# L1Narm++ – a multisensory and multimodal device for the neuromuscular rehabilitation of the upper limb for enriched treatments

**L1Narm++** helps to train and recover after a stroke or injuries of the upper limb. Such devices are typically expensive, complex and cumbersome, and they are not suitable to be installed and used at patient's home. **L1Narm++** is a low-cost training device with a compact and optimised design. An adaptable hybrid assistive control collects sensory information and optimises the parameters of the training task based on the patient's physical and physiological state and activity. **L1Narm++** uses dedicated computer games that gain and maintain the patient's attention properly throughout the rehabilitation task. The scenarios continuously adapt to the most appropriate level of difficulty in order to ensure adequate motor ability improvements and sufficient engagement.

**Cooperation partners:**

+ Consiglio Nazionale Delle Ricerche (CNR) - Institute of Intelligent Industrial Technologies and Systems for Advanced Manufacturing, Italy
+ Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland
+ Idrogenet Srl, Italy
+ University of Ljubljana, Slovenia

**Contact:**
Dr. Matteo Malosio, matteo.malosio@stiima.cnr.it

Echord++
Coordinated by the Technical University of Munich (TUM)
Department of Informatics
Chair of Robotics, Artificial Intelligence and Real-time Systems
Boltzmannstr. 3
D-85748 Garching

info@echord.eu



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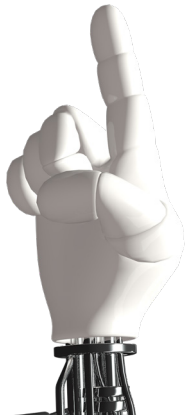
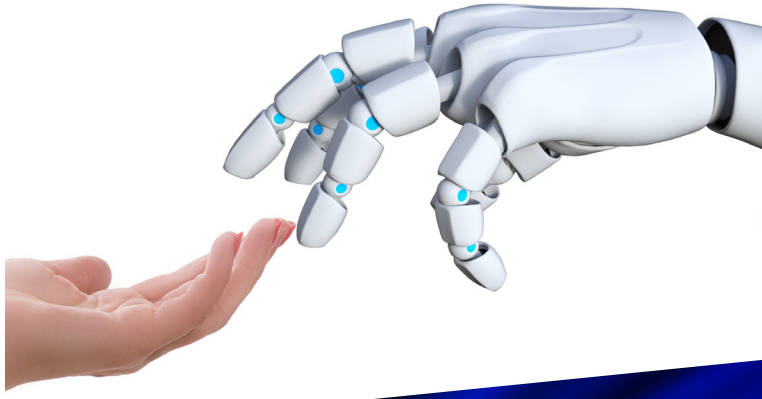
www.echord.eu



# FROM LAB TO MARKET

ECHORD++

(The European Coordination Hub for Open Robotics Development)



**The European robotics research project ECHORD++ promotes the interaction between robot manufacturers, researchers and users. It facilitates the cooperation between academia and industry to enhance the knowledge transfer from lab to market.**

**The five-year EU-funded project (2013-2018) supports small research projects, so-called experiments, innovative robot technologies in public institutions „Public End-User Driven Technological Innovation" (PDTI) and three „Robotics Innovation Facilities" (RIFs). RIFs offer access to high-tech robotic equipment and expertise at zero risk: using the RIF is not only free of charge, it also safeguards your intellectual property.**

## Assesstronic – Robotic for CGA

makes the execution of **C**omprehensive **G**eriatric **A**ssessment (CGA) exams easier, faster, more traceable and repeatable. Moreover it provides added-value outputs in different, more objective and subtle dimensions; it uses existing low-cost technologies such as 3D cameras, standard computers and tablets.

**ASSESSTRONIC**

- improves the user experience for both the caregiver and patients by performing CGA tests through natural interfaces as voice and touch. Thanks to such interaction means, the system is able to carry out the assessment autonomously.
- explores multimodal signal analysis for fine diagnosis. The platform extracts and analyses non-verbal behavioural parameters, based on non-verbal indices, i.e. prosody, facial expressions, gestures, gaze, etc.
- allows automatic physical assessment of tests for further analysis and quantification of motor, psychomotor and sensory-motor abilities on the basis of physical activities.
- collects, treats and stores health data related to each patient's CGA in a safe and efficient way.

**Cooperation partners:**

+ ACETIAM, France
+ Université Pierre-et-Marie-Curie, Sorbonne Université, France
+ Consorci Sanitari del Garraf, Spain

**Contact:**

Dr. Consuelo Granata, consuelogranata@gmail.com

## CLARC – a Smart Clinic Assistant Robot for CGA


**CLARC** significantly reduces total times for CGA sessions and at the same time increases the quality and quantity of the collected data collected. It moves autonomously in the care centre, receiving the patient and his family as a clinical assistant and accompanying them to the medical consulting room.

**CLARC** incorporates a RGB-D sensor, a touch panel, and a shotgun microphone, being able to perform Barthel and GetUp&Go tests without supervision. Additionally, these sensors allow the robot to collect further data automatically during the CGA interactive session using non-invasive procedures. For performing the Barthel test, **CLARC** offers the interviewee an external device that eases him to answer the questions. The aim is to automatically perform the session to the patient allowing the healthcare professional to take more time for addressing tasks such as personal interviewing, data evaluation or care planning. **CLARC** works autonomously and does not impose any constraint on the patient. The monitoring abilities of the software architecture allow **CLARC** to ask the medical expert for help, if needed during a CGA session.

**Cooperation partners:**

+ MetraLabs GmbH, Germany
+ SERVICIO ANDALUZ DE SALUD (SAS), Seville, Spain
+ Universidad de Málaga (UMA), Spain
+ Universidad Carlos III de Madrid, Spain
+ University of Troyes, France

**Contact:**

Dr. Antonio Bandera, ajbandera@uma.es

## EXOTrainer – An Exoskeleton for Children with Spinal Muscular Atrophy

The child on on the photo below never walked before. **EXOTrainer** is a project for the development of wearable gait exoskeletons for the therapy of children affected by **S**pinal **M**uscular **A**trophy (SMA). Walking is the key to retard the evolution of side effects, and with only 14 kg weight this device improves significantly the quality of life of those children and increases their life expectancy. The new therapy potentially relieves each family of up to 25.000 € spent on nursing costs per year. It also reduces expenditures of the healthcare systems through an improved and personalized therapy.

**EXOTrainer** builds on available technology, but with many more actuators and an optimized design.

MAK-Active Knee is an active, powered and intelligent device for knee rehabilitation after intervention or stroke. MAK users can walk up slopes or stairs, its joint behaves compliantly, adapting its stiffness to the gait cycle. It includes an intelligent control system that detects user intention and adapts the gait pattern to what the disease progression requires.

**Cooperation partners:**

+ Consejo Superior de Investigaciones Científicas (CSIC), Spain
+ Hospital Sant Joan de Déu, Spain
+ Marsi Bionics, Spain

**Contact:**

Manuel Prieto, manuel.prieto@marsibionics.com