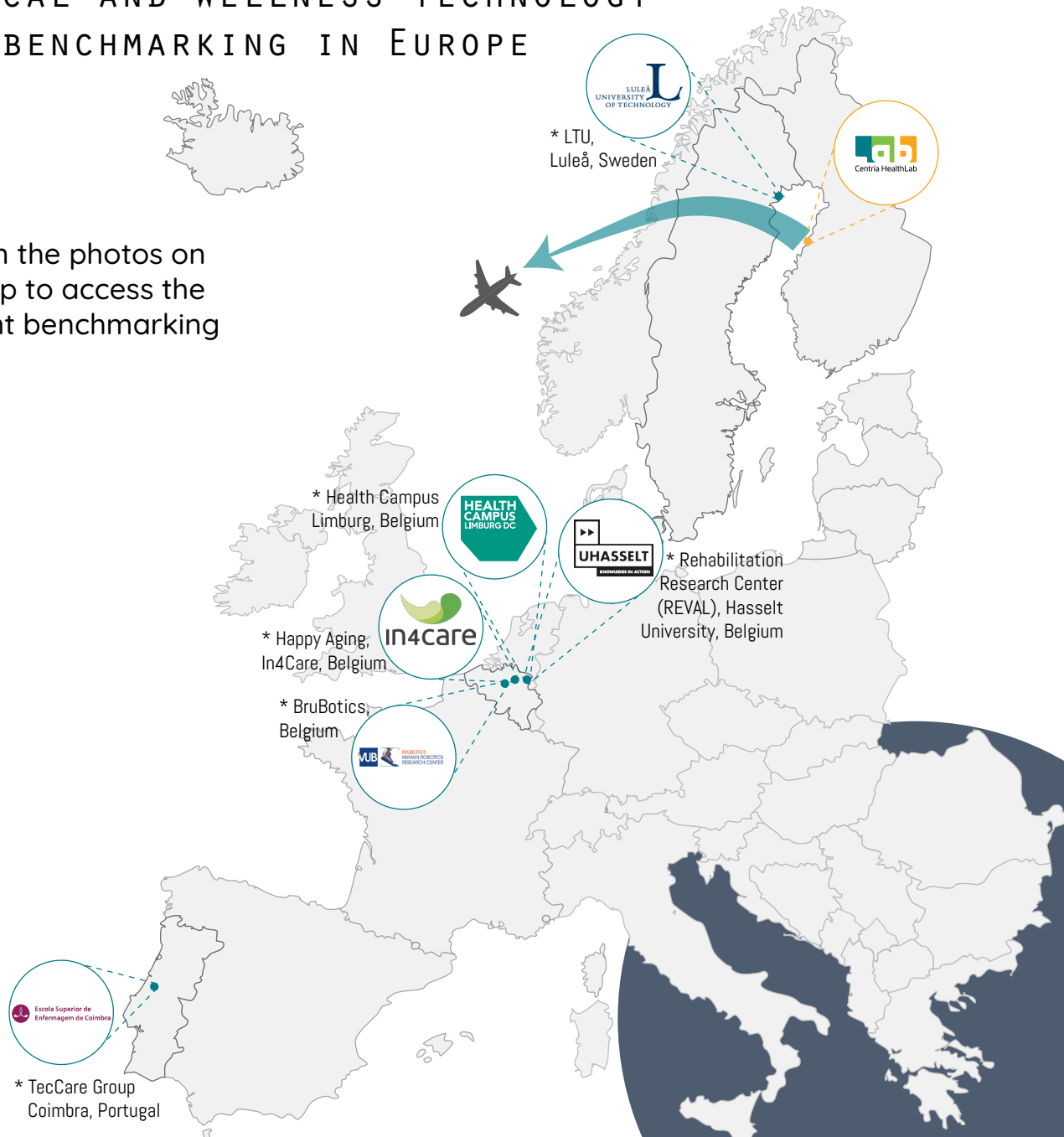


MEDICAL AND WELLNESS TECHNOLOGY RDI BENCHMARKING IN EUROPE

Click on the photos on
the map to access the
relevant benchmarking



JUNE 2023 , TEC CARE GROUP , THE HEALTH
SCIENCES RESEARCH UNIT: NURSING (UICISA: E) ,
NURSING SCHOOL OF COIMBRA , PORTUGAL

Facts: TecCare group is a part of the Portuguese nursing school, Escola Superior de Enfermagem de Coimbra. Their laboratory has multidisciplinary RDI staff collaborating with the teachers and students of the nursing school.

