



**LabORA**  
LABORATORI OBERT DE ROBÒTICA ASSISTENCIAL

## White paper on Assistive Robotics

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Following the recommendations of the Institut d'Estudis Catalans<sup>1</sup>, we will use the generic masculine throughout this document.

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<sup>1</sup> THE INCLUSIVE LANGUAGE: COMPATIBILITY OF SYLIST RESOURCES AND USES DO NOT SEXIST AMONG LINGUISTIC REGULATIONS  
<https://sf.iec.cat/wp-content/uploads/2024/07/El-lenguatge-inclusiu.pdf>

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# 1. Summary executive

# Summary executive

The aim of this White Paper on Assistive Robotics is to analyse the reality of health care robotics and draw lessons to help us understand the difficulties that have been a barrier to its proliferation.

[Chapter 2](#) begins by analysing the field of social and health care. The world's population is ageing at an unprecedented rate, and this demographic change brings enormous challenges for health and social systems. Robot-assisted care is a burgeoning field of research that is gaining ground and a trend that looks set to continue into the future.

[Chapter 3](#) shows that assistive living includes a wide range of technologies and devices that aim to help people with their needs, improving their quality of life and facilitating access to services and support.

Based on the consideration that technology is a fundamental tool to address the challenges of ageing, national governments, the European Union and health organisations around the world have developed a variety of programmes, initiatives and directives to promote the use of technology in health and social care. The most relevant of these are presented in [chapter 4](#).

[Chapter 5](#) introduces assistive robotics as the branch of robotics aimed at helping people to maintain their autonomy, to continue living at home and to participate in their communities, with the best possible quality of life. The chapter presents the landscape of assistive robotics, a number of general considerations to be taken into account in the design of assistive robots, what their applications are and how they interact with society.

In recent years, a very significant number of projects have been carried out in the field of assistive robotics. A representative selection of research projects is presented in [Annex 1](#). [Chapter 6](#) presents a quantitative assessment and the main lessons and recommendations that can be drawn.

[Chapter 7](#) introduces a classification of assistive robots according to their functions. A detailed list is presented in Annex 2.

[Chapter 8](#) is a central chapter of the White Paper. Based on all the analysis carried out so far, it identifies the main barriers and enablers to the widespread adoption of assistive robotics in society.

The other [central chapter is chapter 9](#), which presents the role of assistive robotics as a transformative factor in health and social care, identifying the main challenges and opportunities, as well as a vision of the expected market for assistive robotics.

[Chapter 10](#) focuses on the outlook for the robotics care sector in Catalonia, identifying strengths, existing entities in the field and a series of recommendations to promote robotics care in the Catalan health and social care ecosystem.

[Chapter 11](#) presents the conclusions of all the analysis carried out in the document.

Finally, the annexes present the aforementioned lists of assistive robotics projects ([annex 1](#)) and assistive robots ([annex 2](#)), as well as a series of conferences and seminars on assistive robotics ([annex 3](#)) and research centres in robotic areas ([annex 4](#)).





## 2. Social and health care: towards robot-assisted care

# Social and health care: towards robot-assisted care

The world's population is ageing at an unprecedented rate, and this demographic and epidemiological change brings enormous challenges for health, social and community care systems. To cope with demographic and epidemiological pressure, many countries are undertaking long-term care reforms. There is a mismatch between the care needs of citizens and the provision of services that makes it necessary to explore innovative solutions to provide all people with efficient and affordable services. In this scenario, robotic-assisted care is a burgeoning field of research that is gaining ground and a trend that looks set to continue in the future. Below we identify some of the reasons why.

## 2.1 Ageing population

Declining birth rates and increasing life expectancy are mainly responsible for the accelerated ageing of the population, a phenomenon that is widespread worldwide with few exceptions. According to the World Health Organisation (WHO), it is estimated that between 2015 and 2050, the percentage of the world's population over 60 years of age will double from 12% to 22%<sup>2</sup>. Ensuring that health and social care systems can respond to this demographic change is the enormous challenge now facing many countries. The WHO has emphasised the concept of Healthy Ageing in its latest reports<sup>3,4</sup> as the process of developing and maintaining a functional capacity that enables well-being in old age.

In Catalonia, according to data from the Statistical Institute of Catalonia (IDESCAT), the ageing process of the Catalan population continues<sup>5</sup>. The percentage of the population aged 65 and over has risen from 19.0% in 2021 to 19.3% in 2022. The age composition of the over-65s is also ageing, with the ratio of over-85s to over-65s (over-ageing index) rising from 16.9 in 2021 to 17.1 in 2022.

<sup>2</sup> <https://salutweb.gencat.cat/ca/departament/ambits-estrategics/atencio-sociosanitaria/cronicitat/index.html>

<sup>3</sup> [https://iris.who.int/bitstream/handle/10665/186471/WHO\\_FWC\\_ALC\\_15.01\\_spa.pdf](https://iris.who.int/bitstream/handle/10665/186471/WHO_FWC_ALC_15.01_spa.pdf)

<sup>4</sup> <https://www.who.int/publications/i/item/9789240017900>

<sup>5</sup> <https://www.idescat.cat/novetats/?id=4418>



Data for Spain also show a growing rate of population ageing, with an all-time high of 125.7% recorded in 2020<sup>6</sup>. This means that there are 125 people over the age of 64 for every 100 people under the age of 16. It is expected that by 2050 one in three Spaniards will be over 65 and more than 5.3 million people will be aged 80 or over. It should be borne in mind that there is also a differential demographic aspect at the gender level in population ageing.

Despite the increase in life expectancy, not all the years of life gained will be lived in good health, especially for the very old. The ageing of the population is associated with a reduction in intrinsic capacities and an increase in cases of dependency. The Council of Europe defines<sup>7</sup> dependency as 'The condition of a person who, through lack or loss of physical, mental or intellectual autonomy, requires the care or substantial assis-

tance of others to carry out activities of daily living, such as: personal care, basic domestic activities, essential mobility and related activities.'

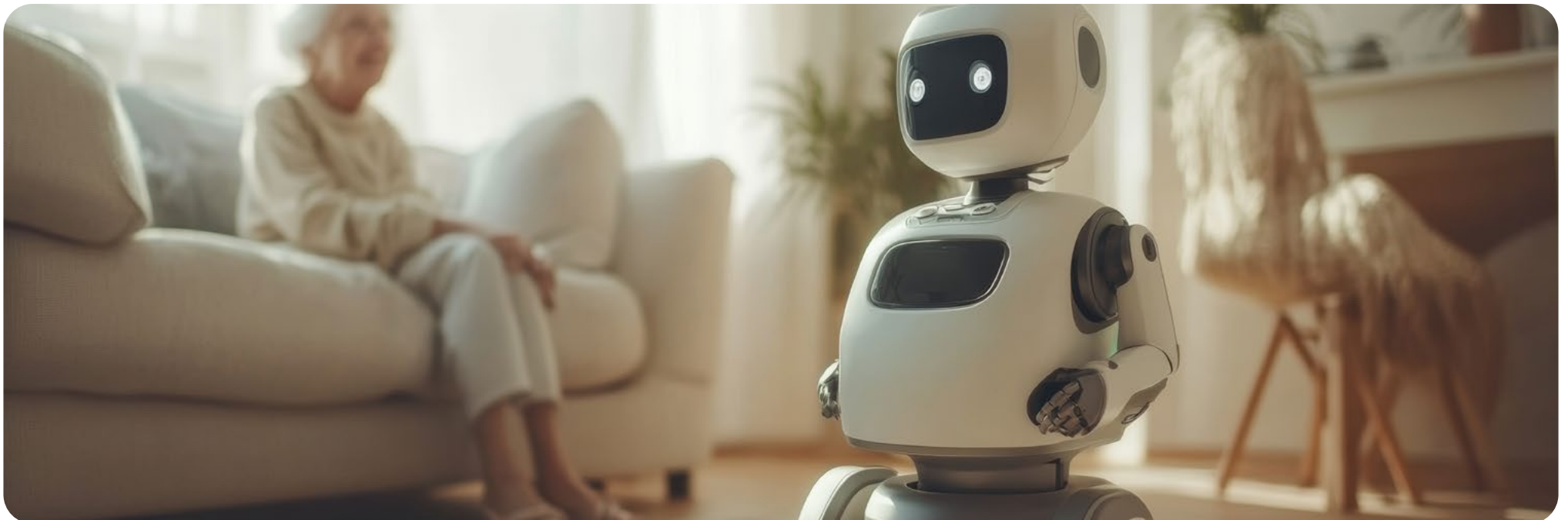
This trend will therefore require an increased need for social and health care services, while the number of professionals available to provide and fund these services is decreasing<sup>8</sup>.

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<sup>6</sup> <https://fundacionadecco.org/notas-de-prensa/ano-2020-el-envejecimiento-avanza-imparable-y-alcanza-su-valor-maximo-en-espana-125-se-contabilizan-125-mayores-de-64-anos-por-cada-100-menores-de-16/>

<sup>7</sup> [https://ibdigital.uib.es/greenstone/collect/portal\\_social/import/vodafone/vodafone0001.pdf](https://ibdigital.uib.es/greenstone/collect/portal_social/import/vodafone/vodafone0001.pdf)

<sup>8</sup> Becker P, Schütz J, Zimmermann A (2018) Ageing Workforce, Social Cohesion and Sustainable Development: Political Challenges con la Baltic Sea Region. Población Europe Discussion Paper.p. 61: <https://population-europe.eu/research/discussion-papers/discussion-paper-no-9-ageing-workforce-social-cohesion-and-sustainable>



## 2.2 Unsustainable social expenditure

As more and more older people require care due to chronic illness or disability, the cost to society of providing health and social services in hospitals and nursing homes becomes unsustainable.

On the other hand, people prefer, whenever they have a choice, to live at home as far as possible. Their quality of life, and often their dignity, depends on being able to maintain autonomy in their lives and social relations in their known environment. In many European countries, priority is given to ageing at home. Therefore, non-institutionalised, community-based long-term care services, or what is known as home care, are promoted.

In Spain, the average cost of home care is 59.23 €/day<sup>9</sup>, while the average cost of a nursing home is between 1,600 and 2,000 €/month<sup>10</sup>. Home carers charge between 13.5 €/hour if they work more than 40 hours per month<sup>11</sup>,

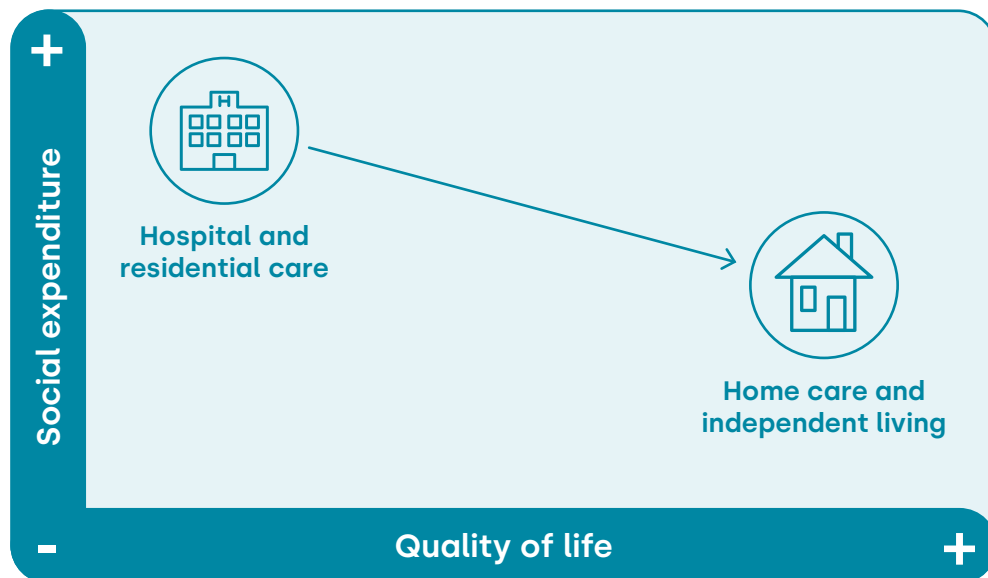


Illustration 1. Reasons for home-based care (adapted from Robotdalen)

and residential care homes for the elderly have an average annual cost ranging from around 17,500 € for adult day care services to around 94,000 € for long-term care in a private room<sup>12 13</sup>.

Thus, the home care formula is the most desired by the individual, the one that provides the best quality of life and the most affordable for society.

## 2.3 Lack of health professionals and social resources

There is a shortage of health professionals in Catalonia, Spain and Europe. The 1,400 doctors and nearly 5,000 nurses who graduated in Catalonia in 2021 are insufficient to cover the needs of the system and guarantee generational renewal. Moreover, some of these professionals will leave to work abroad.

Spain is also suffering from a shortage of health professionals, more than 4,000 doctors in 2019<sup>14</sup>. The health crisis in Spain has been caused by decades of underinvestment and competition between autonomous regions for health personnel. Thousands of doctors and nurses have left Spain over the last decade due to cuts in the health system and to seek better salaries and prospects abroad.

<sup>9</sup> <https://wayalia.es/precio-cuidadora-ancianos>

<sup>10</sup> <https://mejorencasa.es/cual-es-el-precio-de-una-cuidadora-de-ancianos/>

<sup>11</sup> <https://aiudo.es/precio-de-auxiliares-de-ayuda-a-domicilio/>

<sup>12</sup> <https://www.allheartcare.com/es/home-care-vs-nursing-home-care/>

<sup>13</sup> <https://www.aarp.org/espanol/recursos-para-el-cuidado/prestar-cuidado/info-2018/el-cos-to-anual-de-los-hogares-de-ancianos.html>

<sup>14</sup> <https://www.reuters.com/article/ushealthcoronavirusspaindoctors/southernperuexodusofdoctorsnursesascoronavirussurgesidUSKBN27Z1IC>

The General Council of Nurses in Madrid estimates that Spain needs up to 150,000 nurses to be in line with the European Union average. But the situation is not unique to Spain. Even Finland will need 200,000 new health care workers due to unprecedented hospital overcrowding caused by 'a severe shortage of nurses'<sup>15</sup>.

In Spain and in Catalonia, social services have historically been characterised by their welfarist approach, which means that not everyone can access services, but that they are restricted to certain groups. In order to benefit from these services or benefits, it is necessary to demonstrate that the necessary requirements are met. This entails a constant verification of the financial resources of applicants, who must prove financial need in order to obtain assistance. This policy has significant implications for the care of older people, who cannot universally access limited resources of social workers for their daily care. Moreover, the long-term care system is sustained by the support of informal carers, and informal carers are declining due to the increase in female participation in the labour market in recent decades<sup>16</sup>.

## 2.4 Growth of environmental assistance for independent living

Technology can become essential in promoting ageing at home, improving older people's independence, safety and quality of life. Through remote monitoring, smart devices and communication platforms, it can facilitate health management, social connection and access to services, reducing feelings of isolation. Telehealth and assisted mobility solutions promote autonomy and minimise caregiver dependency, while optimising healthcare resources. This technological integration in ageing at home is a step towards more sustainable and personalised care systems. Ambient Assisted Living, also known as AAL, is the result of applying smart technology to the physical environment to prolong the autonomous life of older

people<sup>17</sup> and support their carers. These systems can measure physiological parameters and vital signs of the person, as well as recognise their position, movements and activity in their daily life. Monitoring this data in real time helps to reduce the risk of chronic diseases, prevent accidents and communicate with their assigned caregivers, health and social professionals or family members in case of any incidents.

