Title (tentative): Assessing the effects of varying control strategies on a back-support exoskeleton for helping workers

Thesis advisor(s): Sanguineti Vittorio, Tommaso Poliero, Jesus Ortiz (Istituto Italiano di Tecnologia)

E-mail: Vittorio.Sanguineti@unige.it

Address: Via All'Opera Pia, 13 - 16145 Genova

Phone: (+39) 010 33 56487

Motivation and application domain
Back-support exoskeletons for assisting workers performing manual material handling are becoming more and more widespread. The proponents have developed an active robotic device that allows to test the effects of different control strategies on users (https://advr.iit.it/projects/inail-scc/esoscheletro).

General objectives and main activities
The student will join the XoLab multi-disciplinary research group, in the ADVR department of the Istituto Italiano di Tecnologia (IIT), Genova, Italy. The active exoskeleton developed in our group can generate custom torque profiles (‘control strategy’) to assist users, relying on different sensor inputs. Currently, exoskeleton control allows to adapt the strategy to the task being performed, but the effectiveness of this approach still has to be validated. To validate this new approach, the student will compare muscle activity and metabolic energy expenditure recorded during assistance with different control strategies. The experiments will allow the student to explore important aspects of research on human-robot interaction, motion tracking, gait analysis and real-time exoskeleton control. The study of the mechanisms of interaction between exoskeleton and user will allow to develop critic thinking on possible future design and approaches.

Training Objectives (technical/analytical tools, experimental methodologies)
- Data analysis on motion capture, muscular activity and metabolic consumption techniques.
- Experiments on healthy subjects.
- Analysis on the effectiveness of different control strategies based on different tasks (walking, standing, bending, etc)

Place(s) where the thesis work will be carried out: XoLab, Fondazione Istituto Italiano di Tecnologia; Bioengineering Lab, DIBRIS University of Genoa

Additional information
Pre-requisite abilities/skills: Conoscenza di Matlab e tecniche di base di analisi di dati e segnali

Maximum number of students: 1