Network: Companies, health care professionals. International cooperation: companies, RDI actors e.g. in higher education institutions, various projects. The Portugal Centre for Evidence Based Practice serves as a JBI collaboration centre and collaborates with TecCare on evidence-based practices. The Health Sciences Research Unit is also member of the European Connected Health Alliance Group.

Collaborative “dating”: networking to find the best synergic matches between different research groups. The innovative topics and ideas are developed together and implemented by applying and starting new projects. Different projects are connected to each other to ensure continuity. Knowledge about the networks and specialists in the field are the key to success.

Technology: New health technologies developed in research projects, simulation facilities of nursing education, XR technology.

Growth and innovation: Attendance of the companies to RDI projects, development of new medical devices, patenting of new technical innovations. Students are encouraged to innovate and present their ideas. TecCare Group offers opportunities for the researchers from bachelor degree to post doc level.

INCREASING THE
USE OF EXPERIMENTAL
AND APPLIED RESEARCH
AND DEVELOPMENT IN
HEALTH TECHNOLOGIES

TecCare provides a free peer-reviewed open access journal Revista de Enfermagem Referência Journal of Nursing, that supports attention and visibility of project activities and results.

The laboratory aims to promote the development of innovative products that meet the real needs of the end-users and the health care sector. Their aim is also to strengthen the competence of students and teachers in health technologies, as well as to develop teaching and learning environments. Best practices, effective and safe solutions for nursing are presented and developed. Clinical practitioners and innovators connected by the group.

Best practices:
from the idea-
to-project
model.



STRENGTH:
“DATING AND
MATCHING”: CHALLENGES
ARE SOLVED THROUGH
THE SYNERGIC PARTNER-
SHIPS, NETWORKS AND
COLLABORATIONS.

BACK ON THE MAP

MAY 2023, BIP CLINICAL SKILLS AT CENTRIA

Fact: BIP is an Erasmus programme that brings together students and teachers. Centria HealthLab met the BIP partners of Universidade de Coimbra from Portugal, Università Vita-Salute San Raffaele from Italy and Universidad de Valladolid from Spain. Health technology related activities, cooperation, similarities and differences between the actors were discussed.

Common themes: The discussion identified the current issues that unite all countries, such as ageing and the need to develop and expand the use of telemedicine.

There could be lessons to be learnt between northern and southern European countries in the field of care for the elderly. The elderly in southern Europe have low level of technological know-how, so technology is not yet helping them to live independently. In Finland, the use of technology and readiness to use it is higher among the elderly, but the challenge is their loneliness. In Portugal, Italy and Spain, family-centered care supports the social well-being of older people.

The development of virtual learning environments would be a fruitful area for cooperation.

Of the devices tested in the Centria hardware labs, the most interesting ones were found to be:

- Cardiac arrhythmia detection device
- Technology for remote consultation
- Somnox sleep robot
- Miro and CRDL, and the medicine dispenser robot

MAIN GOAL:
TEACHING NURSING
(NURSES)

The students are young and interested in technology, and have the confidence and skills to use the applications. The size of organisations, funding and bureaucracy can pose challenges in terms of hardware and application costs, limiting the current possibilities of nursing schools to provide health technology education.



BACK ON THE MAP

OCTOBER 2023 , LULEÅ UNIVERSITY OF TECHNOLOGY (LTU): BOTNIA LIVING LAB, ACTIVITY LABORATORY, HUMAN MOVEMENT SCIENCE LAB, SWEDEN

LTU is located in four university towns: Luleå, Skellefteå, Piteå, and Kiruna in northern Sweden. LTU is a technical university, but also has a holistic perspective and breadth through research and education in multiple fields. They possess several unique experimental environments for research in areas such as space, mining, snow, and energy. Of the total external funding, LTU has the highest proportion of corporate funding among all universities in Sweden.

The university of 17,000 students and more than 1,800 employees is the most important higher education institution in northern Sweden and has several research areas. Strong expertise and research can be found in areas such as Applied AI, Space, Mining, Green Transition, Renewable Hydrogen, Sustainability, Precision Health, Digitalization and circular economy. COMEA visited some of the fascinating research groups and labs at LTU.

