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PhD Research Project Rationale - LUNEX International University

Exoskeleton-Assisted Gait Training of patients with central nervous system diseases Exercise and physical activity provide beneficial effects on motor abilities of people affected by Multiple Sclerosis (MS), but adhering to the rehabilitation interventions represent a real challenge for these individuals due to their muscle weakness, mobility limitations and increased fatiguability [1,2]. While walkers, canes or rollators have been proven to assist MS ambulatory activity, they cannot provide improvement in physical endurance[3] as exercise interventions which, as resource-intensive approaches, still have limited success in clinical settings[4]. Considering such premises, a real need for innovative solutions in improving exercise delivery and intake capacity in people with MS is advisable. Robotic technology which seamlessly interfaces and interacts with human motion, can provide a practical and feasible solution to improve endurance and adherence in training[5–7]. LUNEX International University proposes to test the effectiveness of a supervised 4-weeks gait training based on an innovative powered lower-limb exoskeleton (ExoAtlet, Luxembourg). A cross-over design study will be implemented to compare improvements in gait abilities and endurance between a conventional gait rehabilitation and the exoskeleton-assisted gait training in MS. Complete biomechanical assessment of gait, (motion, forces and muscular activities), together with clinical motor and cognitive tests, (Timed Up and Go (TUG), 6-minute walk test (6MWT) and the Symbol Digit Modalities Test (SDMT)), will serve as outcome measures and executed at baseline and following the 4-weeks training. Improved motor coordination, endurance and cognitive function of processing speed will be expected in the Exoskeleton-Assisted training group compared to the conventional training approach.

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Title

Study and definition of methodologies for the construction, extension and validation of ontologies from unstructured data

Abstract

The topic of the use of AI (specifically, machine learning) for the classification of unstructured data (e.g., texts) is of main challenge for the extraction of knowledge from data. The CRISP centre is actively working on this topics in several national and international projects, in both Labour Market Intelligence and Healthcare fields.

One of the problems related to the use of AI in such a context lies in the ability to classify on both domain dependent and independent taxonomies/ontologies, which often present limitations in terms of representation and updating ability, and this limits their expressive power in the context of in which they are used (as in the case of the ESCO taxonomy). In such a context, the research direction goes towards the identification and definition of new techniques for the definition of ontologies from data (hence bottom-up, rather than top-down), with the aim of identifying terms, concepts and ontology relationships in a semi-automatic way (human-in-the-loop approach), to build new taxonomies / ontologies, as well as to enrich and to validate the existing ones.