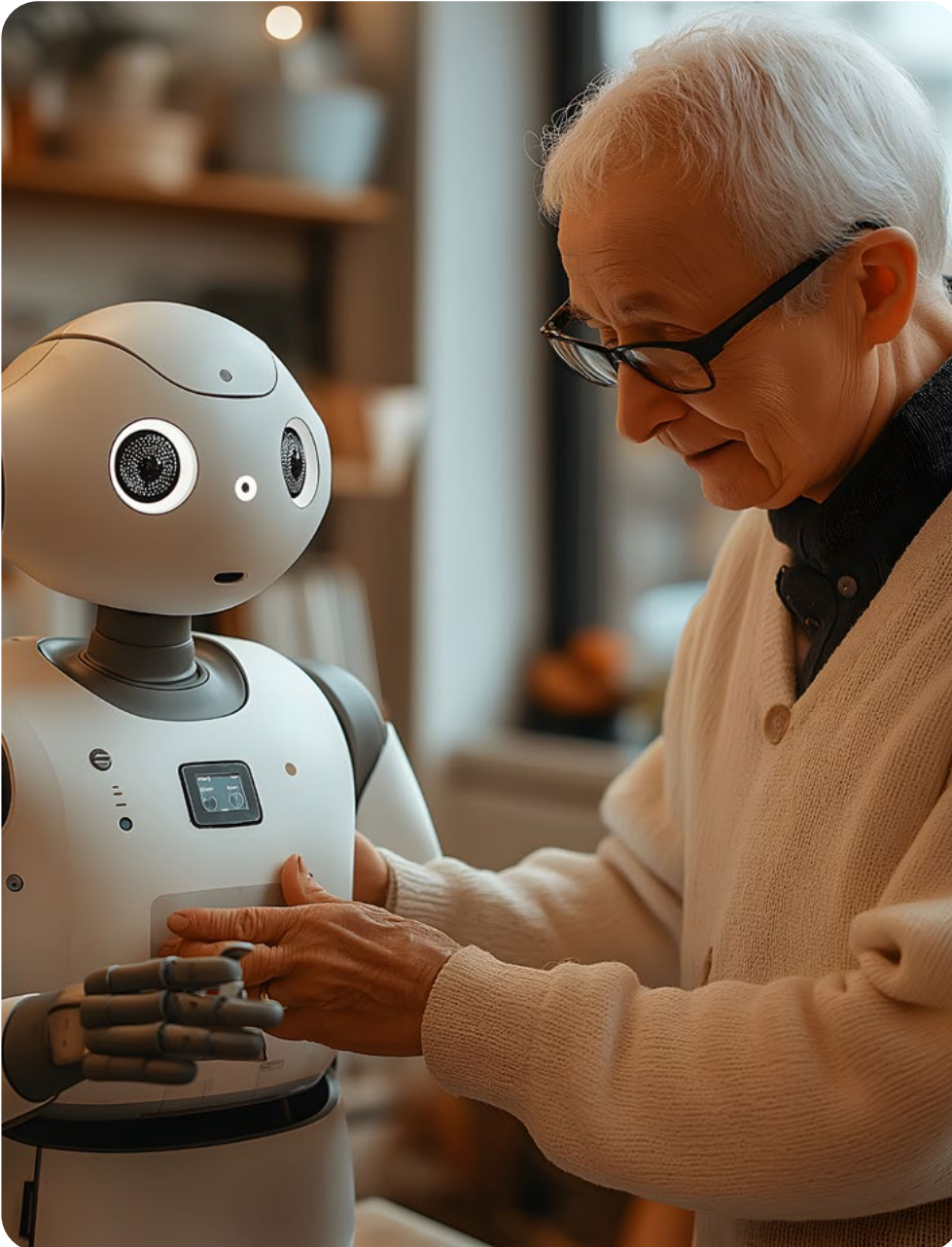
The use of AAL is expected to grow in the coming years because of the needs of an ageing population that wants to maintain their autonomy and quality of life at home, because of rapid advances in technology leading to the development of innovative solutions that are more accessible, easier to use and effective, and because these solutions may ultimately be cheaper than traditional healthcare solutions and therefore more easily reach the market. In addition, these technologies ease the burden on caregivers by providing constant monitoring and emergency alerts, reducing the need for constant face-to-face supervision and enabling more efficient time management. They also facilitate direct communication with healthcare professionals, improving access to support and advice. Thus, AAL can increase caregivers' peace of mind, knowing that their loved ones are safe and well cared for, allowing them to better balance their caregiving responsibilities with their personal and work needs.

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<sup>15</sup> <https://www.theguardian.com/society/2022/dec/14/a-ticking-time-bomb-healthcare-under-threat-across-western-europe>

<sup>16</sup> <https://aecr.org/es/en-un-futuro-con-menos-cuidadores-informales-puede-la-expansion-gasto-en-dependencia-aumentar-el-pib-y-reducir-el-gasto-sanitario/>

<sup>17</sup> <https://pmc.ncbi.nlm.nih.gov/articles/PMC8160803/>



## 2.5 The care robot as a chosen solution

No one doubts that human handling and care is preferable to that of a machine, but there are simply not enough hands to perform these tasks. Not all people in need have an informal caregiver, such as a family member, or a professional caregiver, available to them. A special case is found in nursing homes. A recent study<sup>18</sup> by Griffith University found that older people in nursing homes have, on average, 28 minutes per day of personal interaction. There are not enough staff to care for everyone in a personalised way, so the simple act of interacting with a robot can be a source of companionship and affection for many people who are lonely or have little social interaction.

Beyond this reality, there are situations in which a person may find it beneficial to be assisted by a robot:

- In certain circumstances older people may value not being a burden to the other person, when the other person must accompany them in their activities of daily living, such as washing, dressing or eating.
- People may feel uncomfortable and embarrassed when they have to rely on others for their most private activities, e.g. personal hygiene, and the use of a robot could help them maintain their privacy and dignity<sup>19</sup>.
- Another reason may be distrust of strangers, especially if the person has had negative experiences with human caregivers in the past.

<sup>18</sup> <https://cosmosmagazine.com/technology/in-aged-care-where-residents-get-28-minutes-of-human-interaction-a-day-could-robots-help/>

<sup>19</sup> Holthöwer, J., van Doorn, J. Robots do not judge: service robots can alleviate embarrassment in service encounters. J. of the Acad. Mark. Sci. 51, 767–784 (2023). <https://link.springer.com/article/10.1007/s11747-022-00862-x>



- Older people may feel more comfortable interacting with a robot than with a stranger or someone performing a task without real affection<sup>20</sup>.
- Robots do not get tired, work 24/7 and may be more consistent and predictable in their assistance, whereas people may vary in their quality of support and are subject to having better and worse days. This may be particularly important for people with specific medical or cognitive needs.
- Complementing the subjective perception of the human caregiver, assistive robots use advanced sensors and algorithms to accurately analyse the health status and behaviour of users. This objectivity allows for more efficient and careful monitoring, thus optimising resources and ensuring more personalised care<sup>21</sup>.

## 2.6 Respectful care for human rights

There is a conviction that we need the use of assistive technologies to address the socio-health and quality of life challenges of an ageing population. As technologies advance, so does the need to regulate this field to ensure that people's human rights, especially those of older people, are not violated.

Recognizing the need, the United Nations Human Rights Council published a report<sup>22</sup> in 2017 that examines the potential impact and challenges of the use of assistive technologies on older people and underlines the importance of a human rights-based approach to addressing these challenges.

This includes ensuring that older people have access to accessible, safe and quality assistive technologies. States are urged to take measures to prevent discrimination based on age and ability levels, and it is recommended that older people should be able to actively participate in the design and implementation of technologies.

States are also recommended to promote research and development of innovative assistive technologies, including those that can help address social problems such as social isolation.

Finally, the importance of ensuring that older persons have access to effective redress mechanisms in case of technology-related violations of their human rights is underlined.

This includes guaranteeing the right to an effective remedy before competent national or international tribunals.

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<sup>20</sup> Korchut A, Szklener S, Abdelnour C, Tantinya N, Hernández-Farigola J, Ribes JC, Skrobas U, Grabowska-Aleksandrowicz K, Szczęśniak-Stańczyk D, Rejdak K. Challenges for Service Robots-Requirements of Elderly Adults with Cognitive Impairments. *Front Neurol.* 2017 Jun 1;8:228. doi: 10.3389/fneur.2017.00228. PMID: 28620342; PMCID: PMC5451499.

<sup>21</sup> Vitanza, A., D'Onofrio, G., Ricciardi, F., Sancarolo, D., Greco, A., Giuliani, F. (2019). Assistive Robots for the Elderly: Innovative Tools to Gather Health Relevant Data. In: Consoli, S., Reforgiato Recupero, D., Petković, M. (eds) *Data Science for Healthcare*. Springer, Cham. [https://doi.org/10.1007/978-3-030-05249-2\\_7](https://doi.org/10.1007/978-3-030-05249-2_7)

<sup>22</sup> [Report of the Independent Expert on the enjoyment of all human rights by older persons \(2017\). Human Rights Council, United Nations](#)





### 3. Assistive technologies

# Assistive technologies

Assistive living encompasses a wide range of technologies and devices that aim to help people with their needs, improving their quality of life and facilitating access to services and support. Many of these technologies are rapidly evolving into smarter, more personal and accessible solutions.

The most common assistive technologies are as follows (in alphabetical order).

## Home automation

Automated systems, often remotely operable, that control and manage the home, including lighting, temperature, security and appliances. They make everyday life easier and improve safety and comfort.

## Artificial Intelligence (AI) and machine learning

Algorithms and systems that learn and improve from data and are used in a variety of healthcare applications, such as disease detection and diagnosis, treatment management and emotional support.

## Brain-computer interfaces

Systems that collect brain signs to control external devices.

## Internet of Things (IoT)

Internet-connected devices that collect and share data to improve daily life, health and well-being. It includes health sensors, wearable devices, smart home appliances and others. Included in this category are voice assistants, such as Alexa, Siri or Google Assistant, which respond to voice instructions to control other devices.

## Information and support platforms

Applications and websites that provide resources for information, education and emotional support, including online communities for patients, caregivers and healthcare professionals.

## Virtual Reality (VR) and Augmented Reality (AR)

Immersive technologies that can be used for therapy, rehabilitation, training or entertainment, providing personalised experiences tailored to users' needs.

## Robotics

Assistive robotic devices designed to help people with a variety of functions such as mobility, object manipulation, reminders, emotional support and companionship.

## Wearable sensorics

Wearable or body-worn devices, detectors and sensors for a variety of monitoring and measurements.

## Communication technologies

Devices and software that facilitate communication for people with speech or hearing difficulties, such as speech synthesisers, alternative input devices and subtitling software. Also, cameras, tablets and video conferencing applications that enable communication through telepresence.

## Mobility technologies

Devices that help people with disabilities or mobility difficulties to move around, such as wheelchairs, exoskeletons, smart canes and others.

## Health monitoring technologies

Devices that enable users and professionals to monitor people's health, such as blood pressure monitors, glucometers, sleep and vital signs monitoring devices and health tracking applications.

## Telemedicine

Remote healthcare services that allow patients and professionals to communicate and share information through videoconferencing, mobile applications and other online platforms.

Robotics is seen as one of the key technologies in personal care, especially for the elderly, and will become increasingly important in our ageing society, with a wide range of applications <sup>23</sup>. On its own, and combined with other assistive technologies, the future of assistive robotics is promising and offers many possibilities to improve people's autonomy and quality of life <sup>24</sup>.

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<sup>23</sup> Shuai Yuan, Simon Coghlan, Reeva Lederman, and Jenny Waycott. 2022. Social Robots in Aged Care: Care Staff Experiences and Perspectives on Robot Benefits and Challenges. Proc. ACM Hum.-Comput. Interact. 6, CSCW2, Article 329 (November 2022), 23 pages. <https://doi.org/10.1145/3555220>

<sup>24</sup> Reza Kachouie, Sima Sedighadeli, Rajiv Khosla & Mei-Tai Chu (2014) Socially Assistive Robots in Elderly Care: A Mixed-Method Systematic Literature Review, International Journal of Human-Computer Interaction, 30:5, 369-393, DOI: [10.1080/10447318.2013.873278](https://doi.org/10.1080/10447318.2013.873278)





## **4. Guidelines, programmes and initiatives to improve health and social care using technology**

# Guidelines, programmes and initiatives to improve health and social care using technology

Technology is seen as a fundamental tool to address the challenges outlined in chapter 2 and to improve health and social care in many respects, including the quality of care itself, the costs involved and accessibility.

As a result, national governments, the European Union and health organisations around the world have developed a variety of programmes, initiatives and directives to promote the use of technology in health and social care, some of which are presented below.

## 4.1 EU and governmental initiatives

### Digital Health Europe (2020) <sup>25</sup>

Initiative that aims to achieve several objectives, such as secure citizen access and exchange of health data across borders, better data to advance research, disease prevention and personalised care and attention, digital tools for citizen empowerment and person-centred care.

### Digital Health Germany (2019) <sup>26</sup>

An initiative led by the German Society for Digital Medicine (DGMI) that promotes innovation and the implementation of digital solutions in the German healthcare sector, working in collaboration with healthcare stakeholders and encouraging research and development of innovative healthcare technologies to improve healthcare and reduce healthcare costs.

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<sup>25</sup> <https://digitalhealtheurope.eu/>

<sup>26</sup> <https://www.gtai.de/en/invest/industries/healthcare/digital-health-64408>



## eHealth Action Plan (2012-2020) <sup>27</sup>

EU Action Plan which aims to promote the use of digital technologies in healthcare across the EU, focusing on patient-centred care, interoperability and telemedicine.

## Estrategía de Salud Digital (2021-) <sup>28</sup>

Strategy of the Spanish Government's National Health System to contribute to the maintenance of a good level of health in the Spanish population and to strengthen the public health system through the transformative capacity of digital technologies aimed at people, health professionals, health service provider organisations and other related agents.

## EU4Health (2017-2021) <sup>29</sup>

Programme focusing on the digitisation of healthcare through the adoption of digital tools and technologies. Its objectives include strengthening the response to health crises and challenges across Europe, including emerging technologies, as well as strengthening the use and re-use of health data for healthcare and research and innovation, together with the introduction of digital tools and services.

## NHS Long Term Plan (2019) <sup>30</sup>

Long-term plan for the National Health System (NHS) in England. Its main objectives are to improve access to health services, optimise the use of health resources and boost innovation in the sector.

## Programma Operativo Nazionale Ricerca e Innovazione (2014-2020) <sup>31</sup>

Instrument through which Italy contributes to the improvement of the quality of higher education and the enhancement of research, technological development and innovation, achieving the objectives of the European Union's cohesion policy in disadvantaged areas of the country.

## Region Digital Health (2023-2030) <sup>32</sup>

Regional digital health refers to the use of digital technology to improve healthcare in a specific region. The WHO European Region has launched a draft regional action plan for digital health for the period 2023-2030, with the aim of supporting countries to leverage and scale up digital transformation for better health and to align digital technology investment decisions with the needs of their health system.

## The European Innovation Partnership on Active and Healthy Ageing (EIP on AHA) <sup>33</sup>

An initiative born out of a partnership between the European Commission, industry, researchers and health and social care providers, with the aim of promoting active and healthy ageing through the use of innovative technologies.

## Together with Innovation Programme (2020-2026) <sup>34</sup>

Programme of the German Federal Ministry of Education and Research to fund application-oriented research for better health and quality of life. It is accompanied by a research 'tour' in which researchers and users will reflect and discuss in an interdisciplinary way with interactive formats.

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<sup>27</sup> <https://epha.org/ehealth-action-plan-2012-2020-more-equality-less-fragmentation/>

<sup>28</sup> [https://www.sanidad.gob.es/areas/saludDigital/doc/Estrategia\\_de\\_Salud\\_Digital\\_del\\_SNS.pdf](https://www.sanidad.gob.es/areas/saludDigital/doc/Estrategia_de_Salud_Digital_del_SNS.pdf)

<sup>29</sup> [https://health.ec.europa.eu/funding/eu4health-programme-2021-2027-vision-healthier-european-union\\_en](https://health.ec.europa.eu/funding/eu4health-programme-2021-2027-vision-healthier-european-union_en)

<sup>30</sup> <https://www.longtermplan.nhs.uk/>

<sup>31</sup> <http://www.ponricerca.gov.it/pon-ricerca/programma/>

<sup>32</sup> <https://www.who.int/europe/news/item/13-09-2022-countries-in-the-european-region-adopt-first-ever-digital-health-action-plan>

<sup>33</sup> <https://digital-strategy.ec.europa.eu/en/policies/eip-aha>

<sup>34</sup> <https://miteinander-durch-innovation.de/>

## 4.2 Funding programmes

In the last two decades, the European Union has opened different funding programmes<sup>35</sup> that have included among their objectives the promotion of research in digitisation and health technologies.

Numerous projects related to healthcare robotics have been funded by these programs.

### AAL Europe Programmes

AAL Europe (Active and Assisted Living room Programme Europe) is a funding programme launched by the European Commission to support the development of innovative information and communication technology (ICT) solutions that can improve the quality of life of older people and promote their active and independent living. Launched in 2008, and initially scheduled to run until 2013, it has been extended several times, with the last call for projects in 2021.

### Competitiveness and Innovation Framework Programme (CIP)<sup>36</sup>

EU-funded programme that ran from 2007 to 2013. The objective of the CIP was to foster competitiveness and innovation in Europe to boost economic growth and job creation. One of the CIP's action areas was the 'Competitive Intelligence and Innovation' programme for the adoption of information and communication technologies (ICT). The CIP was replaced by the *Europe's programme for small and medium-sized enterprises*<sup>37</sup> in the period 2014-2020, with a continuity in the initiatives aimed at promoting competitiveness and innovation in the EU framework.

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<sup>35</sup> <https://cordis.europa.eu/>

<sup>36</sup> <https://ec.europa.eu/cip/>

<sup>37</sup> [https://single-market-economy.ec.europa.eu/smes/cosme\\_en](https://single-market-economy.ec.europa.eu/smes/cosme_en)



## CHIST-ERA Programme

Collaborative programme between several national funding agencies from different European countries, including France, Germany, Spain, Italy, Finland, Switzerland, Estonia, Czech Republic, Turkey and Slovakia. It aims to promote high quality innovative research that addresses long-term challenges in the field of ICT. CHISTERA's scope is not specifically limited to the social or health domain, but some of its research topics are connected, such as those related to wearable devices, human-computer interaction or data-driven approaches to understanding and managing complex systems. The programme was launched in 2010.

## ECHORD++ Programme

ECHORD++ (European Coordination Hub for Open Robotics Development) was a project funded by the European Union between 2013 and 2017, as the second phase of the ECHORD project, which had started in 2009 and ended in 2013. With a budget of €63 million, it aimed to support the development of robotics technologies in Europe by fostering collaboration between research institutions and industry.

## FP7 Programme

The Seventh Framework Programme for Research and Technological Development was the European Union's main research and innovation funding programme from 2007 to 2013. It had a budget of €55,000 million and funded a wide range of research and innovation activities in different fields.

## Horizon 2020 Programme

Horizon 2020 is a European Union (EU) funding programme for research and innovation covering the period from 2014 to 2020. It is the largest EU research and innovation programme ever created, with a budget of approximately €80,000 million.

## Horizon Europe Programme

European Union (EU) Framework Programme for Research and Innovation for the period 2021-2027. Successor to the Horizon 2020 programme, it aims to support research and innovation activities across Europe and beyond by funding collaborative research projects and promoting the development of new technologies and solutions.