Botnia Living Lab facts: Started in 2000 as a test bed and it has participated in several national and international projects. Botnia Living Lab is project-based. The activities involve 5-6 part-time researchers. Botnia Living Lab is usually invited to participate in projects, based on previous cooperation and knowledge. The Living Lab often plays a research role in projects focusing on different types of innovation.

Network: Botnia Living Lab has done collaboration with about 400 different organizations. Living Lab has quadruple-helix approach and that means that they collaborate with public sectors, academia, private sectors and citizens. Botnia Living Lab is closely involved in the European Network of Living Labs (ENoLL) - in fact, they were one of the founding members of ENoLL in 2006.

A LIVING LAB IS
A USER-CENTRIC
INNOVATION
APPROACH.

Innovation: The leading themes of Botnia Living Labs work are participatory design and user engagement. The innovation process consists of research, co-creation, implementation and evaluation. This innovation process will be repeated several times in the development project to achieve the best possible outcome.

In all projects, the key is early and continuous engagement of all relevant stakeholders and users. Botnia Living Lab does not have its own laboratory facilities, but development and innovation takes place in collaboration with stakeholders in authentic environments, depending on the scope of the development project.

In projects, Botnia Living Lab organizes training sessions and workshops, supports the innovation development process with and by users, designs and develops toolkits and manuals, tests innovations with users and conducts research.

Botnia Living Lab works in different areas such as Urban Living Lab, Rural Living Lab, Smart Cities, Health, Energy, Climate and Sustainability.

Activity Laboratory facts: An environment originally developed to support the teaching of occupational therapy students. Activity Lab is a home environment, where students can practice different kinds of work tasks in a real-life environment. The lab can also be used when wanting to demonstrate some new technology or test products.

The area's social- and healthcare professionals are also invited to the lab to get to know new technology and test it.

Network: The network for co-operation around the Lab is still being built.



THE MOST IMPORTANT
AND CHALLENGING ASPECT
OF INNOVATION IS THE
EARLY AND CONTINUOUS
INVOLVEMENT OF ALL
RELEVANT STAKEHOLDERS.

The main focus of the people working in the lab is education, and all the research and development is done in projects. In the Lab there are Pepper and Buddy social robots and Double telepresence robot. In addition, the lab has lots of technology to support activity management, such as digital calendars, reminders and smart boards.

In LTU, technology is part of occupational therapy teaching from the very beginning of the studies. Activity Lab has made videos to enable the students to familiarize themselves with the lab and its technology beforehand. Currently the Activity Lab is mainly booked for occupational therapy students, but in the future it could be used for a wider range of other disciplines. For example, paramedic students can practice transferring a patient from bed to stretcher in the lab. Technology students also use the lab facilities, focusing on specific technologies and systems found there.



There are very few health technology companies in the area, but the Activity Lab has collaborated with other companies in the region, for example applying technology used in mining and bringing it to the home environment.



ACTIVITY LAB
HAS SIMULATED
HOME ENVIRONMENTS
WITH VARIOUS
TECHNOLOGIES

Human Movement Science Lab facts:

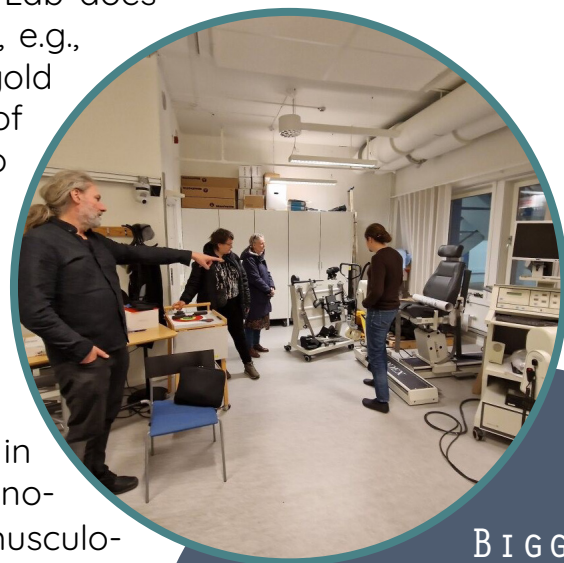
Movement Science Lab has facilities and expertise for movement (kinematics), forces (kinetics) and muscle activity analysis. It locates in Luleå campus and has a group of researchers and PhD's in physiotherapy and engineer. The Lab is run by the division of physiotherapy, and they work on different projects, also together with other departments. The Lab is financed by LTU lab fund, Kempe Foundation and Swedish Research Council.

