEGNERIA / BIOENGINEERING - 40th cycle

PNRR 630 Research Field: INNOVATIVE BIOMARKERS FOR THE OPTIMIZATION OF POST-STROKE REHABILITATION TREATMENTS - BIOMARKERS INNOVATIVI PER IL MONITORAGGIO E L OTTIMIZZAZIONE DI PROTOCOLLI DI RIABILITAZIONE POST-STROKE

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	Gait disorders significantly affect everyday mobility and quality of life in patients suffering from stroke. Enriched treatments such as Functional Electrical Stimulation (FES) and Exoskeletons can be used to enhance rehabilitation therapies, however it is still unclear how best to use them to maximize the outcome. In fact, the brain dynamics underlying sensorimotor control of gait are currently poorly documented because of technological challenges related to neuroimaging performed during patients' movement. The aim of the proposed research is to discover and analyze relevant physiological biomarkers, collected during the rehabilitation treatment of post-stroke patients, which could allow to track rehabilitation progress, predict outcomes and ultimately optimize the treatment.
Methods and techniques that will be developed and used to carry out the research	The research will be carried out mainly at the Villa Beretta Rehabilitation Center (Costa Masnaga, Lecco). The candidate will develop novel techniques to analyze features extracted from ground reaction force, kinematics, electromyographic (EMG) and electroencephalographic (EEG) data, that will be collected during gait in chronic stroke patients. Relevant features will be used to assess the cognitive the patients' cognitive flexibility and used to promote plastic reorganization in a closed loop

Educational objectives	•Learning how to perform mobile brain/body imaging data collection, synchronization, analysis •Learning the best clinical practices from one of the most advanced rehabilitation clinics in Italy •Increase data analysis/processing technical skills •Learning how to interact with engineers, therapists and clinicians in a strong multidisciplinary environment
Job opportunities	The candidate will gain strong skills in data processing and clinical practices that will be considered of great value to clinics, hospitals, rehabilitation centers and industries.
Composition of the research group	2 Full Professors 3 Associated Professors 3 Assistant Professors 15 PhD Students
Name of the research directors	Prof. Fiorenzo Artoni

Contacts
Prof. Fiorenzo Artoni fiorenzo.artoni@polimi.it Dr. Franco Molteni Ing. Eleonora Guanziroli

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)	Ospedale Valduce, Dipartimento di Medicina Fisica e Riabilitazione, Centro di Riabilitazione Villa Beretta
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	Clinique Romande de Readaptation, Sion, Switzerland - http://www.crr-suva.ch/
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 2 / 3in International Schools. Teaching assistantship: There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations. Computer and desk availability: the student will be allowed to access facilities of the DEIB.