## Next Generation EU Programme

European Union (EU) recovery plan, announced in 2020, designed to address the economic and social impact of the COVID-19 pandemic. It includes a focus on promoting the digital transition in member states that aims to support projects that foster digital innovation and improve access to digital technologies.

A recent study<sup>38</sup> by the Alan Turing Institute has examined the differences in policy, funding, research and commercial applications of assistive robots between the European Union and Japan. The study highlights that Japan has invested significantly in the research and development of assistive robots, while in the EU, funding and focus in this area has been comparatively limited.

Illustration 2 and Illustration 3, from the same study, show the comparison between the most relevant assistive robotics projects funded in the EU at 2007-2013 and 2014-2020.

It is suggested that the European Union could improve its positioning in the commercialisation and adoption of assistive robotics by looking at the experience of a leading country such as Japan. Section 9 of this White Paper, 'Assistive robotics as a transforming factor in social and health care' considers these and other recommendations gathered throughout our research.

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<sup>38</sup> WWright, James. (2020). Comparing the Development and Commercialization of Care Robots in the European Union and Japan: [https://www.researchgate.net/publication/343933973\\_Comparing\\_the\\_Development\\_and\\_Commercialization\\_of\\_Care\\_Robots\\_in\\_the\\_European\\_Union\\_and\\_Japan](https://www.researchgate.net/publication/343933973_Comparing_the_Development_and_Commercialization_of_Care_Robots_in_the_European_Union_and_Japan)

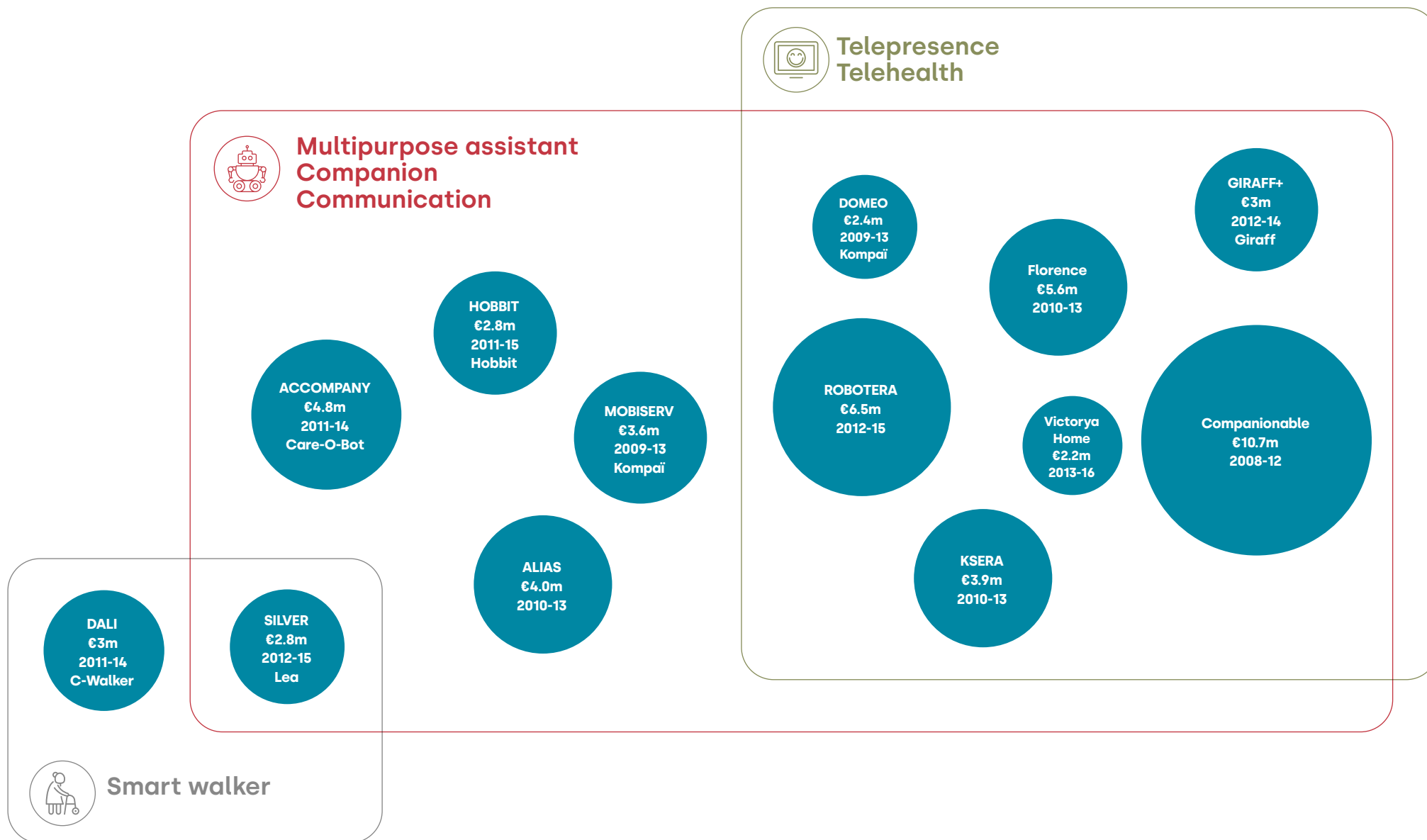


Illustration 2. European Commission-funded assistive robot projects under FP7 framework (2007-2013)  
(Reference: European Commission: Cordis; AAL Programme)

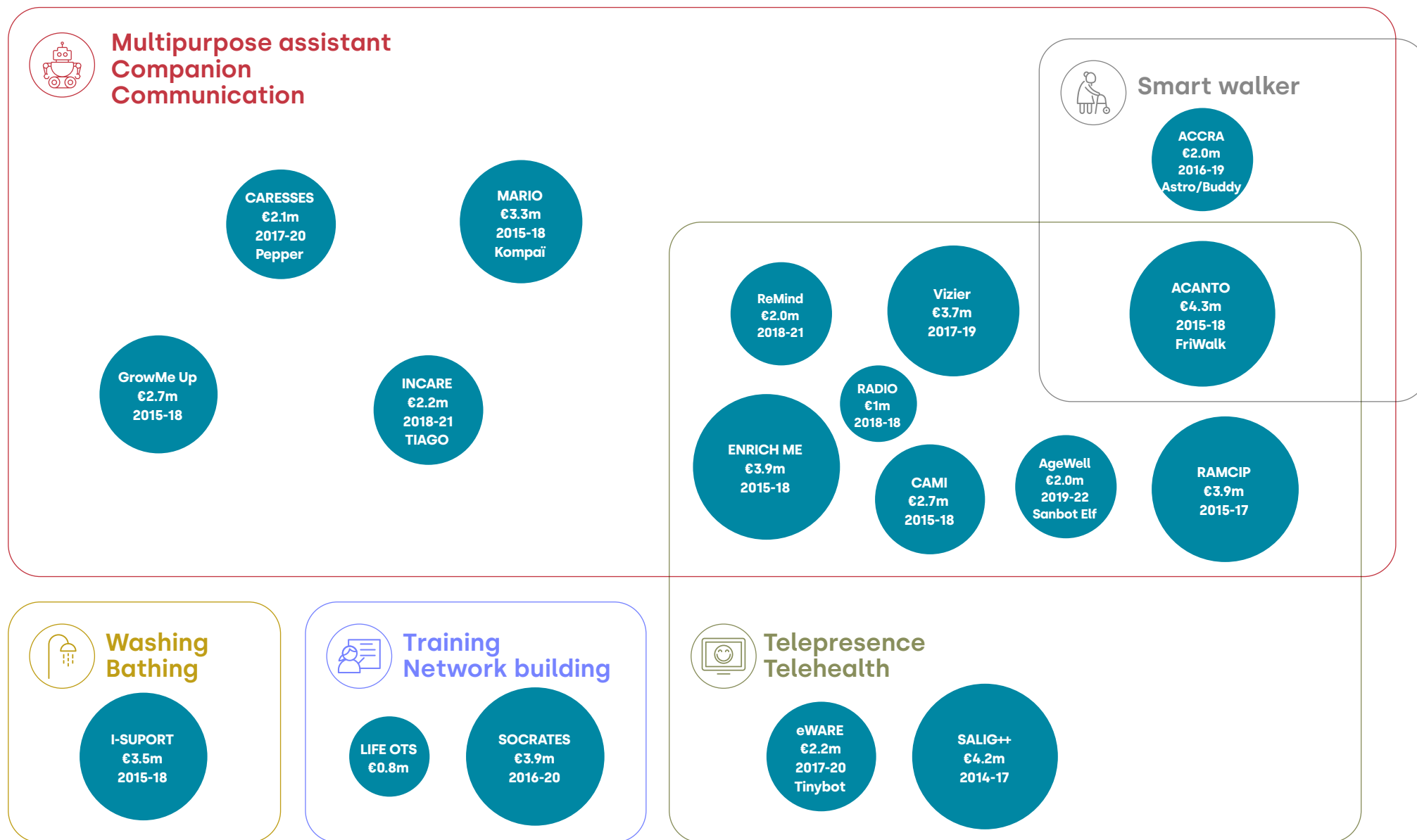


Figure 3. Assistive robot projects funded by the European Commission under the FP8/Horizon 2020 framework (2014-2020)  
(Reference: European Commission: Cordis; AAL Programme)



## 4.3 Reports and guidelines

As technological advances facilitate the use of artificial intelligence and robotics in areas that affect people, the European Commission, the United Nations and other organisations have produced reports and guidelines to consider ethical principles and human rights in new developments. These recommendations apply to assistive robotics, because of its direct impact on people.

- **Analysis of the legal and human rights requirements for AI and robotics in and outside the EU, SIENNA Project, European Commission 2019** <sup>39</sup>

The report documents and critically assesses the legal requirements, including human rights, applicable to artificial intelligence and robotics technologies. It includes an analysis of EU and international standards and regional legal systems. It also provides an analysis of human rights standards and the ways in which human rights may be affected by AI and robotics technologies.

- **Artificial Intelligence, Human Rights, Democracy, and Rule of Law, Council of Europe and The Alan Turing Institute, 2021** <sup>40</sup>

The report is an introduction to AI, human rights, democracy and the rule of law. It introduces the main concepts and principles presented in the Council of Europe's report on AI and provides an overview of the challenges and opportunities posed by AI. It highlights the need for a human rights-based approach to AI that is guided by ethical principles.

- **Asilomar Conference on Beneficial AI-Set of guidelines for AI research, 2017** <sup>41</sup>

The Asilomar Conference on Beneficial AI was a conference organised by the Future of Life Institute in January 2017. More than 100 thought leaders and researchers in economics, law, ethics and philosophy gathered to address and formulate principles of beneficial AI. Their outcome was the creation of a set of guidelines for AI research: the 23 Asilomar AI principles<sup>42</sup>.

- **Ethics guidelines for trustworthy Artificial Intelligence, HighLevel Expert Group on AI, European Commission, 2019** <sup>43</sup>

A set of principles and recommendations developed to address the ethical challenges associated with artificial intelligence (AI). These guidelines aim to establish an ethical framework for the development and use of AI, ensuring that this technology is used responsibly and in a way that respects human values and fundamental rights, and are published one year after the first draft of the guidelines, on which more than 500 comments were received through open consultation.

- **Report of the Independent Expert on the enjoyment of all human rights by older persons, United Nations, 2017** <sup>44</sup>

Report examining the impact of assistive robotics, artificial intelligence and automation on human rights. It highlights the need for an approach to digitalisation and robotics that should be guided by ethical principles. It also calls for a comprehensive regulatory framework to ensure accountability, transparency and participation in decision-making processes. It stresses that older people are particularly vulnerable to negative effects of digitalisation and robotics, such as social isolation or discrimination, and recommends that their needs be taken into account when designing policies related to these technologies.

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<sup>39</sup> [Analysis of the legal and human rights requirements for AI and robotics in and outside the EU \(2019\). Trilateral Research Ltd.](#)

<sup>40</sup> [Artificial Intelligence, Human Rights, Democracy, and the Rule of Law \(2021\). Council of Europe and The Alan Turing Institute](#)

<sup>41</sup> [Asilomar Conference on Beneficial AI](#)

<sup>42</sup> [Set of guidelines for AI research](#)

<sup>43</sup> [Ethics guidelines for trustworthy AI](#)

<sup>44</sup> [Report of the Independent Expert on the enjoyment of all human rights by older persons \(2017\). Human Rights Council, United Nations](#)



## 5. Assistive robotics

# Assistive robotics

Autonomy has been described as the driving force that propels us as individuals to live life to its fullest potential<sup>45</sup>. In youth, achieving autonomy is synonymous with freedom: to be able to live life as you please, to distance and individualise yourself from your parents. As adults, it is the personal tool to make choices and decisions. As we age, autonomy becomes more important to maintain dignity and purpose in life as personal circumstances change or deteriorate.

When people face physical and cognitive difficulties, autonomy is threatened. Mobility problems, visual or hearing impairment, dementia and other situations jeopardise a person's ability to function in the physical and social world. Strategies, services and products need to be designed to help us protect our autonomy, and this is a fully person-centred task.

Assistive robotics (AR) is the branch of robotics aimed at helping people to maintain their autonomy, to continue to live at home and to participate in their communities, with the best possible quality of life.

<sup>45</sup> <https://www.frog.co/designmind/designing-for-independence-in-the-longevity-economy>



## 5.1 Overview of assistive robotics

Assistive robotics is a very broad field with a diversity of target audiences, applications and spaces in which it is developed. It is also a relatively young discipline, in full growth and evolution.

Illustration 4 shows an **overview of assistive robotics**, the agents that make it up, the most common applications and the spaces in which they can be developed in urban, social and care environments.





### 5.1.1 The actors

The illustration 'Overview of assistive robotics' shows the general scenario of actors involved from a user-centred viewpoint, in which the user is at the centre of the map and the rest of the actors are distributed in concentric layers, according to their conceptual proximity.

These actors are:

- **The users**

People with age-related limitations or disabilities who directly benefit from the use of assistive robotics. The disabilities may be mobility, visual, hearing, cognitive or other conditions that reduce their ability to perform daily tasks or maintain their social activity.

- **The relatives and formal/informal caregivers**

People who care for users on a day-to-day basis. They can be family members acting as informal caregivers or professional caregivers. Sharing the more mechanical tasks with care robots is a way to reduce the burden on caregivers and to have more quality time for human interaction.

- **Social-health professionals**

Doctors, nurses, physiotherapists, social workers, occupational therapists or speech therapists who work directly with users and can implement assistive robotics solutions as part of their healthcare plans. They can assess users for robotic services, recommend devices and provide training and support to users and caregivers to use these devices.

- **The managers of health and social centres**

Managers in health or social care organisations who make decisions about the implementation of assistive robotics solutions, including safety, effectiveness and cost factors. Manage issues that may arise and establish staff training plans.

- **The defence groups**

Organisations representing the interests of users. They may work to raise awareness of assistive robotics technology, advocate for increased funding and research, promote policies that support the use of assistive robotics devices, or advocate for the ethical use of assistive robotics..

- **The researchers and developers**

Scientists, engineers and other professionals who design, develop and test assistive robotics technology. They may work in academia, government or private industry to create new devices, improve existing ones or develop new applications.

- **The manufacturers and distributors**

Companies that produce and distribute assistive robotics devices. They can work closely with researchers and developers to bring new devices to market, and can also offer support and training to users and caregivers.

- **The funding agencies**

Organisations that provide funding for research and development of assistive robotics technology. These may include government agencies, philanthropic organisations or private foundations.

- **The regulators**

Government agencies that oversee the safety and effectiveness of assistive robotic devices. They can set guidelines for product design, testing and approval, and can also monitor the market to ensure that devices meet established standards.

- **The administrations**

The policies and decisions of public authorities and administrations can have a direct impact on the adoption and accessibility of new technologies,



supporting funding through health systems and contributing in areas of their responsibility as public servants. For their part, local councils can be promoters of care robotics projects.

### 5.1.2 The functions

To help people gain autonomy and live a better quality of life, assistive robotics devices develop their functionality in seven areas: mobility, domestic support, information, care, communication, companionship and monitoring.

- **Mobility**

The robot provides support for the user's movements and movement in the environment.

- **Domestic support**

The robot helps with household tasks such as cleaning, preparing meals, managing household appliances or picking up and carrying objects.

- **Care**

The robot assists the user in personal care tasks, such as hygiene, dressing, feeding and other activities related to personal well-being.

- **Information**

The robot transmits information and content of interest to users, such as reminders of activities to be carried out.

- **Communication facilitator**

The robot acts as a channel to facilitate communication with other people (family, friends or health professionals) via spoken language or touch screens.

- **Accompaniment**

The robot offers companionship and emotional support, helping to alleviate loneliness and providing social interaction and entertainment.

- **Monitoring**

The robot monitors and records vital data, medication intake and other important health parameters, alerting in case of abnormal or risky situations.

Some robotic devices specialise in a single function, such as a robotic spoon that assists a person to eat, while others may encompass more than one, such as a robot with a manipulator arm that also has a screen to enable communication.

### 5.1.3 Support environments

Care robots will be found wherever the people who need them are, and this includes a wide range of healthcare, urban, private and public spaces.

Robotics expert Carme Torras, research professor at the Institute of Robotics and Industrial Informatics (IRI, CSIC-UPC), predicts<sup>46</sup> that, although care robots will be found in different contexts in the future, costs will mean that the first widespread deployments will take place, not in the domestic sphere, but in hospitals, day centres, residences and public spaces.