Network: Movements Science Lab collaborates with other departments of LTU e.g. AI & Robotics, Machine learning and Health care. Main partners regionally are Region Norrbotten, Hermelinen and Medtech company Curest AB. Nationally they work with Lund and Umeå Universities ja Gävleborg region. Internationally they have collaborated with e.g. University of Queensland in Brisbane Australia.

Technology: Optoelectronic motion capture system (Qualisys), electromyography (EMG, Noraxon), Force plates (Kistler) in the lab. Mobile wireless equipment for movements, forces and muscle activity measurements. Dynamometers (incl. Biodex Syst4), Gaitrite, VR-goggles applied for e.g. neck rehabilitation, and more, including special equipment for perturbations.

Business co-operation: Movement Science Lab does evaluation of new methods and equipment, e.g., validation against labs equipment as the gold standard, reliability testing and evaluation of feasibility and treatment effects. Lab also sells services (equipment and personnel) when there isn't any clear research collaboration with the company. They have a cost and price model for the different equipment and personnel.

Good practices: The lab has a core role in physiotherapy research, education and innovation. Their core expertise is research on musculo-skeletal rehabilitation, elderly people balance and fall related aspects. Lab's strengths are having a great group of experts, comprehensive high standard equipment, a good location and access to the lab. All research performed on humans have ethical clearances before start.



BIGGEST
CHALLENGE IS
FINDING THE RIGHT
PEOPLE WHO HAVE
THE POWER TO MOVE
THINGS FORWARD.

Machine Learning facts: Machine learning research group consists of over 20 professionals. It was established in 2018. The vision of the group is to harness machine learning to work in as many areas of welfare society as possible. They do research in various areas of machine learning and artificial intelligence, such as natural language processing and brain analysis. They also develop new medical devices.

Projects: Machine Learning group has worked on projects in the fields of good health and well-being, sustainable industry innovation and infrastructure as well as quality education and culture. They work in industrial applications focusing on trustworthiness and robustness. On the other hand, they do a lot of fundamental research.

Technology: The group has special knowledge and experience widely on different aspects of machine learning and artificial intelligence. They are doing applied research involving computer vision, gesture analysis, natural language supervision, industrial data analysis and processing and privacy-aware trustworthy machine learning in different fields. In speech and language technology they have provided very well performing intent classification, developed chatbots for different situations, such as supporting young people mental health. Their Brain Analysis Lab has EEG-fMRI combination system for simultaneous recordings of EEG in MR that has been applied e.g. to inner speech recognition.

Network: Machine learning group is actively marketing their work and knowledge. They have time to meet different organizations and company representatives. Group members participate in conferences on their special field of expertise.

MACHINE
LEARNING FOR
THE WELFARE
SOCIETY!

[BACK ON THE MAP](#)

OCTOBER 2023, HEALTH CAMPUS LIMBURG, DIEPENBEEK, BELGIUM

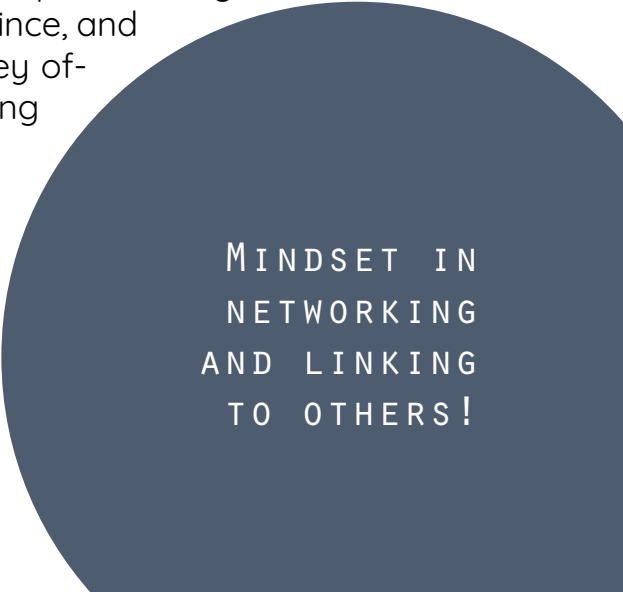
Health Campus Limburg's builds the future of healthcare by stimulating collaborations, entrepreneurship, and innovation. Its main focus is to accelerate regional health and life science economics. Health Campus is a center that contributes both the development and implementation of new solutions to the healthcare field.

