Title (tentative): Evaluation of performance of a lower limb exoskeleton

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Motivation and application domain
Xosoft (www.xosoft.eu/) is a novel lightweight lower limb exoskeleton which uses quasi-passive actuators to assist up to six joints at the same time. The XoSoft platform allows to customize the exoskeleton configuration, by assisting any combination of hip, knee and ankle joints. An open control architecture enables the user to set custom control strategies.

General objectives and main activities
The main goal of this activity is to assess the effectiveness of the exoskeleton in assisting lower limb movements, by looking at muscle activity and metabolic energy expenditure during assisted walking by healthy subjects. Muscle fatigue will be also evaluated.

The student will join the multi-disciplinary research group carried on at the XoLab, ADVR, Istituto Italiano di Tecnologia (IIT), Genova, Italy. The experiments will allow the student to explore important aspects of research on human-robot interaction, motion tracking, gait analysis, real-time exoskeleton control, inertial and proprioceptive sensing. The study of the mechanisms of interaction between exoskeleton and user, and 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 possible assistive strategies based on varying control strategy and configuration of the assisted joints: flexion and/or extension of hip, knee and ankle.

Place(s) where the thesis work will be carried out: XoLab, ADVR, Istituto Italiano di Tecnologia (IIT), Genova, Italy

Additional information
Pre-requisite abilities/skills: Matlab and basic data and signal analysis skills

Maximum number of students: 2