What we should expect in these early deployments are not versatile multifunctional robots, but smaller robots that support specific tasks. These robots will act in conjunction with other technologies such as the internet of things, artificial intelligence or big data, and could share data and procedures resulting from their experiences in the cloud.

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<sup>46</sup> <https://www.fundaciogrifols.org/ca/-/entrevista-a-carme-torras>



## 5.2 General considerations for assistive robots

Assistive robots interact directly with vulnerable people, operate in changing and dynamic environments, and must manage a variety of physical and social interactions. This requires specific design, technological and ethical considerations and requirements to ensure the safety, comfort and rights of users.

### 5.2.1 Design considerations

In general, assistive robots should have a highly person-centred design. This emphasises the importance of participatory design, in order to ensure that technological solutions meet their real needs and preferences, thus increasing the acceptance and effective use of technologies in their daily lives. It includes concepts such as the following:

- **Reliability and security**

Robots must be designed to ensure maximum safety for the people they interact with, recognising the response or movement of the person, in order to detect risk situations and avoid accidents.

- **Simplicity and ease of use**

Robots should be designed to be intuitive and easy to understand for the user, caregiver or health and social care professional.

- **Transparency**

Care robots must be transparent or explainable, that is, we must be able to understand why they have made a decision or why they have not been able to carry out an action.

- **Adaptability to dynamic environments**

Robots must be able to adapt to different situations, people and contexts, as users may have different needs and preferences and spaces may be very diverse.

- **Personalization**

Robots must be able to personalise the user experience, as each person is different, is at a different point in life and has different needs. This implies that they must be able to remember the user's preferences and adapt to them. This adaptability allows the robot to remain useful as a person's needs change over time.

- **Empathy**

Social robots must be able to identify the emotions and needs of the people they interact with at any given time in order to adapt their actions.

- **Privacy**

Robots must be designed to protect people's privacy. This includes security of personal data and confidentiality of interactions

## 5.2.2 Technological considerations

The market for assistive robots is different from that of other robotic sectors. Thus, industrial or agricultural robots focus their design on the mechanical structure, while for aerial, marine and transport robots the focus is on their autonomous navigation and obstacle detection capabilities.

Assistive robots are built around the emerging field of homerobot interaction<sup>47</sup>. They are devices that physically interact with their user, can autonomously monitor their condition and support them in different activities. This context implies the integration of different technologies,

structures, design processes and testing methodologies and is, in itself, a challenge for new developments.

The most important technologies in assistive robotics include the following:

- **Navigation systems**

They allow robots to move and adjust their position autonomously. Technologies such as simultaneous localisation and mapping, depth sensors and path planning algorithms can be used.

- **Handling systems**

They include robotic hands and arms that enable robots to pick up and move objects. The technologies manage force control, object recognition and machine learning for complex manipulation tasks. Particular difficulty is found in the manipulation of objects that change shape, such as clothing.

- **Interfaces for communication**

Tablets, voice systems and displays are interfaces designed to be accessible and allow users to communicate and control the robot. Speech and natural language technologies are important for communication.

- **Sensors and monitoring systems**

To detect the needs of the user, the environment and potential problems. This includes elements such as fall detection sensors, activity recognition, and health monitoring sensors and algorithms. The sensors provide awareness and triggers for the robot to provide assistance.

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<sup>47</sup> [https://www.housinglin.org.uk/\\_assets/Resources/Housing/OtherOrganisation/UK\\_RAS\\_robotics-in-care-report.pdf](https://www.housinglin.org.uk/_assets/Resources/Housing/OtherOrganisation/UK_RAS_robotics-in-care-report.pdf)

- **Artificial Intelligence and software**

Technologies such as machine learning and user modelling are crucial to adapt the robot's capabilities, interfaces and interactions to the individual's skills, needs and environment.

Thus, the key technologies for assistive robotics relate to motion, manipulation, communication and social interaction, tracking and personalisation. The combination of these capabilities enables robots to assist in a variety of tasks and provide support as needed. Of particular relevance is the ability to integrate assistive robots into existing information systems in healthcare facilities, in order to share information collected from their users that can be relevant to the monitoring of their care process.

### 5.2.3 Ethical Considerations

Assistive robots interact directly with vulnerable people, especially the elderly, and there is a need to ensure that they are designed, developed and used in an ethically responsible manner that is beneficial to the people they care for and to society at large.

Ethical considerations have become increasingly relevant as robotics has become more pervasive in all sectors, giving rise to a new discipline, Roboethics, which provides recommendations to guide the design, development, implementation and use of robots, including assistive robots, in a manner consistent with human values and human rights.

Researchers have identified different risks<sup>48 49</sup> to be addressed. These include the following.

- **Security**

It is crucial to ensure that assistive robots do not harm the people they are designed to assist. This requires careful design, testing and monitoring to minimise the risks of mechanical problems or errors.

- **Privacy**

Assistive robots may monitor users or collect personal data. This information should be kept private and should only be used to benefit the individual. Individuals should retain control and consent over their data.

- **Bias**

The data and algorithms that feed care robots could reflect biases or disproportionately benefit certain groups over others. Designers should work to avoid such biases and ensure equal access and opportunity.

- **Dependence**

While assistive robots can provide greater autonomy, they may also increase dependence on technology or reduce human relationships and interactions. Designers should seek to complement human relationships/interactions rather than replace them.

- **Costs**

Assistive robots can be expensive to develop and use. This may limit access to only certain groups. Researchers should explore ways to reduce costs and increase affordability to provide equitable access to the benefits of these technologies.

- **Purpose**

It is important to design assistive robots to meet real human needs and desires. Rather than focusing on technical capabilities, robots should be designed with a good understanding of how to improve the person's

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<sup>48</sup> Pareto Boada, Júlia & Roman, Begoña & Torras, Carme. (2021). The ethical issues of social assistive robotics: A critical literature review. *Technology in Society*. 67. 101726. [10.1016/j.techsoc.2021.101726](https://doi.org/10.1016/j.techsoc.2021.101726).

<sup>49</sup> Preferències i reticències de la gent gran sobre els robots de cura (2021). *Anuari de l'envelliment. Illes Balears*

quality of life and independence. User-centred design and taking user feedback into account is necessary to determine meaningful purposes and experiences.

- **Explainability**

This is a necessary condition for robots that assist vulnerable people and that can make decisions and carry out movements, even on the person himself. It is necessary to know, with transparency, why the robot acts as it does.

The number and relevance of ethical considerations to be addressed in the design and use of assistive robots, as well as a constantly evolving society in ethical considerations, requires continuous evaluation and reflection on all these aspects.





## 5.3 Applications of assistive robots

We have already seen that assistive robotics is a very broad and diverse field, just as the concept of assistance itself can be understood.

To focus the scope of this White Paper, we will consider assistive robots as those that help to improve the autonomy and quality of life of people in their homes or in social and healthcare centres, by performing one or more of the functions we have defined above, i.e. helping in terms of mobility, domestic support, information, personal care, communication, companionship and monitoring.

On the fringes of this core of assistive robots, there are other robots and robotic devices that, although they also help the user and/or the work of the care professional, represent their own categories and will not be considered in our approach. Thus, they are excluded:

- Surgical and surgery support robots.
- Exoskeletons to improve the physical capabilities of healthy people or the comfort of the working position in industrial environments, or for military purposes.
- Rehabilitation exoskeletons.
- Robotic prostheses and orthoses.
- Robots for special education.

Assistive robots, as we have defined them, have their main application in the support of so-called **Activities of Daily Living** (ADL).

### 5.3.1 Tasks of the life daily

Activities of daily living refer to the fundamental abilities needed to manage oneself independently.<sup>50</sup> ADLs are indicators of a person's functional status and are important in predicting the need for nursing home admis-

sion, hospitalisation or the use of home care services. ADLs are classified as basic and instrumental.

They are considered basic ADLs:

- Walking : The ability of a person to move from one position to another and to walk independently.
- Feeding : A person's ability to eat and drink on their own.
- Dressing : The ability to select appropriate clothing and put it on.
- Personal hygiene : the ability to bathe and groom oneself, as well as to maintain dental hygiene, nail and hair care.
- Continence : the ability to control bladder and bowel functions.
- Toileting : The ability to move to the toilet, use it properly, and clean oneself.

Instrumental ADLs are activities that require more complex organisational and thinking skills. They include:

- Transport: the ability to move around in the environment, driving or by other means of transport.
- Financial management: the ability to pay bills and manage your financial assets.
- Shopping and meal preparation: buying food and preparing meals. It also covers the purchase of clothing and other items necessary for daily life.
- Household cleaning and maintenance : cleaning the kitchen after meals, keeping living areas reasonably clean and tidy, etc.
- Management of communication with others : the ability to manage phone calls, emails or other means.
- Medication management: the ability to obtain medicines and take them as prescribed.

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<sup>50</sup> Edemekong PF, Bomgaars DL, Sukumaran S, et al. Activities of Daily Living. [Updated 2022 Nov 19]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK470404/>

## 5.4 Typology of human-bot interaction

Regardless of their functional areas and applications in everyday life, assistive robots have also been classified according to how they interact with the person<sup>51 52</sup>, giving rise to three categories

- **Robots PAIR (Physically Assistive Robots)**

These are robots that perform their function by responding to the user's instruction via buttons or other interfaces, without communicating socially with them.

This category includes most mobility or manipulation support robots. These include robotic scoops and gloves, robotic walkers and wheelchairs, hip exoskeletons, and robotic hygiene devices: head washers, toilets and showers.

- **Robots SAR (Socially Assistive Robots)**

They are robots that have been designed to interact with people in a socially acceptable way, following social rules and behaviours<sup>53</sup>. They can use technologies such as artificial intelligence and voice or facial recognition to recognise moods, carry on conversations and adapt their response, provide emotional and social support or telecommunication with relatives or healthcare professionals.

In this category we find fixed or mobile social assistant robots, robots for communication, and companion and emotional therapy robots.

- **Robots PSAR (Physical-Socially Assistive Robots)**

These are robots that combine the functions of physical assistive robots and social interactive robots. This means that they can help people with everyday tasks and also communicate with the user in a social way. SARs are designed to interact with people in a way that is comfortable and natural.

This category includes many of the ongoing assistive robotics projects, with a variety of multi-purpose mobile robots.

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<sup>51</sup> [Canal, G., Alenyà, G., Torras, C. \(2017\). A taxonomy of preferences for physically assistive robots. Institute of Electrical and Electronics Engineers \(IEEE\) DOI:10.1109/ROMAN.2017.8172316.](#)

<sup>52</sup> [Fong, T. & Nourbakhsh, I. & Dautenhahn, K. \(2003\). A Survey of Socially Interactive Robots. Robotics and Autonomous Systems. 42, 143-166. 10.1016/S0921-8890\(02\)00372-X.](#)

<sup>53</sup> [Cano, S.; González, C.S.; Gil-Iranzo, R.M.; Albiol-Pérez, S. Affective Communication for Socially Assistive Robots \(SARs\) for Children with Autism Spectrum Disorder: A Systematic Review. Sensors 2021, 21, 5166.](#)



## **6. Assistive robotics projects**

# Assistive robotics projects

In recent years, a very significant number of projects have been carried out in the field of assistive robotics. A representative selection of the type and quality of the research projects in healthcare robotics that have been funded and developed in the European Union over the last decade is detailed in the Annex.1. Multiple sources of information have been used to compile this list:

- Extraction from Cordis database<sup>54</sup>
- Extraction from AAL Europe database<sup>55</sup>
- RIS3MCAT Extraction<sup>56</sup>
- Compilation of research groups
  - Applied Assistive Technologies, TU Wien<sup>57</sup>
  - Institute of Robotics and Industrial Informatics (IRI) CSIC-UPC
  - Projects with CareOBot<sup>58</sup>
  - Ongoing PAL Robotics projects<sup>59</sup>

The same study, carried out from a different geographical area and using other local sources of information, would show projects that do not appear in the list, but we believe that the sample collected is valid to exemplify the casuistry of most projects and the learning derived from them.

## 6.1 Quantitative analysis

From the analysis of the projects presented in Annex 1, several reflections can be drawn.

### • Number of active projects

From 2010 onwards, the number of projects funded grew steadily until 2018, when it began to fall.

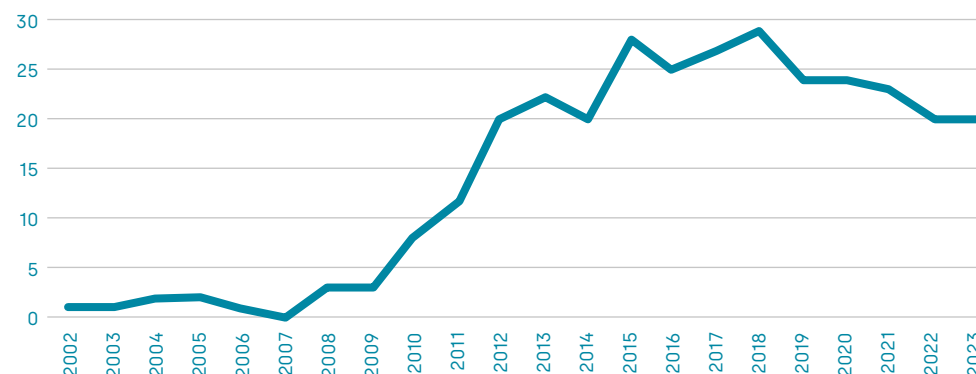


Illustration 5. Number of active projects per year

<sup>54</sup> [https://cordis.europa.eu/search?q=contenttype%3D%27project%27%20AND%20\(%27assistive%27%20AND%20%27robotics%27\)&p=1&num=10&srt=Relevance:decreasing](https://cordis.europa.eu/search?q=contenttype%3D%27project%27%20AND%20(%27assistive%27%20AND%20%27robotics%27)&p=1&num=10&srt=Relevance:decreasing)

<sup>55</sup> <https://www.aal-europe.eu/projects-main/>

<sup>56</sup> <https://fonseuropeus.gencat.cat/ca/ris3cat/>

<sup>57</sup> <https://www.aat.tuwien.ac.at/en/project.html>

<sup>58</sup> <https://www.care-o-bot.de/en/related-projects.html>

<sup>59</sup> <https://pal-robotics.com/collaborative-projects/>

### • Amount of aggregate expenditure

Funding for projects in the field of assistive robotics increased significantly and continuously from 2010 until 2020, after which there has been a slight decrease. The cumulative figure is around 300 million euros, which is a truly significant amount.

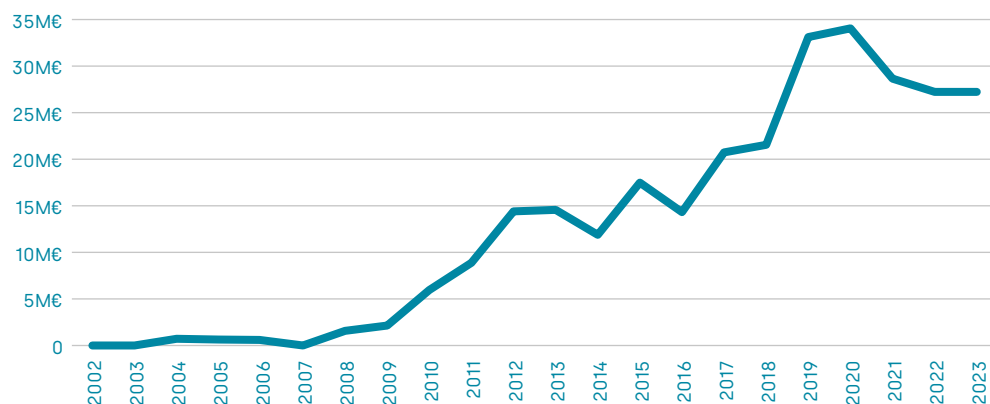


Illustration 6. Amount of aggregate expenditure

### • Average expenditure per project

Average expenditure per project remains relatively stable, with a significant jump in 2019.

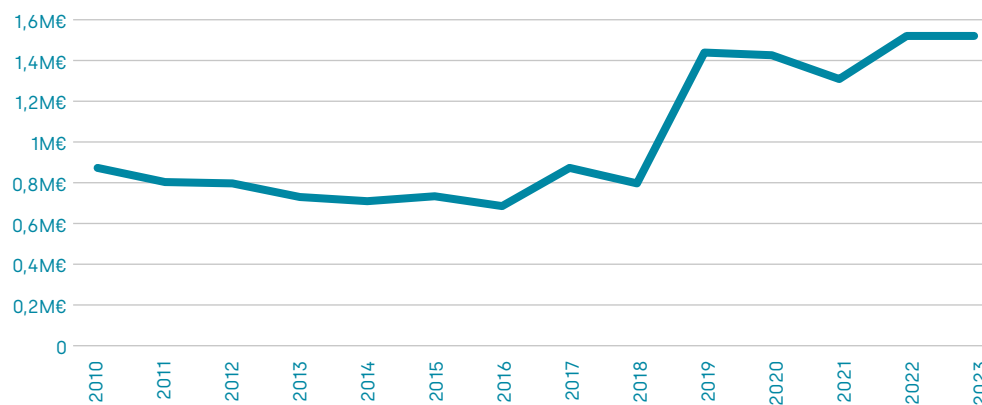


Illustration 7. Average expenditure per project per year (euros)

As an overall assessment, it can be concluded that public funders have begun to withdraw the generous support they have given to Assistive Robotics, concentrating resources on fewer but more ambitious projects.





