BIOENGINEERING AND MEDICAL-SURGICAL SCIENCES

DIMEAS/DET/CRT - Neuroengineering techniques to support clinicians in the management of PD patients undergoing Deep Brain Stimulation neurosurgery

Funded By	Dipartimento DIMEAS FONDAZIONE CRT CASSA DI RISPARMIO DI TORINO [P.iva/CF:06655250014] Dipartimento DET
Supervisor	AGOSTINI VALENTINA - valentina.agostini@polito.it
Contact	GHISLIERI MARCO - marco.ghislieri@polito.it
Context of the research activity	Specific objectives of the research will be: (1) development of innovative signal processing techniques for mapping subthalamic nucleus through microelectrode recordings; (2) development of advanced methodologies to analyze and interpret motor control strategies, based on gait analysis and muscle synergy extraction; (3) assessment of motor-cognitive dual task effect in PD patients before and after bilateral subthalamic nucleus Deep Brain Stimulation.
Objectives	Deep Brain Stimulation of the Subthalamic Nucleus (STN-DBS) is a well-established surgical therapy for patients with advanced Parkinson's Disease (PD) and motor complications that cannot be adequately managed with medication. Instrumented gait analysis already proved succesfull for objectively evaluating alterations of locomotor patterns in a wide variety of neurological and neurodegenerative disease, including PD. Novel motor biomarkers obtained in ecological conditions will be considered, as well as the study of motor modules, through the muscle synergy theory. In particular, this latter technique revealed its potential in clinics for understanding the basic mechanisms through which the Central Nervous System (CNS) coordinate different motor tasks. The aims of this research project are: (1) development of innovative signal processing techniques for mapping subthalamic nucleus through microelectrode recordings, to help clinicians identifying STN during neurosurgery; (2) development of advanced methodologies to analyze and interpret motor control strategies, based on gait analysis and muscle synergy extraction; (3) assessment of motor-cognitive dual task effect in PD patients before and after bilateral STN-DBS. With the final aim of supporting clinicians in the management of PD patients before and after STN-DBS neurosurgery, the candidate will acquire, process and interpret different kinds of biomedical signals developing new

	neuroengineering techniques.

Skills and competencies for the development of the activity	Biomedical signal processing and interpretation, documented expertise in the analysis of physiological data, neuroengineering and machine learning techniques.