Networks: Health Campus Limburg collaborates regionally and with other European partners. In their network they have different kinds of business stakeholders, governmental institutions, healthcare organizations, universities and colleges. The campus has one university and two college universities. Internationally they cooperate e.g. in Korea Bio, Osaka Bio headquarters, IASP and Flanders Investment & Trade networks.

Limburg is located in the ELAt (Eindhoven-Leuven-Aachen triangle) area, which includes six regions located at the intersection of Germany, the Netherlands and Belgium. ELAt is a dense cross-border area of over 8 million inhabitants, including multiple city and regional growth poles. Flamers are strongly connected to this regional ecosystem.

Connective infrastructure where lots of likeminded organizations are situated closely, gives good possibilities for collaboration. Health Campus Limburg brings together primary care stakeholders of the province, and they are also working on health-related research. They offer coaching, partnership and different kinds of training programs to their network.

Topics of expertise: Digital and data-driven healthcare, personalized digital medication, rehabilitation technology, integrated and primary care and clinical research and validation. They work in and with facilities also outside of campus. Health campus has lots of different kind of technology according to their topics of expertise.



MINDSET IN
NETWORKING
AND LINKING
TO OTHERS!

Activating businesses: In Limburg there is a regional investment company that was established when areas economy was transferred away from mining industry. Regional funding functions as oxygen that companies need for growing and to proceed new ideas to business.

To activate innovation, talented people and collaboration is needed. Needs and challenges arise from health care, while the ability to solve those challenges comes from university and technological applications. Key for new innovations is to bring these actors together, and health campus offers an interactive environment for this.

To reaching different actors from the field it's important to make a lot of noise, that means being active in local and social media. At the moment health campus is growing fast and new facilities are being planned and built. Limburg will be building a green and healthy campus that activates people to spend time outside. Areas transition towards high tech is still going on.



BACK ON THE MAP

OCTOBER 2023, HAPPY AGING, IN4CARE, BELGIUM

Happy Aging offers a real-life environment for companies and health care organization to co-create and develop innovative concepts for elderly care. With co-creation we can make sure that aging people can reside longer and with higher quality of life, in their home environment.

Living lab: There are over 400 Happy Aging specialists, the aging people themselves, who are the heart of the living lab. They are often invited to participate in gaining user focused products and actions related to aging people. The living lab is a membership organization. Member fee varies from 600 € to 5200 € annually, depending e.g. the size of the member organization. Member organizations operate in the healthcare innovation and service provider sectors.

Main form of network collaboration is to bring the members together. Living lab arranges events, educations, workshops and courses. Living lab also arranges easily accessible social events for aging people to feel as a part of living lab.

One of the living labs method for member organizations is Pilot table. In the pilot table the decisionmakers are invited to get an update on recent ideas and products of companies. First in the event the companies give a short pitch about their idea or product. After the pitching sessions all have a dinner together and during the dinner the companies go around the table. It's lot like a speed dating event that companies pay to attend. Decisionmakers are motivated by the new innovations and new co-operation can get started.

Technology: Happy aging is working on improving digital health and technology skills for aging people. They have been testing e.g. vital function monitoring, VR rehabilitation applications and a mobile robot designed to elderly care.



WISDOM OF
AGE PROVIDES
KNOWLEDGE TO
COMPANIES.

End user collaboration is the focus of living lab. Connecting companies with the Happy Aging end-users enables fruitful co-creation.

Communication: Living lab hosts Happy Aging Day, that is the main annual event. They arrange site visits. Face to face meetings are important for the aging people. Personalized emails and calls are a good way to activate participants. Happy Aging staff attends to conferences and other events where they share flyers and booklets of their living lab. Happy Aging is also a member of EnOLL network that gives them a good chance to share information and news about their activities. ELAt area's living labs have close collaboration, such as cooperating in projects, sharing information to each other and having mutual site visits. Happy Aging is being active in just about all main social medias.