## 6.2 Learnings and Recommendations

After more than two decades of research and projects in assistive robotics, it is appropriate to analyse what has been learned from analysing what has worked and what has not.

Analysing projects that have been completed for years is a complex task given that most of them do not have easily accessible information on results. From initial objectives to completion, years later, the reality of the projects may have been different. In many cases, the websites that were created while the project was active are now discontinued and the results are scattered in a variety of documents and reports, often more technical than qualitative or synthesising. However, from all the experiences we can extrapolate a number of lessons and recommendations to be taken into account for future developments.

### 6.2.1 In relation to the general scenario

- **There may be no significant real need**

Many projects have demonstrated initial acceptance of robots during pilot testing, both by users, caregivers and health professionals, but not implementation in routine practice. In recent years it has been questioned<sup>60</sup> whether older people or health professionals really have a need for assistive robots, at least in the current technological state. This trend and the large resources invested in research might rather respond to discursive logics of EU innovation policies that focus on techno-solutions to address demographic ageing and do not address the complexity of the care crisis.

- **A holistic approach to care is needed**

In the case of older people, it is important to take a holistic view of the person and to understand that their needs can be, and often are, mobility, cognitive, sensory and communication needs. Attempting to solve one

aspect without taking into account the needs as a whole can lead to the abandonment of solutions. This is the case, for example, with the PARO emotional support robot in Japan, where actions not initially expected from older people with dementia have been described<sup>61</sup>.

- **It is necessary to concentrate the dispersion of efforts**

Many different groups work in the field of assistive robotics, spread across research centres, hospitals and companies, often without coordination, with duplication of efforts and dedicated to a wide variety of applications and approaches. This diversity of approaches increases innovation, but also fragments efforts and resources, limiting its impact.

### 6.2.2 In relation to project definition

- **Focusing on research continuity limits commercialisation**

Most of the projects we have reviewed have an academic and research progress focus. In other words, the result of the project cannot be understood as a success or a failure, as a product or as a point and apart, but as a basis and an open door to continue advancing in technological research or to evolve the prototypes and improve their functionalities. This is the case of the **MARIO project**, a continuation of the **DOMEQ project**, or the **ROGER project as a continuation of the ROREAS project**. While research is necessary, it is more complex for this approach to lead to marketable products.

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<sup>60</sup> Maibaum, A., Bischof, A., Hergesell, J. et al. A critique of robotics in health care. *AI & Soc* 37, 467–477 (2022). <https://doi.org/10.1007/s00146-021-01206-z>

<sup>61</sup> <https://www.technologyreview.com/2023/01/09/1065135/japan-automating-eldercare-robots/>

- **Technical achievement is not as important as solving the real need**

An assistive robotics project can generate impact when it solves a real user need, not when it focuses on technical achievements, i.e. technology for technology's sake. While most projects are explained as 'user-centred', users are often not involved in development until pilot testing. Thus, they may evaluate the robotic solutions proposed to them, the ease of use of the technology, the interaction with the devices, and even improvements in their well-being, but there is no certainty that these solutions respond to real user needs, and if they are not perceived as important enough for them, the demand will not exist.

- **Co-creation and involvement of all actors from the beginning is key**

Related to the previous point, it is necessary to involve not only users, but also caregivers and social and health professionals throughout the process. True user-centred design is always co-designed. The involvement of all stakeholders is necessary to ensure that the assistive robots will meet real-world needs and will be usable and useful. In order to get their participation and time commitment, it will be necessary to explain the project, its purpose and interest to them very well. In this sense, the [ACCRA project](#) already developed a 4-phase methodology that included co-creation and the [AIEAT project](#) includes it in its process as well.

## 6.2.3 In relation to the technologies involved

- **Unrealistic expectations lead to disappointing results**

It is important not to communicate or promise robot capabilities and benefits beyond the expected reality, but public funding is competitive and values ambitious goals. Thus, there are projects that may set targets beyond what is reasonable and propose assistive robots that may end up with disappointing results. These projects, when they reach the deadline,

often conclude that the potential interest of the solution has been detected, but that the technologies involved need to be matured and further experimentation is needed. A technology that is not sufficiently robust does not allow exhaustive experimentation in real environments, nor can users incorporate it into their routine, so the results are never conclusive or extrapolable.

- **Technology costs for mass deployment must be borne in mind**

Sometimes projects use complex or multi-purpose robots with technologies that are not yet mature enough, which makes the device extremely expensive and makes it impossible to envisage user adoption or mass deployment. For example, the robot developed in the [NURSEBOT](#) project was valued at \$100,000. On the other hand, for simpler devices, such as the exoskeletons in the [EXOLEGS](#) project, an evolution is feasible to imagine the product on the market. In this case, the device was simplified, reducing the cost of the original model from €11,500 to €1,700.

## 6.2.4 In relation to marketing

- **The business model must be designed a priori, with a market vision**

Projects that are clearly defined as commercial are in the minority. Some of the research-focused projects, such as [GIRAFFPLUS](#), developed business models seeking partners and investors to reach the market, but the technologies were not sufficiently mature and were extraordinarily expensive to commercialise. The projects that have managed to bring products to market have done so with a market vision from the outset, solving very specific needs, with technologically mature products and business models that include options to facilitate access to users. This is the case of the subscription and micro-payment model of the [INCARE](#) platform or the scalable and customisable modular system of [TOILET](#) services.

- **Having industry partners in the working group facilitates marketing**

It is a smart strategy to incorporate into the consortium organisations that not only bring technical expertise and complement the capabilities of the group, but also have the capacity to develop the solutions and bring them to the market. These companies and corporations, already involved, bring pragmatism to the project, such as Hewlett-Packard in the case of the [SRS project](#).

- **Incorporating pre-commercial procurement as a strategy**

The [SILVER project](#) is an example of how pre-commercial procurement can help bring new solutions to the market. In this project, more than 30 proposals were received and evaluated by a panel of experts. In the end, only one was left, the LEA robot, which was commercialised.

## 6.2.5 On partnership and cooperation

- **Strong partners ensure the sustainability of the project**

In projects that last for years, planning for long-term sustainability is crucial to avoid projects ending prematurely due to lack of funding or resources to continue the work. This includes the sustainability of the companies or groups that are part of the project consortium themselves. When, mid-way through the project, a company goes bankrupt and needs to be replaced, the planning is disrupted and it may even be necessary to revise the project objectives and expected results. An example is the [SACRO project](#), where the initial coordinator, Rose BV, ceased operations and had to be replaced mid-project by Heemskerk Innovative Technology.

- **The future of assistive robotics is collaborative**

Especially in recent years, there are different projects that promote collaboration and exchange. One example is the [LIFEBOTS EXCHANGE project](#), which aimed to create a knowledge centre for social robotics involving academia, industry and users.

This project has evolved to also involve SMEs and municipalities. Another network model is the DIH-HERO project, which aims to connect companies and stakeholders to develop health products and services, reducing time to market.

Still ongoing until 2026, the [EUROBIN project](#) aims to create a network of excellence that brings together European expertise in robotics and artificial intelligence, enabling joint research by the most prestigious laboratories in this field of research. Previously, the [INBOTS project](#) had already created a platform to create debate and build bridges between technology experts, companies, experts in ethical, legal and socio-economic aspects, end-users, policy makers and the general public. Cooperation and collaboration in networks, hubs and communities will undoubtedly become increasingly important and necessary at all levels.



## 7. Assistive robots


# Assistive robots

There is a great diversity of assistive robots, which can be classified as follows:


- **Commercials:** robots or robotic devices that have been brought to the market by companies, startups or spinoffs from research centres, with the specific purpose of responding to a healthcare need.
- **Prototypes:** robots or robotic devices created by a company or as a result of a research project that have not been commercialised.
- **Platforms:** existing robots or robotic devices with generic functionalities that can be adapted, usually through software, to different healthcare uses and applications

In all three categories, there are robots that are currently available and others that are not. This and other information is shown in Annex 2. Assistive robots.


The functions to which the robots refer correspond to those described in [section 5.1.2](#) of this document.




**MOB**  
Mobility




**DOM**  
Domestic support




**CUR**  
Care




**INF**  
Information



**COM**  
Communication facilitator



**ACO**  
Accompaniment




**MON**  
Monitoring

Some robots clearly specialise in a single function while others may have more than one. For example, a communication facilitator robot that is also capable of detecting risky situations through its sensors.

Here is a robot that exemplifies each of these functions.

## Function: mobility



Device	LEA Lean Empowering Assistant						
Type	Walker						
Producer	Spark Design						
State	Available						
Functions	<b>MOB</b>	DOM	CUR	INF	COM	ACO	MON
Web link	<a href="https://www.sparkdesign.nl/projects/lea-care-robot">https://www.sparkdesign.nl/projects/lea-care-robot</a>						

LEA is a robotic walker to help people move around. It takes care of stability, safety and comfort, but always leaving the person in control, making them feel useful.



## Función: domestic support



Device	<b>Robot-Era</b>						
Type	Multi-purpose mobile robot						
Producer	Robot-Era Project						
State	Prototype						
Functions	MOB	<b>DOM</b>	CUR	INF	COM	ACO	MON
Web link	N/A						

The Domestic, Condominium and Outdoor robotic platforms, developed in the Robot-Era project, worked collaboratively providing various services, such as transportation, shopping, rubbish disposal and cleaning, to support large users in their environment.

## Function: care



Device	<b>Obi</b>						
Type	Robotic spoon						
Producer	Obi Robotics						
State	Available						
Functions	MOB	DOM	<b>CUR</b>	INF	COM	ACO	MON
Web link	<a href="https://meetobi.com/">https://meetobi.com/</a>						

Obi is an adaptive feeding device for people with upper limb strength and mobility limitations. It uses customisable accessibility switches to allow the user to eat autonomously, controlling what they eat and when.

## Function: information



Device	<b>Tessa</b>						
Type	Fixed social robot						
Producer	Tinybots						
State	Available						
Functions	MOB	DOM	CUR	<b>INF</b>	COM	ACO	MON
Web link	<a href="https://www.tinybots.nl/">https://www.tinybots.nl/</a>						

Tessa is a robot designed for people in the early stages of dementia. It provides pre-programmed alerts, reminders, messages and music through an app accessible to family members, caregivers or healthcare professionals. It can also broadcast messages from these in real time.

## Function: communication facilitator



Device	<b>Temi</b>						
Type	Mobile and telepresence social robot						
Producer	Roboterly						
State	Available						
Functions	MOB	DOM	CUR	INF	<b>COM</b>	ACO	MON
Web link	<a href="https://www.robotemi.com/">https://www.robotemi.com/</a>						

Temi is a mobile telepresence robot that allows users to make calls and communicate with people outside the home, family members, caregivers, friends or healthcare professionals. Equipped with the appropriate sensors, it can also take on monitoring functions.

## Function: accompaniment



Device	Jennie
Type	Companion robot and emotional therapy
Producer	Tombot
State	Preorder (March 2023)
Functions	MOB DOM CUR INF COM ACO MON
Web link	<a href="https://tombot.com/">https://tombot.com/</a>

Jennie is a pet robot that has perfected the touch, sounds and movement of a real dog. She responds to voice instructions and tactile interaction with the user through her sensors. Jennie is designed to provide companionship and reduce a person's restlessness or stress in adverse situations.

## Function: monitoring



Device	Aeo
Type	Multi-purpose mobile robot
Producer	Aeolus
State	Closed manufacturer. Available through distributors.
Functions	MOB DOM CUR INF COM ACO MON
Web link	<a href="https://aeolusbot.com/solutions/Care_Monitoring">https://aeolusbot.com/solutions/Care_Monitoring</a>

Aeo makes rounds in hospitals and nursing homes. Its cameras and sensors allow it to detect risky patient situations, in which case it immediately alerts medical professionals. The grippers on its hands allow it to open doors, enter rooms and navigate through spaces.



## 8. Barriers and enablers to the adoption of assistive robotics

# Barriers and enablers to the adoption of assistive robotics

## 8.1 Barriers

Despite the pressures that the health and social care system is facing as a result of demographic changes, it is not yet taking advantage of the incorporation of robots as other sectors have done.

Numerous publications demonstrate a positive impact on people with the use of assistive robots in a variety of situations<sup>62</sup>, but robotic innovation in health and social care is progressing very slowly and market transformation has not yet taken place.

Care robots are still underdeveloped and not widely deployed for a variety of reasons. Different studies<sup>63 64</sup> have analysed this scenario to clarify the main obstacles limiting the arrival of these robots on the market. The most relevant reasons identified are set out below.

### 8.1.1 Lack of commercial products

The lack of commercial robots is an obvious obstacle to the mass adoption of assistive robotics. Despite the research effort and significant public funding, there are certainly few commercial products.

Many of the groups working on assistive robotics are academic research teams with little connection to industry and little interest in market issues. For these technologies to reach end-users, the knowledge gained from research needs to be transferred to companies and they need to take on product development.

### 8.1.2 Cost-effectiveness

Assistive robots are expensive to develop and produce, especially when they have sophisticated capabilities.

High costs limit access to the technology and slow adoption, so more affordable solutions are needed to make robots available to those who can benefit.

Investment in assistive robotics solutions must be economically viable, with affordable acquisition, implementation and maintenance costs and demonstrable benefits, such as savings in resource expenditure or reduction of indirect costs of illness.

Widespread adoption of assistive robotics requires a rigorous assessment of the budgetary impact in the short, medium and long term.

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<sup>62</sup> Reza Kachouie, Sima Sedighadeli, Rajiv Khosla & Mei-Tai Chu (2014) Socially Assistive Robots in Elderly Care: A Mixed-Method Systematic Literature Review, International Journal of Human-Computer Interaction, 30:5, 369-393, DOI: [10.1080/10447318.2013.873278](https://doi.org/10.1080/10447318.2013.873278)

<sup>63</sup> Aguiar Noury, G.; Walmsley, A.; Jones, R.B.; Gaudl, S.E. The Barriers of the Assistive Robotics Market—What Inhibits Health Innovation? Sensors 2021, 21, 3111. <https://doi.org/10.3390/s21093111>

<sup>64</sup> Koh, W.Q., Felding, S.A., Budak, K.B. et al. Barriers and facilitators to the implementation of social robots for older adults and people with dementia: a scoping review. BMC Geriatr 21, 351 (2021). <https://doi.org/10.1186/s12877-021-02277-9>

On the horizon of care robotics, the debate on its financing needs to be introduced. Both a paper<sup>65</sup> published by the European Parliament in 2018 and a study<sup>66</sup> conducted in the Nordic countries in 2020 have initiated reflection to identify ways of financing the provision of assistive technologies.

Several options are considered:

- If the use of robots provides a reduction in public financial expenditure, the first funding option should come from public health.
- If the use of robots provides a clear positive impact on people, funding should also be public. This opens the debate on what care needs can be considered basic level.
- Health insurers can make care robots available to their customers. A proper cost calculation is necessary to analyse whether the service is affordable without an increase in premiums.
- Finally, if neither public nor private health care provides care robots but users can afford to pay for them, they should be able to buy their own robot.

Clearly, this alternative raises questions about increasing social inequality across different economic levels.

In parallel to funding and in line with the economic trend of resource sharing, an alternative could be 'robot-libraries', bases of care robots to cover needs on a shared basis.

### 8.1.3 Attribution of responsibilities

Attribution of responsibilities for problems that may arise with care robots is a complex issue. There is no straightforward answer as to who is liable if a robot causes harm or fails to provide adequate care.

Several parties, including designers, manufacturers, service providers and users, could share responsibility. Determining liability is further complicated by difficulties in identifying the causes of problems arising from interactions between robots and users or environments.

### 8.1.4 Technological trust

Robots must be safe and reliable to be accepted by society, and people must be able to trust the technology and be confident that it will not have negative impacts. Obviously, robotic technologies must be designed, developed and manufactured to appropriate safety standards to ensure their reliability, but in addition, potential users need to be given the opportunity to experience assistive robots first-hand through demonstration events or installations in real spaces. This will help overcome scepticism and build comfort with the technology.

Ease of use, intuitive interfaces and progress in communicating with machines through natural language will make assistive robots more acceptable and usable for elderly and disabled people.

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<sup>65</sup> [https://www.europarl.europa.eu/RegData/etudes/IDAN/2018/603218/EPRS\\_IDA\(2018\)603218\(ANN4\)\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2018/603218/EPRS_IDA(2018)603218(ANN4)_EN.pdf)

<sup>66</sup> Johansson-Pajala, RM., Thommes, K., Hoppe, J.A. et al. Care Robot Orientation: What, Who and How? Potential Users' Perceptions. Int J of Soc Robotics 12, 1103–1117 (2020). <https://doi.org/10.1007/s12369-020-00619-y>



### **8.1.5 Lack of knowledge and experience**

The lack of knowledge and experience in the field creates an initial scepticism in society towards care robots, but informing and educating people about the benefits can help to overcome this scepticism.

There are different groups of actors who need to be informed and trained: the users of the robots themselves, their relatives who may be informal caregivers, professional caregivers, social workers, health care staff in nursing homes, day care centres and hospitals, and the managers of these centres, who have to make decisions about the use or non-use of assistive robots and manage the problems that may arise. The introduction of robotics requires multidisciplinary and continuous training of these groups.

There is also a need for quality information on which assistive robots are available, their characteristics and the tasks they can perform. Use cases in real environments and specific examples of benefits related to individual needs are necessary.

### **8.1.6 Undefined regulatory framework**

Regulators do not yet have knowledge and experience in the emerging field of assistive robotics. While it is essential that policy keeps pace with technological developments, regulators must also be careful not to rush ahead without fully understanding the technologies and the ethical considerations involved. Poor policies may stifle innovation or fail to address real problems.

