UNIVERSITY OF GENOA
DEPARTMENT OF INFORMATICS, BIOENGINEERING, ROBOTICS AND SYSTEMS ENGINEERING
MASTER'S PROGRAM IN BIOENGINEERING

Thesis Project Form

Title (tentative): Assessing compressive loads of commercial back support exoskeletons.

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Description

Motivation and application domain

Motovation: developing technologies for protecting the human musculoskeletal system from work related injuries. Exoskeletons are a good way of doing so but we do not know how these devises alter the mechanical loads inside of our body. This thesis will use advanced MSK modelling methods to assess alteation in lumbar spine compressive loads during working tasks wearing a trunk exoskeleton.

Application domain: wearable robotics for occupational setting.

intro: Large scale electromyography (EMG) driven models can help estimate low back moments and compressive loading in real-time applications (Moya-Esteban et al 2022). These approaches have been used to benchmark exoskeletons at their workplace (Mohamed Refai et al 2024).
IUVO is an exoskeleton company that manufactures exoskeletons including those for back support such as the MATE XB. They are interested in knowing the influence of the exoskeleton assistance on low back compressive loads during industrial tasks. The EMG-driven models developed in our lab can suit this task perfectly.

General objectives and main activities

The goal is to measure the compressive loads of the MATE XB during industrial lifting activities This requires building neuro-mechanical models of human extremities. These models include computer-based representations of the musculoskeletal system and are driven by bio-electrical signals measured from skeletal muscles including electromyograms. These models are validated on experimental data and used to control wearable systems including wearable active orthoses.

Training Objectives (technical/analytical tools, experimental methodologies)

During the project, the student will learn and work with exoskeletons and apply musculoskeletal modeling and wearable sensing techniques to the measurements collected from participants. The student will enhance the following skills: Biomechanical modeling, movement analysis, electromyography, real-time closed-loop control.

Place(s) where the thesis work will be carried out: University of Twente

Additional information

Maximum number of students: 1

Financial support/scholarship: Erasmus scholarship