Challenges: Technology goes forward so fast that it's tricky to stay updated for the aging people. We should see the aging people as a valid part of society and give them a voice. When we recognize aging people as individuals we can really start to develop our products suitable for them.



Companies are a bit challenging to attract. Usually start-ups don't have budgets for living lab services and for that reason the living labs business model could be developed to better serve the companies.

OCTOBER 2023, REHABILITATION RESEARCH CENTER (REVAL), HASSELT UNIVERSITY, BELGIUM

REVAL applies interdisciplinary and technology-supported research to rehabilitation. Their focus is on the individual with the aim of promoting the lifelong functioning, health and well-being of each person. REVAL is the European leader in multiple sclerosis (MS) physical rehabilitation as well as cardiometabolic and chronic obstructive pulmonary disease (COPD) rehabilitation.

Network: Collaboration with companies, clinical and academic partners, students, research and teaching personnel. Its personnel consist of over 100 rehabilitation teachers and researchers. All relevant stakeholders are involved in a local rehabilitation innovation ecosystem. Collaboration with companies is agreed with separate contracts. One of the current network activities is mapping rehabilitation technology that is already present and used in clinics today. Center is also creating hubs working around rehabilitation.

Health lab: Research Center's main focus is applied research in clinical rehabilitation practices. They also make significant contribution to the research of the underlying mechanisms in rehabilitation. The center is active in four research areas: neurological and geriatric rehabilitation, rehabilitation of cardiorespiratory and internal diseases, musculoskeletal rehabilitation, and pediatric rehabilitation. Technology is seen as a tool to improve the quality, adherence and accessibility of rehabilitation care.



ACTIVE
RESEARCH BOOSTS
THE COMPANIES
ON THE AREA.

Technology: REVAL has comprehensive equipment for kinesiology measurements and physiotherapy applications. Equipment and expertise to measure gait, balance and motor skills in various populations, such as children with cerebral palsy or coordination disorders, individuals with multiple sclerosis, and people rehabilitating after stroke. For technology assisted rehabilitation they have devices and software for mHealth, remote monitoring and telerehabilitation, VR environments, AI and big data applications. Currently they are implementing an installation of a high-tech motion registration lab with a VR dome that will be unique in mainland Europe.

The best practices: Strong expertise in rehabilitation and academic industrial collaboration are key elements for innovation activity. Young and senior researchers do lots of collaboration, that supports innovative activities and rehabilitation business growth in the region.

[BACK ON THE MAP](#)

OCTOBER 2023, BRUBOTICS REHABILITATION RESEARCH CENTER, BRUSSELS, BELGIUM

BruBotics focuses on development of new evidence-based and user-centered technologies. It aims to improve the quality of life and working conditions of people through human robotics. It consists of eight research groups closely collaborating with each other, of which we visited two: [Rehabilitation Research Group](#) and [Electronic & Informatics](#).

HealthLab activities: Development of new evidence-based and user-centered technologies for rehabilitation. Interdisciplinary robotics research uniquely combining expertise on robotics, AI, rehabilitation sciences, movement sciences, ageing and eHealth. Development of new medical devices, clinical trials, clinic – research collaboration.

Network: Most important networking of the research groups is close interdisciplinary collaboration with local hospital and other research groups of BruBotics. The groups also implement projects with other universities, such as University of Leuven and do industrial collaboration with robotic companies, such as KUKA. Research groups do active collaboration with physiotherapy and engineering education, the students even have opportunity to develop new medical devices with them.

Technology: Specialized in rehabilitation robotics, developing new medical robotics and other devices. The lab has developed new devices for upper lower limb, home and remote rehabilitation, including e.g. exoskeletons, robotics, a smart rollator and various gamified applications. One award winning example is a rehabilitation robot designed for limb movement practicing after stroke. A recent example is Ghostly, a gaming app designed for rehabilitation in patient wards which is controlled with EMG. Another medical device developed by the group is AR assisted neurosurgical drain placement. They also have facilities for physical rehabilitation measurements, such as EMG and multicamera movement analysis.

Best practices: Close collaboration between research centers and clinicians at the hospital locating next to the campus. Shared physical offices at both sites i.e. clinical linking points and scientific linking points: people from the research group work in hospital ja opposite.

Challenges: Finding more collaborating companies.



BACK ON THE MAP