Regulations, guidelines, and other policies that support the use of assistive robots can increase their adoption by providing legitimacy, resources, and incentives, but more work and usage data are needed to determine how to ensure adequate governance and accountability as the use of assistive robots expands.

## **8.2 Enablers**

### **8.2.1 Commitment and investment in this area**

Investment in assistive robotics continues to be significant through funding programmes, denoting significant financial availability to further advance research and experimentation in this field. National governments, the European Union and the rest of the world suffering from the effects of ageing populations are committed to developing technologies to help people in situations of dependency or vulnerability, and assistive robotics is at the heart of these efforts.

### **8.2.2 Perception of robotics as a valid solution**

As the figures for investment in research corroborate, and despite the fact that there is not yet a market sector for assistive robots, in our imagination we perceive them as a valid, useful and versatile technology for assisting people and improving their quality of life. The integration of robots with other assistive technologies increases their functions to better adapt to the specific needs of each person, which may make them more useful and effective in the future.

A white humanoid robot with a black face and blue eyes is holding a beige jacket. It is standing next to an elderly woman with white hair. The robot has a friendly expression with a smiling mouth. The background shows a room with a green wall and a potted plant.

## 9. Assistive robotics as a transformative factor in social and health care

# Assistive robotics as a transformative factor in social and health care

## 9.1 Challenges

### 9.1.1 Lack of comparative studies

Claims about the real benefits of assistive robotics can only be substantiated by controlled studies that directly compare robot-based care services with conventional care approaches. At present, we have no comparative data to support these benefits. Neither do we have user evaluation data, PREMs (Patient Reported Experience Measures) or PROMs (Patient Reported Outcome Measures) in robotic care, unlike in other robotic areas, such as surgery<sup>67</sup>.

### 9.1.2 Pragmatic approach in the marketplace

A pragmatic approach to the market means focusing on the real needs of people and care systems rather than developing technology for its own sake. Such an approach is crucial for the adoption of assistive robotics because it identifies concrete market needs, the most promising value prospects and the real barriers to be overcome. It also ensures that the technology developed is relevant and commercially viable. If it is based on the real needs of potential users, it is more likely to be supported and successfully adopted.

### 9.1.3 Security and reliability

Since assistive robots are interacting with vulnerable people and performing critical tasks, any error could have serious consequences. There are many complex technical challenges to overcome to ensure that robots are safe, reliable and able to effectively handle unpredictable real-world situations.

Human-robot interaction is dynamic and different with each person, involves uncertainties and is difficult to fully shape. Robots must respond appropriately to all human situations and actions, and failure to do so poses a risk to human safety.

On the other hand, the actual environments in which these robots must operate can be as diverse as households, and it is necessary to ensure that robots can adapt to them and personalise their performance. However, even with rigorous standards and thorough testing, it is not possible to eliminate all risks. The software that powers robots is complex and there is always the possibility of errors or unexpected behaviour.

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<sup>67</sup> Richards JA, Williams MD, Gupta NA, Kitchen JM, Whitaker JE, Smith LS, Malkani AL. No difference in PROMs between robotic-assisted CR versus PS total knee arthroplasty: a preliminary study. *J Robot Surg.* 2022 Oct;16(5):1209-1217. doi: [10.1007/s11701-021-0](https://doi.org/10.1007/s11701-021-0)

### 9.1.4 Social acceptance

Assistive robotics, like all robotics, can be viewed with mistrust by the population. The introduction of robotics in care needs to be accepted by professionals, users, formal and informal caregivers and society at large. The potential benefits in terms of autonomy, quality of life and the therapeutic tools it provides need to be adequately communicated. Ethical and job destruction concerns must also be addressed to avoid possible resistance.

It should be made clear that this distrustful view is typical of the occidental perspective, in which robots have traditionally been seen more as enemies of the human species, as 'Terminators'. In the Eastern mentality, especially in Japan, robots have traditionally been seen as positive, fair and companionable figures to humans, such as 'Astro Boys', so that the acceptance of robots in domestic environments is total.

### 9.1.5 Integration into the social and health care system

If we think of assistive robotics as a transformative element, it must be integrated into the health and social system to achieve coordinated and efficient care. This implies establishing protocols for its use, establishing adequate training for professionals and ensuring that the technology is available to everyone who needs it.

Technologically, robotic systems and devices from different manufacturers will need to be able to exchange data and integrate with existing clinical and social information technologies (electronic health records, information systems, etc.) to exploit synergies, reduce fragmentation and improve care coordination. Open standards will be needed to facilitate this interconnection and interoperability.

### 9.1.6 Coverage and accessibility

Access to robotic assistive solutions should be progressively expanded to cover the entire population in need of them, regardless of socio-economic, geographic or type of care factors. This means continuing research and development to include increasingly diverse groups, democratising them so that they become a common and universal care tool, and considering public funding mechanisms to enable their large-scale implementation.

### 9.1.7 Privacy and cybersecurity

Care robots collect data from the people they serve. This data can be sensitive, including health history, socio-economic background, eating habits or behaviour. In addition, robots may be connected to networks that allow them to exchange information with other devices or healthcare professionals.

It is necessary to ensure the confidentiality, integrity and availability of this data and to adopt physical, digital and logical security measures to prevent unauthorised access, disclosure or modification.

The possibility that data may be compromised or that the system may be vulnerable to hackers and cyber threats makes these technologies distrustful and a deterrent to organisations and potential users. Recent episodes of data theft and disclosure<sup>68 69</sup> in the healthcare sector reinforce the idea that cybersecurity is a critical issue to be addressed in order to promote the adoption of healthcare robotics.

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<sup>68</sup> [Publiquen dades robades al Clínic, amb informació personal de pacients i treballadors](#)

<sup>69</sup> <https://www.vilaweb.cat/noticies/hospital-clinic-pirates-ransomhouse-infeccioses/>

### 9.1.8 Pre-commercial procurement

Pre-commercial procurement (PCP) processes have so far been an underused tool to promote innovation, but they can be very useful to develop and deploy technological solutions that respond to the real needs of health and social care services. Through public procurement of innovation, PCPs can identify innovative systems that improve care and validate them on a small scale, reducing risks and costs. They can stimulate the development of customised and interoperable innovations, facilitate access to funding and ensure their scalability.

### 9.1.9 Social and ethical implications

There are multiple concerns about the social and ethical implications of the use of robots in human environments<sup>70</sup> : concerns about data privacy, dignity and potential stigma, the use of force in robots' physical interactions with humans, human control of robots, etc.

A European Parliament briefing paper<sup>71</sup> published in 2018 states that ethical issues related to assistive technologies need to be addressed. This will require policies and regulations to ensure the responsible and ethical implementation of these technologies. In general, the document calls for concerted action across sectors to harness the potential of assistive technologies to improve the inclusion and quality of life of people with disabilities in the EU.

<sup>70</sup> Youssef, K.; Said, S.; Alkork, S.; Beyrouthy, T. A Survey on Recent Advances in Social Robotics. *Robotics* 2022, 11, 75. <https://doi.org/10.3390/robotics11040075>

<sup>71</sup> [Assistive technologies for people with disabilities. Legal and socio-ethical perspectives. European Parliament \(2018\)](#)





## 9.2 Opportunities

Wellness technologies, those that improve people's lives, are seen as a solution to address the challenges of the health and social care sector. Among welfare technologies, robotics will increasingly become a necessary complement to provide quality care and increase care efficiency. This opens the door to the development of all kinds of assistive robots and monitoring systems to help people maintain autonomy at home. Thus, necessity is a major driver of future growth in the sector, where significant opportunities are on the horizon thanks to factors such as the following.

### 9.2.1 Advances in intelligence artificial

Significant advances in artificial intelligence are key to the development of assistive robots. They benefit from learning algorithms that allow them to adapt and learn from their interactions with people. It is through training with data that assistive robots can learn to recognise patterns, identify objects and perform specific tasks more efficiently and accurately.

In particular, advances in the ability of machines to process and respond to natural language represent an important opportunity for the adoption of assistive robotics. Early robots that recognised the human voice used an internal dictionary that needed to be updated. Now, however, the ability to interact seamlessly with robots through a natural language interface will make them much more usable and acceptable to users.

### 9.2.2 Beginning of availability of general behavior patterns

Aggregated analysis of anonymised data collected by home monitoring systems opens up opportunities to progressively improve remote health monitoring.

By analysing large volumes of data from connected sensors, general behavioural patterns and subtle changes can be identified, indicating changes in health status even before symptoms become apparent. This will enable early detection of diseases, accurate monitoring of chronic conditions, rapid adjustment of treatment and personalised support for long-term health management. The same pattern would be applicable on the social side

### 9.2.3 Approach on human technological solutions

Assistive robotics solutions that enhance the capabilities of healthcare professionals and facilitate their work, rather than replacing them with pure automation, are more likely to gain acceptance from users and society at large. These solutions allow professionals to continue to provide person-centred, personalised and therapeutic care, while benefiting from data and alarms from robotic systems for improved monitoring and faster, more accurate action.

## 9.3 Expected market for assistive robotics

The global market for assistive robotics is large and growing. It was valued at \$6,020 million in 2020 and is expected to reach \$26,160 million by 2027, at a CAGR of 23.34% during the forecast period<sup>72</sup>. Expert studies<sup>73</sup> forecast the assistive robotics market size to grow from \$4,100 million in 2019 to \$11,200 million in 2024, at a CAGR of 22.3% during the forecast period and at a CAGR of 21% in 2027<sup>74</sup>.

While there are no specific figures for assistive robots for ADL tasks, it is clear that assistive robotics can support healthcare needs in a future with a growing shortage of healthcare professionals and a growing population of people who will need personalised care<sup>75</sup>.

More concrete data is available for social interactive robots. A recent report<sup>76</sup> by Future Market Insights forecasts the market for companion robots in healthcare to grow at 18% CAGR over the forecast period 2023-2033. By 2033, the global market could reach a market valuation of \$11.73 billion.

### 9.3.1 The Japanese model

Japan currently leads the market in assistive robotics, with a very high rate of social acceptance thanks to the fact that Japanese culture has a positive view of robots and is more inclined to accept and adopt robotic technology in everyday life, including in the field of medical care.

Beyond cultural acceptance, which facilitates the commercialisation and adoption of assistive robots in the country, James Wright's comparative study<sup>77</sup> for the Alan Turing Institute identifies that Japanese success is also explained by:

- Government policies. Japan has implemented policies that promote the development and commercialisation of assistive robots to address its ageing demographic and shortage of healthcare workers. This includes the National Robotics Plan, which sets goals and strategies for the robotics industry, including the care robotics industry.
- Investment in research and development. Japan has invested significantly in the research and development of assistive robots, with companies and research centres working collaboratively to create innovative technologies in this field.
- The approach on users' needs. Japanese companies have focused on understanding the needs and expectations of end-users and healthcare professionals, designing care robots that are practical, easy to use and provide real added value to people's lives and care environments.
- Cross-sector collaboration. Japan has fostered collaboration between the public sector, the private sector and the academic community, creating a support network for research, development and commercialisation of assistive robotics technologies.

Although Japan might seem to be the model to imitate, it did not produce the expected results: the reality is that robots have little presence in people's daily lives, including in the field of healthcare.

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<sup>72</sup> <https://brandessenceresearch.com/technology-and-media/assistive-robotics-market-industry-analysis>

<sup>73</sup> <https://www.marketsandmarkets.com/Market-Reports/assistive-robotics-market-37247851.html>

<sup>74</sup> <https://www.mordorintelligence.com/industry-reports/assistive-robotics-market>

<sup>75</sup> <https://www.washington.edu/doit/programs/accessengineering/adept/adept-accessibility-briefs/assistive-robotics-activities-daily>

<sup>76</sup> <https://www.pharmiweb.com/press-release/2023-05-22/geriatric-population-to-procure-40-market-share-for-healthcare-companion-robots-market-fmi-study>

<sup>77</sup> Wright, James. (2020). Comparing the Development and Commercialization of Care Robots in the European Union and Japan. 10.13140/RG.2.2.30615.60320.

In the book *Robots Won't Save Japan: An Ethnography of Eldercare Automation*<sup>78</sup>, James Wright details that often, once assistive robots are operational in healthcare facilities and nursing homes (due to the high cost they are not found in private homes) the robots do not live up to expectations and end up being abandoned after a short time.

In some cases, they are complex robots to manoeuvre, require attention and maintenance, and may end up making professionals spend time manipulating the robot to the detriment of interacting with the person. It has also been found that social robots do not provide the expected support for users, elderly people, who often suffer from dementia and require human treatment.

In other words, the current state of assistive robotics shows the limitations of technosolutionism in addressing complex problems such as caring for people, which require a shared social, political and economic effort that ultimately relies on human relationships.

Finally, Wright warns that the widespread use of assistive robots could lead to lower-skilled, lower-wage workers and larger, more standardised facilities to make robots affordable. The technology could end up creating jobs, but in low-level positions.

Despite the negative experience presented by Wright, it is necessary to contextualise it. His study is based on three very specific use cases with robots that were either not mature enough to be on the market and therefore could not offer the necessary support (Pepper, which was discontinued as a product in 2020), or were experimental prototypes not ready for commercial deployment (Robear). The other robot evaluated by Wright (Paro) has numerous positive studies that contradict Wright's view.<sup>79 80</sup> We cannot expect from experimental robots the support and robustness that final commercial products have, which have been thoroughly tested and have continuous support and updates with improvements.

In order to robustly and effectively design and evaluate assistive robots for their full potential, it is first necessary to adjust expectations that are often culturally beyond the current capabilities of the technology. Multi-disciplinary teams, not just technologists, are needed to co-design robots with end-users, patients and caregivers, to identify those functions that add value to care and are technically robustly implementable. Industry involvement is also needed in this co-design, to fine-tune the engineering to what is feasible as an economical and technically accessible end product for both end-users and administrations. Going back to the beginning of this report, the problem of an ageing society is still on the table and the lack of care personnel requires a solution.

The recent revolution in generative artificial intelligence has brought about a unique paradigm shift that will transform society and artificial intelligence, including robotics according to experts<sup>81</sup>. We can expect to see in the coming months how these advances will enable the field of assistive robotics, for example, to offer never-before-seen human-bot interaction capabilities.

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<sup>78</sup> Wright, James. *Robots Won't Save Japan: An Ethnography of Eldercare Automation*, Ithaca, NY: Cornell University Press, 2023. <https://doi.org/10.1515/9781501768064>

<sup>79</sup> <https://www.bbvaopenmind.com/articulos/innovacion-para-la-vida-con-robots-terapeutico-paro/>

<sup>80</sup> <https://bmccgeriatr.biomedcentral.com/articles/10.1186/s12877-019-1244-6>

<sup>81</sup> <https://tailor-network.eu/wp-content/uploads/2023/06/v3-eurogpt-press-release-A4-Document.pdf>



## **10. Overview of the assistive robotics sector in Catalonia**

# Overview of the assistive robotics sector in Catalonia

## 10.1 Strengths

Catalonia shows great strength in three essential areas to promote the adoption of healthcare robotics in the territory: a health system that is well recognised as being of excellence, a benchmark technological positioning and a very dynamic and growing ecosystem of new companies.

### 10.1.1 Health system of excellence

The Catalan health system is one of the country's great strengths and a source of pride. Catalonia has first-rate hospitals and health centres, many of them international benchmarks in various specialities.

Catalonia is also a pioneer in biomedical research and has a large network of companies dedicated to life sciences and health. The high innovative capacity in this sector has positioned the country as one of the main European poles of health research, with institutions such as IDIBAPS, Hospital Clínic, Hospital de Sant Pau, Bellvitge and Hospital Vall de Hebron.

This dynamism in research translates into constant improvements in healthcare, new medical techniques and a very high level of healthcare quality.

The combination of quality infrastructures, scientific talent and a network of collaboration between public and private institutions demonstrates the power of the Catalan health sector, making it a fundamental pillar for the well-being and progress of society.

### 10.1.2 Technological Innovation Hub

Barcelona and, by extension, Catalonia is an international pole of attraction for technological innovation events. These gatherings demonstrate cutting-edge technologies and are a gateway to new collaborations, learning and business opportunities. Notable events in 2022 include the Mobile World Congress Barcelona, 4 Years From Now (4YFN), Mobile Week Barcelona, Advanced Factories Expo & Congress, ISE Barcelona, IoT Solutions World Congress, and the Smart City Expo World Congress.

According to the Tech Hubs Overview<sup>82</sup> report, prepared by Mobile World Capital, the Agency for Business Competitiveness of the Government of Catalonia and Barcelona City Council, there are 96 global technology development centres in operation in Catalonia, 99% of which are located in the Metropolitan Area of Barcelona, which accounts for 78%.

In terms of innovation and talent, Catalonia has leading institutions<sup>83</sup> such as the Barcelona Supercomputing Center (BSC), the Alba synchrotron and the Barcelona Institute of Science and Technology (BIST).

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<sup>82</sup> <https://mobileworldcapital.com/ca/report/tech-hubs-overview/>

<sup>83</sup> [https://www.viaempresa.cat/opinio/som-hub-innovacio-talent-rat-gasol\\_2179211\\_102.html](https://www.viaempresa.cat/opinio/som-hub-innovacio-talent-rat-gasol_2179211_102.html)



In the field of health, the Barcelona Health Hub promotes innovation in digital health and its transfer to the sector, linking start-ups, healthcare organisations, corporations and investors.

An example of this is Teladoc Health's<sup>84</sup> commitment to setting up its digital health hub in Barcelona. Barcelona also hosts the XPatient Barcelona Congress and the World Congress on Medical and Patient Education.

It has recently been announced<sup>85</sup> that Catalonia will participate in ELLIS (European Laboratory for Learning and Intelligent Systems), a European network of excellence in artificial intelligence. From Barcelona, a working team of 21 people will bring together the talent of universities and research centres. The alliance includes the Universitat de Barcelona, the Universitat Autònoma de Barcelona, the Universitat Politècnica de Catalunya, the Universitat Pompeu Fabra, the Universitat Oberta de Catalunya, the Computer Vision Centre, the Institute of Robotics and Industrial Informatics, the Barcelona Supercomputing Center, the Artificial Intelligence Research Institute and the Intelligent Data Science and Artificial Intelligence Research Center. The aim of the research is to advance in machine learning and natural language processing, both of which are essential disciplines in assistive robotics and should open the door to new developments.

Overall, Catalonia already has some 180 companies specialising in artificial intelligence with a turnover of 1,350 million euros and employing 8,500 workers.

### 10.1.3 Dynamic entrepreneurial ecosystem

Catalonia has a very dynamic and growing startup fabric. In a recent interview<sup>86</sup>, Lluís Juncà, General Director for Innovation, Digital Economy and Entrepreneurship, provided data showing how the startup ecosystem in Barcelona and, by extension, in Catalonia, has reached record numbers in recent years.

On the one hand, in the number of companies, which have doubled since 2016 to reach more than 2,000 today. These companies, with a turnover of over 1,700 million euros, employ more than 20,000 people.

In addition, the current startups have more workers per company, exceeding the average of companies of their size, and have a power to attract investment of more than €1,600 million. According to Juncà, the startup model has changed, because while previously the model of replicating successful foreign initiatives in the country prevailed, today they have their own scientific and technological base and are the ones who can generate exportable business models.

The largest number of startups are in the health sector. According to ACCIÓ<sup>87</sup> data, health and healthcare startups in Catalonia have a good position in the entrepreneurial fabric, being the third main sector with 289 of the more than 1,700 startups located in Catalonia. This represents 17%, 8 points above the same figure for the entire global entrepreneurial fabric, which is 9%. In Catalonia, a new company is created every week in the life sciences and health sector.

Moreover, Catalonia has 291 deeptech start-ups according to the first study by the Generalitat<sup>88</sup> in this field, 8.6% of which develop robotic technologies.

Deeptech companies often have founders from the university and research system, tend to develop physical products rather than digital services, and have a higher scalability and time to market than other startups.

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<sup>84</sup> [https://www.viaempresa.cat/empresa/teladoc-barcelona-hub\\_2179251\\_102.html](https://www.viaempresa.cat/empresa/teladoc-barcelona-hub_2179251_102.html)

<sup>85</sup> [https://www.viaempresa.cat/innovacio/xarxa-europa-catalunya\\_2180213\\_102.html](https://www.viaempresa.cat/innovacio/xarxa-europa-catalunya_2180213_102.html)

<sup>86</sup> <https://www.3cat.cat/3cat/lluis-junca-ja-hi-ha-mes-de-2-000-start-ups-a-catalunya-des-del-2106-la-xifra-sa-duplicat/audio/1163594/>

<sup>87</sup> [https://www.viaempresa.cat/es/innovacion/cinco-startups-catalanas-healthcare\\_2162702\\_102.html](https://www.viaempresa.cat/es/innovacion/cinco-startups-catalanas-healthcare_2162702_102.html)

<sup>88</sup> <https://www.accio.gencat.cat/ca/serveis/banc-coneixement/cercador/BancConeixement/eic-analisi-ecosistema-startups-deeptech-a-catalunya>

## 10.2 Entities in assistive robotics

Despite the strengths detected in the health-technology-entrepreneurship triangle and the figures that denote dynamism and opportunity in the applications of technology to health, the reality of the number of entities specifically dedicated to healthcare robotics in Catalonia does not match the potential. We identified a very small number of research centres and companies set up with this focus.

### 10.2.1 Research centres

Among the research centres in different fields of robotics (shown in [annex 4](#) of this document), we have identified the following centres that are involved in specific projects in assistive robotics:

- **Eurecat, Technological Centre of Catalonia**

Leading technology centre in Catalonia offering innovative solutions and applied research services to companies and industries. With multiple areas of expertise, including industry 4.0, digital health, materials technology and sustainability

It participates or has participated in the projects:

- MoveCare - Multiple-actOrs Virtual Empathic CARgiver for the Elder (2017-2020)
- DIH-HERO - Digital Innovation Hubs in Healthcare Robotics (2019-2023)
- NHoA – Never Home Alone (2021-2024)
- AI Accelerator – A Smart Hospital Care Pathway Engine (2021-2024)

- **Institute of Robotics and Industrial Informatics (IRI) CSIC-UPC**

Joint research centre between the CSIC (Consejo Superior de Investigaciones Científicas) and the UPC (Universitat Politècnica de Catalunya) dedicated to research in robotics, computer science and artificial intelligence.

It participates or has participated in the projects:

- Strategic Research Program on Human-Centered Robotics (2017-2021)
- RAADiCal (2021-2024)
- ROB-IN – Robot para continual personalized assistance able to explain itself (2021- 2024)
- AI EAT (2022-)
- FRAILWATCH (2023-2025)
- ClothIRI - Robotic Cloth Manipulation at IRI (2023-2026)

- **Institute of Robotics for the Dependency (IRD)**

Research centre dedicated to developing robotic and assistive technology solutions to improve the quality of life of people with dependence or disability.

It participates in the project:

- RAADiCal (2021-2024)

- **Leitat**

Technology centre dedicated to promoting innovation, applied research and technological development for companies and industries in different sectors.

It participates in the project:

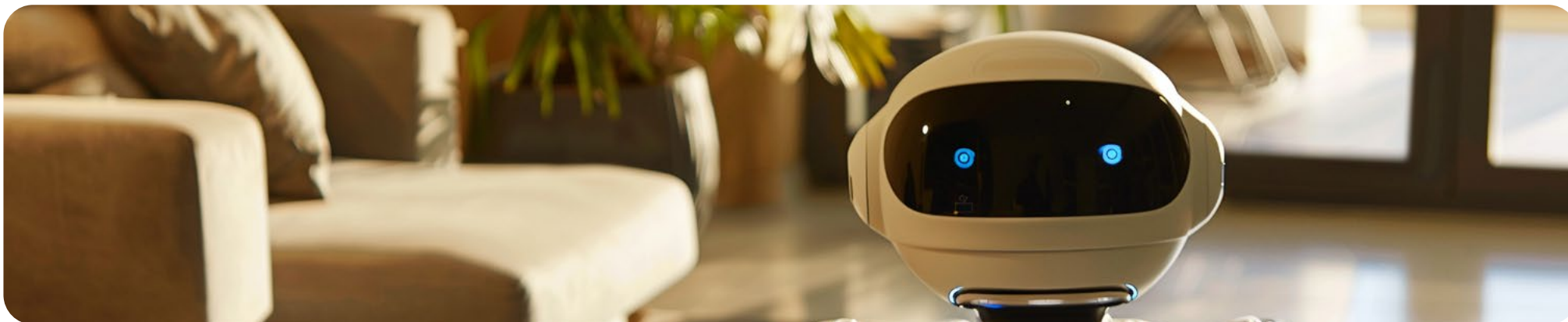
- RAADiCal (2021-2024)

### 10.2.2 Companies

At the company level, we have identified the following:

- **ABLE Human Motion**

Barcelona-based company that designs, develops and markets exoskeleton technology. More information at [www.ablehumanmotion.com](http://www.ablehumanmotion.com).



- **Group Saltó (Som Care)**

Lleida-based company that markets the social robots Misty, Temi and Zenbo for different applications in the care of older people and dependent people and in education. More information at [som-care.com](https://som-care.com).

It is worth mentioning a third company, Pal Robotics ([pal-robotics.com](https://pal-robotics.com)), which does not directly market assistive products or services, but develops robotic platforms on which these functions can be programmed. The Pal Robotics platforms most commonly used in the pursuit of assistive robotics are ARI and TIAGo.

### 10.2.3 Other entities

The assistive robotics scene has two new laboratories to promote collaboration for the co-creation of solutions that increase the quality of life of the elderly.

- **Barcelona Aging coLLaboratory (BALL)**

Barcelona Aging coLLaboratory (BALL) is a living lab focused on ageing. It is promoted by ten renowned entities representing the main areas of Catalan society: health (Parc Sanitari Pere Virgili and Vall d'Hebron Re-

search Institute), robotics (Institute of Robotics and Industrial Informatics, CSIC-UPC), university (Universitat Ramon Llull, with the Blanquerna Faculty of Health Sciences and the Borja Institute of Bioethics, and Universitat Oberta de Catalunya), social (Fundació iSocial), private enterprise (Grupo Efebé, Qida and Universal Doctor) and associations of older people (Fatec Federation of Associations of Older People of Catalonia). More information at [ballaginglab.org](https://ballaginglab.org).

- **LabORA**

LabORA is the Open Laboratory for Assistive Robotics, an initiative that seeks to bring together and promote efforts in the field of assistive robotics. With the aim of developing technologies that improve people's quality of life, LabORA creates a space for collaboration between academic research, industry, the care sector, the administration and users to identify needs, develop technology and test robotic solutions in real environments. This will be the first time that the different actors involved in the promotion of healthcare robotics will work together in the same infrastructure. LabORA wants to contribute to the creation of a business network around this new sector, while promoting the necessary legislation. More information at [labora.cat](https://labora.cat).

## 10.3 Recommendations for promoting assistive robotics in the Catalan social and healthcare ecosystem

As robotic technologies progress and assistive robotics becomes safer and more integrable, the following recommendations can help promote awareness and adoption in society and in the country's healthcare ecosystem.

### 10.3.1 Coordination and focus

- **Knowledge of the ecosystem**

In general, drawing up an integrated map of 'who is who' and 'who is doing what' in an area of innovation helps to visualise the entire ecosystem, identify synergies and coordinate efforts. In the case of healthcare robotics in Catalonia, an integrated map would help to detect gaps, connect agents by collaborative projects and synergic actions to accelerate their implementation. By visualising agents, initiatives and gaps, resources are better managed, efforts are aligned and synergies are harnessed to move forward quickly and efficiently.

- **Concentration of effort**

Greater coordination between research and development groups can accelerate progress and reduce duplication of effort. It may make sense to create a sectoral cluster of companies specialising in assistive robotics to facilitate the prioritisation of the most promising assistive robotics approaches to help focus efforts on the applications and technologies with the greatest potential for impact.

### 10.3.2 Cooperation and collaboration

- **Partnerships for the collaboration**

Partnerships need to be fostered between technology developers, the health and social care system, business, government and the patient and caregiver communities. Working together can better ensure that technology meets real needs and is implemented effectively. This can include fostering public-private collaboration projects with universities and companies and open innovation processes. Partnerships can also help address challenges related to cost, training and other issues, as well as sharing learning to disseminate best practice.

- **Global partnership for governance**

Assistive robotics is a very new field and international collaboration can help address the challenge of limited knowledge by allowing regulators to learn from each other. By working together across countries to share knowledge, the field as a whole could establish informed regulations for the development and responsible use of assistive robots. However, global coordination introduces difficulties in navigating differences between countries and finding aligned policies. Overall, there is a need for proactive learning, careful consideration of complex issues, and possibly a global partnership for responsible governance of assistive robotics that keeps pace with technological progress.

### 10.3.3 Awareness and training

- **Training health and social care professionals**

It is essential to invest in educating and training health<sup>89</sup> and social service professionals about the capabilities and benefits of assistive robotics. The more professionals understand these technologies and their potential to help users, the more likely they are to adopt and recommend them. Universities could incorporate assistive robotics into courses and professional organisations could offer continuing education on the topic. Collaborations could also be established between universities, companies and research centres to facilitate access to practical training in this area. This is a relatively new and rapidly advancing field, so training should be seen as ongoing.

- **Raising awareness among society**

Outside of laboratories and pilot tests, society is not aware of the applications of assistive robotics. One way to see the value is to give visibility to real stories of people positively impacted by the technology. It is important to explain the risks and limitations, as well as the benefits, to set realistic expectations. Open conversations can be held about the ethical issues to consider in terms of privacy, data and security. Greater understanding will drive user interest and demand for responsible innovation and use. In addition, involving end-users in the design and development of solutions will also make them see robots as more useful and acceptable, facilitating their adoption.

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<sup>89</sup> <https://partner.sciencenorway.no/e-health-research-elder-care-elderly/from-social-robots-to-dementia-villages-people-must-be-trained-in-using-digital-technology-in-care/2146456>

### 10.3.4 Integration strategy

- **Model for integration**

A strategic framework is needed to integrate assistive robotics into the social and healthcare system, making it possible to meet the challenges posed by the ageing population, optimise the provision of services and improve people's quality of life.

This strategy should include aspects such as the identification of user needs, the promotion of research and innovation, the establishment of regulatory and ethical frameworks, the training of professionals and users, collaboration between different agents and the implementation of mechanisms for evaluating results.

- **Guidelines and protocols**

In order to regulate the use of assistive robotics in the social and healthcare field, it is necessary to establish clear guidelines and protocols for use that guarantee the safety and privacy of users, also reviewing regulations related to cybersecurity. It is also necessary to implement mechanisms for measuring the impact, evaluation and certification of products and services based on assistive robotics. The adaptation of labour regulations must guarantee the integration of these technological advances into the labour market, ensuring the protection of workers' labour rights.

- **Increase pilotage**

If person-centred design, co-created with end-users and healthcare professionals, helps to ensure that the robotic solution approach makes sense and is useful for the person, it is in the pilots that valuable information is gathered on the feasibility and effectiveness of the solution in real-life situations. This information includes how the technology fits into existing work processes in health and social care settings, and how professionals can increase their quality time for users. In addition, piloting allows for the identification of possible ethical, legal and social issues.





# 11. Conclusions

# Conclusions

The aim of this White Paper has been to analyse the reality of assistive robotics and to draw lessons to help us understand the difficulties that have been a barrier to its proliferation. From these lessons, we aim to promote the implementation of assistive robots in society and to create new solutions that help people. At the same time, we want to encourage the development of a new business fabric in Catalonia in this field.

Assistive robotics will play an important role in transforming people's lives, and this has been recognised by many international organisations, from the European Commission to the United Nations. For this reason, for more than 15 years, money and efforts have been invested in researching and producing technologies that allow robots to help people in their daily activities. In this book we have collected and analysed a large number of initiatives, both public and private, which unfortunately in the vast majority of cases have not resulted in a product that has reached the market. The reality is that today we still do not have an economic sector based on assistive robotics that can provide us with services. This is a problem, but at the same time it is an opportunity.

The problem with the low uptake of assistive robotics lies in the fact that it has not yet been found which service robots can perform at a reasonable cost and with sufficient efficiency and robustness. Our analysis shows that in many cases expectations were unrealistic, and that there has not been a sufficiently pragmatic approach to market needs and the costs involved. From a technological point of view, there are still no robust robots that can be used without supervision. Robot interactions with the environment are still slow and often fail. Social interactions are rigid and

often unpleasant. Both physical security and cyber security need to be improved. Other issues such as acceptance, privacy of people's data and other ethical considerations are also unresolved. On the other hand, we are increasingly able to produce more robust and cost-effective robots and the explosion of artificial intelligence is revolutionising robotics with new and more complex reasoning and learning capabilities.

The most important conclusion of the white paper is that there is a need for the coordinated work of different actors. Groups developing innovation have the role of creating those enabling technologies that are lacking and improving existing ones to make them useful. To find these real needs, it is necessary to count on the users: the people who receive the service, and the informal and professional caregivers who can be served. But also, with the industry that must produce the robots. Finally, it is necessary from the outset to count on the administrations that must integrate these robots into the health and social system, whether in homes or in care spaces.

In Catalonia we are in an advantageous position to maintain: our health system is a benchmark in research and implementation of new technologies; Catalonia is an international pole of attraction for technological innovation and we have first-class facilities; we participate in numerous consortia and innovation hubs; we have a very dynamic entrepreneurial fabric with the capacity to attract investment, where health and technology start-ups are in the majority; and we have research and transfer centres that are international benchmarks. It seems, therefore, that the time is ripe and that the starting conditions are very good.



A person wearing a white and black prosthetic leg device is walking in a hospital corridor. The device is a complex, multi-jointed prosthetic leg with white plastic components and black straps. The person is wearing a white lab coat. The background is a blurred hospital corridor with other people and medical equipment.

# Annexes

# Annex 1. Assistive Robotics Projects

## ACANTO

Objective	To develop a portfolio of technical solutions to encourage older people to a sustainable and regular level of physical exercise under the guidance and supervision of their caregivers
Programme	H2020-EU.3.1. / H2020-EU.3.1.4.
Dates	2015-2018
Funding received	4.295.755 €
Scope	Academia
Participants	University of Trento (coordinator), Università di Siena, Northumbria University, Hospital Universitario de Getafe, Forth, Inria, Telecom Italia, Atos, Siemens.
Comment	Robotic walking assistant (FriWalk) that acts as a personal trainer and communicates via an audio-visual interface (Fri-Tab). Technology to detect the environment and plan a course of action adaptable to the user.
Users	Prototype trials to evaluate the solution in Italy and the UK.
State	Project closed.
Results	N/A
Link web	<a href="http://www.ict-acanto.eu/index.html">http://www.ict-acanto.eu/index.html</a>

## ACCOMPANY - Acceptable robotiCs COMPanions for AgeiNg Years

Objective	Focusing on home companion technologies, advancing the state of the art in areas such as empathic and social human-robot interaction, learning robot memory visualisation, and tracking people and tasks in the home.
Programme	FP7-ICT
Dates	2011-2014
Funding received	3.653.929 €
Scope	Academia
Participants	University of Hertfordshire Higher Education Corporation (coordinator), Centre Expert en Technologies et Services pour le Maintien en Autonomie a Domicile des Personnes Agees, Fraunhofer Gesellschaft Zur Forderung Der Angewandten Forschung Ev, Stichting Zuyd Hogeschool, The University of Birmingham, The University of Warwick, Università Degli Studi di Siena, Universiteit Twente, Universiteit van Amsterdam.
Comment	Technology integration into an existing robotic platform, CareOBot3 in the context of a smart home environment using a multitude of sensor arrays.
Users	Tests conducted in the UK, the Netherlands and France. <a href="https://www.youtube.com/watch?v=Z1MJPdhnIXc">https://www.youtube.com/watch?v=Z1MJPdhnIXc</a> <a href="https://www.youtube.com/watch?v=1CD9Gxz6qBw">https://www.youtube.com/watch?v=1CD9Gxz6qBw</a>
State	Project closed.
Results	Conclusions document: <a href="https://ieeexplore.ieee.org/document/6577882">https://ieeexplore.ieee.org/document/6577882</a>
Link web	<a href="https://cordis.europa.eu/project/id/287624/results">https://cordis.europa.eu/project/id/287624/results</a>

## ACCRA - Agile Co-Creation of Robots for Ageing

Objective	Enabling the development of advanced ICT robotics-based solutions to extend active and healthy ageing by defining, developing and demonstrating an agile co-creation process. This is a four-step methodology (needs assessment, co-creation, experimentation, sustainability analysis) in three applications (walking support, housework, conversation rehabilitation).
Programme	H2020-EU.3.1. / H2020-EU.3.1.4
Dates	2016-2020
Funding received	1.999.711,25 €
Scope	Academia
Participants	Trialog (coordinator), Scuola Superiore di Studi Universitario e di Perfezionamento S Anna, Erasmus Universiteit Rotterdam, Universite Paris Dauphine, Blue Frog Robotics, Fondazione Casa Sollievo Della Sofferenza
Comment	Applications based on a FIWARE platform integrating enablers including universAAL functions and supporting two robotics solutions, the Astro and Buddy robots.
Users	Evaluation with users in France, Italy, the Netherlands and Japan.
State	Project closed.
Results	Methodology, handbook and video: <a href="https://www.accra-project.org/en/1570-2/">https://www.accra-project.org/en/1570-2/</a>
Link web	<a href="https://www.accra-project.org/en/life/">https://www.accra-project.org/en/life/</a>

## ACTIVAGE (ACTivating INnoVative IoT smart living environments for AGEing well)

Objective	Large-scale multi-centre European pilot on smart living environments. The objective is to build the first European IoT ecosystem across 9 deployment sites (DS) in seven European countries, reusing and extending the underlying open and proprietary IoT platforms, technologies and standards, and integrating the new interfaces needed to provide interoperability between these heterogeneous platforms that will enable large-scale deployment and operation.
Programme	H2020-EU.2.1.1. / H2020-EU.3.1.4
Dates	2017-2020
Funding received	19.922.451,13 €
Scope	Company
Participants	Medtronic Ibérica (coordinator), STMicroelectronics Grenoble 2, STMicroelectronics, STMicroelectronics Rousset, Televes, Mysphera, Universidad Politécnica de Madrid, Fraunhofer Gesellschaft zur Förderung der Angewandten, Commissariat à l'Energie Atomique et aux Energies Alternatives, Fédération Française de Domotique, Minalogic Auvergne-Rhône-Alpes, Ethniko Kentro Erevnas kai Technologikis Anaptixis, IBM Research GmbH, Lepida Scpa, Universitat Politècnica de Valencia, HOP Ubiquitous, National University of Ireland Galway, MEDEA, Fundación Tecnalia Research & Innovation, Centro Expert en Technologies et Services pour le Maintien en Autonomie à Domicile des Personnes Agees, Fundación Vodafone España, Cruz Roja Española, Fundación Tecnologías Sociales, CSEM Centre Suisse d'Electronique et de Microtechnique SA-Recherche et Developpement, Samsung Electronics (UK), Tercera Edad Activa, Fundación de la Comunitat Valenciana para la Promoción Estrategica el Desarrollo y la Innovación Urbana, Consiglio Nazionale delle Ricerche, Azienda USL de Parma, Università degli Studi de Parma, I-Cubo, Aurora Domus Cooperativa Sociale- ONLUS, Wind Tre Spa, Technosens Evolution, Departement de l'Isere, Technopole Alpes Sante a Domicile et Autonomie, Inter

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	Mutuelles Assistance, L'Institut du Bien Vieillir Korian, Servicios de Teleasistencia SA, AJT Wohn-und Quartierzentrum Weiterstadt GmbH & Co. KG, SageLiving GmbH, Servizio Galego de Saude, Gestio Sociosanitaria al Mediterrani SL, Anaptyxiaki Diadimotiki Eteria Psifiakes Polis Kentrikis Elladas AE OTA (Intermunicipal Development Company Digital Cities of Central Greece SA), Gnomon Pliroforikis AE, Dimos Metamorphoseos, SWARCO Hellas Systimata Kykloforias Anonymi Etaireia, Dimos Pylaias Chortiati, Erevnitiko Panepistimiako Institutouto Systimaton Epikoinonion kai Ypolgiston-EMP, SE Innovations Oy, GoodLife Technology Oy, Eseteli Palveluverkko Oy, Turun Ammattikorkeakoulu Oy, Leeds City Council, University of Surrey, Iniciativa Social Integral per al Benestar SLU.
Comment	Smart home sensors, wearable devices and services platform. Uses open software architecture and standardised interfaces for interoperability. Monitoring includes activity indicators, cognitive training and social connectivity.
Users	Evaluation in trials with 278 older users in five countries.
State	Project closed.
Results	AIOTES Platform (Activage IoT Ecosystem Suite) <a href="https://github.com/AIoTES">https://github.com/AIoTES</a>
Link web	<a href="http://www.activageproject.eu/">http://www.activageproject.eu/</a> <a href="https://cordis.europa.eu/project/id/732679">https://cordis.europa.eu/project/id/732679</a>

## AgeWell

Objective	Providing a virtual avatar and robot-based coach to support older people in their transformation towards retirement and support for companies to keep their employees motivated for longer to share knowledge and experience after retirement.
Programme	AAL Programme
Dates	2019-2021
Funding received	1.400.000 €
Scope	Academia / Company.
Participants	WPU GmbH (coordinator), AIT Austrian Institute of Technology GmbH, ProSelf Int. AG, University of Applied Sciences Wiener Neustadt, MedRecord BV, Gouden Dagen, National Institute of Health and Science on Aging.
Comment	Voice recognition technologies, machine learning, as well as scientifically proven psychology methods and models to address personal needs and preferences. Mobile avatar app, Jibo robotic platform and mobile robotic platform without manipulation capabilities. <a href="https://www.youtube.com/watch?v=xs2YrhswNZY">https://www.youtube.com/watch?v=xs2YrhswNZY</a>
Users	Users from Gouden Dagen in the Netherlands and National Institute of Health and Science on Aging in Italy.
State	Project closed.
Results	The latest publication concludes that more research and development and testing of DHC (Digital Health Coach) technology with older people is needed to design a tool that can meet the needs and expectations of users.
Link web	<a href="https://web.archive.org/web/20201205222325/https://agewell-project.eu/publication">https://web.archive.org/web/20201205222325/https://agewell-project.eu/publication</a> <a href="https://web.archive.org/web/20201205222325/https://agewell-project.eu/">https://web.archive.org/web/20201205222325/https://agewell-project.eu/</a>

## AI Accelerator – A Smart Hospital Care Pathway Engine

Objective	Demonstrate the scalability of the AI solutions offered by the Smart Hospital Care Pathway Engine for different types of healthcare uses. A proven and scalable concept will be offered, from which hospitals can select the necessary tools and data management for their use cases.
Programme	H2020-EU.2.1.1.
Dates	2021-2024
Funding received	9,195,162 €
Scope	Academia
Participants	Helsinki University Hospital (coordinator), Oulu University Hospital, Chino.io, Symptoma, Eurecat, Sant Joan de Déu Research Foundation, Nurmoedia GmbH, NEC Laboratories Europe GmbH, Bambino Gesù Children's Hospital, SRDC Corp, Evondos, Ticbiomed, NeuroPath, Erasmus School of Health Policy & Management, University of Padua, Innofactor.
Comment	Artificial Intelligence and robotics. Evondos robot, a medicine dispenser that monitors the progress of pharmacotherapy. SIMA social robot, to improve home care for chronic paediatric patients.
Users	3 pilots that will focus on patient flow management for emergency and surgical units, the establishment of a digital care pathway for Parkinson's disease, and the provision of services to paediatric patients.
State	Project in progress.
Results	N/A
Link web	<a href="https://aiaccelerate.eu/">https://aiaccelerate.eu/</a> <a href="https://cordis.europa.eu/project/id/101016902">https://cordis.europa.eu/project/id/101016902</a>

## AI EAT

Objective	To improve support for the autonomy of people with dependency by providing a method for them to eat on their own without the need for an assistant.
Programme	Barcelona Aging coLLaboratory (BALL)
Dates	2022-
Funding received	
Scope	Academia / Commercial
Participants	Institute of Robotics and Industrial Informatics (IRI) CSIC-UPC, Hospital Pere Virgili (pilot)
Comment	AI EAT is a commercial feeding support robot to which the Institute of Robotics and Industrial Informatics of the CSIC-UPC, in collaboration with the PSPV, is adding features to meet the needs of the elderly during the feeding process.
Users	
State	Project in progress. Pilot start in September 2022. Planned phases: <ul style="list-style-type: none"> <li>- Identification of existing evidence.</li> <li>- Co-creation with healthcare professionals to identify the needs of a feeding robot.</li> <li>- Development of robot prototypes.</li> <li>- Piloting and validation with end users.</li> <li>- Implementation in care and community settings.</li> <li>- Evaluation of effectiveness and safety.</li> </ul>
Results	
Link web	<a href="https://ballaginglab.org/portfolio/ai-eat/">https://ballaginglab.org/portfolio/ai-eat/</a>

## AIDE - Adaptive Multimodal Interfaces to Assist Disabled People in Daily Activities

Objective	To develop and pre-clinically validate a modular and adaptive multimodal human-machine interface that enables people with moderate and severe disabilities to interact with smart devices to perform daily activities and participate fully in society.
Programme	H2020-EU.2.1.1 / H2020-EU.2.1.1.4.
Dates	2015-2018
Funding received	3.409.430,75 €
Scope	Academia / Company
Participants	Universidad Miguel Hernandez de Elche (coordinador), Scuola Superiore di Studi Universitari e di Perfezionamento S Anna, Universita Campus Bio Medico di Roma, Universitat Politecnica de Valencia, Eberhard Karls, Universitaet Tuebingen, The Cedar Foundation, Zed Worldwide S.A. Fraunhofer Gesellschaft zur Forderung der Angewandten Forschung EV, B & J Adaptaciones, Robotnik Automation
Comment	Arm exoskeleton connected to a robotic wheelchair. Customisable modular and adaptive multimodal interface <a href="https://cordis.europa.eu/article/id/241028-daily-chores-made-easy-with-the-right-aide">https://cordis.europa.eu/article/id/241028-daily-chores-made-easy-with-the-right-aide</a>
Users	AIDE prototype validated with 17 end-users suffering from various neurological conditions at the Cedar Foundation in the UK and 2 end-user evaluation sessions using different interfaces at the Campus BioMedico University in Rome.
State	Project closed.
Results	Marketing and future customisation.
Link web	Discontinued project website. <a href="https://cordis.europa.eu/project/id/645322">https://cordis.europa.eu/project/id/645322</a>

## ALIAS - Adaptable Ambient Living ASsistant

Objective	Product development of a mobile robot system that interacts with elderly users, monitors and provides cognitive assistance in daily life, and promotes social inclusion by creating connections with people and events in the wider environment.
Programme	AAL Programme
Dates	2010-2013
Funding received	2.529.165 €
Scope	Academia
Participants	Technische Universität München (coordinador), Technische Universität Ilmenau, MetraLabs GmbH, Cognesys GmbH, Eurecom, G-tec medical engineering GmbH, Fraunhofer IDMT, pme Familien Service GmbH, Youse GmbH.
Comment	Mobile robot platform with the ability to monitor, interact with and access information from online services, without manipulation capabilities.
Users	Test with end-user partner: pme Familien Service GmbH
State	Project closed.
Results	Market potential is detected but technology maturity is still insufficient. <a href="https://www.youtube.com/watch?v=xcRwMdqnpf4">https://www.youtube.com/watch?v=xcRwMdqnpf4</a> <a href="https://www.aal.fraunhofer.de/content/dam/aal/en/doc/2012_ambient_adaptable_living_asistant_meeting_users_aal_forum.pdf">https://www.aal.fraunhofer.de/content/dam/aal/en/doc/2012_ambient_adaptable_living_asistant_meeting_users_aal_forum.pdf</a>
Link web	<a href="http://www.aal-europe.eu/projects/alias/">http://www.aal-europe.eu/projects/alias/</a>

## ARI - Assistent Robòtic Intel·ligent

Objective	The project arose within the framework of the 5G Barcelona alliance and the call for the challenge 'How to improve the quality of life of older people through technology' launched by the Mobile World Capital Barcelona. So far, the first version of the ARI robot has been tested in a dozen homes of older people or dependent people living alone. The preliminary results obtained show the capacity of this widget to improve the quality of life of its users, which, without reducing the support or personal services they may be receiving, incorporates elements of artificial intelligence that can be configured according to the specific needs of each person.
Programme	Mobile World Capital Barcelona
Dates	2021-2024
Funding received	125.000 € first phase, 275.000 € second phase
Scope	Company/Public sector
Participants	MWC Barcelona, Barcelona City Council, Group Saltó
Comment	The new version is capable of moving around the house with a battery life of approximately eight hours. It is also designed to track the person, detect and avoid obstacles, facial and voice recognition, an interactive touch screen and the possibility of charging the mobile phone without a plug. It also incorporates a greater capacity for interaction with the user (in Catalan or Spanish) and can be integrated with other applications, such as the possibility of providing news of interest, being directed remotely by family members or caregivers, or making video calls.
Users	Users selected by the Social Rights Department of the City Council
State	First project phase closed, second phase ongoing (2024).
Results	Market potential identified <a href="https://ajuntament.barcelona.cat/premsa/2021/11/17/la-prova-pilot-del-robot-social-ari-sampla-ra-a-un-centenar-de-llars-durant-els-propers-tres-anys/">https://ajuntament.barcelona.cat/premsa/2021/11/17/la-prova-pilot-del-robot-social-ari-sampla-ra-a-un-centenar-de-llars-durant-els-propers-tres-anys/</a> <a href="https://ajuntament.barcelona.cat/gracia/ca/noticia/robots-que-fan-companyia-a-les-persones-grans_1042357">https://ajuntament.barcelona.cat/gracia/ca/noticia/robots-que-fan-companyia-a-les-persones-grans_1042357</a>
Link web	<a href="https://groupsalto.com/ca/2021/02/24/el-robot-assistencial-de-grup-salto-inicia-les-proves-amb-gent-gran/">https://groupsalto.com/ca/2021/02/24/el-robot-assistencial-de-grup-salto-inicia-les-proves-amb-gent-gran/</a>

## ASSAM – Assistants for Safe Mobility

Objective	To compensate for the declining physical and cognitive abilities of older people by developing modular navigation aids for various mobility platforms, such as walker, wheelchair and tricycle.
Programme	AAL Programme
Dates	2012-2015
Funding received	2.039.942 €
Scope	Academia
Participants	DFKI GmbH (coordinador), Budelmann Elektronik, Johanniter-Unfall-Hilfe e.V., neusta mobile solutions GmbH, Universitat Politècnica de Catalunya, Centre de vida independent, Utrecht School of the Arts, Stichting Bartiméus, Ecobike, Lifante Vehicles.
Comment	Modular robotic assistance systems that provide physical mobility support to increase walking ability, cognitive assistance for visual and mental impairment through obstacle recognition and avoidance, orientation and navigation assistance, and safety through permanent connection to the care centre in case of emergency situations.
Users	Tests carried out in Germany, the Netherlands and Spain.
State	Closed project. Prototypes have been developed and the iWalker is in the process of being transferred to TOPRO for commercialisation. <a href="https://www.topromobility.co.uk/">https://www.topromobility.co.uk/</a>
Results	Downloadable videos: <a href="https://www-cps.hb.dfki.de/assam/videos/index.html">https://www-cps.hb.dfki.de/assam/videos/index.html</a>
Link web	<a href="https://www-cps.hb.dfki.de/assam/index.html">https://www-cps.hb.dfki.de/assam/index.html</a>

## ASTROMOBILE - Assistive Smart RObotic platform for indoor environments: MOBILity and intEraction

Objective	Demonstrate the user utility of a multi-purpose intelligent robotic mobile platform for indoor environments with an interface for internal and external communication.
Programme	FP7 – Projecte ECHORD
Dates	N/A-2012
Funding received	N/A
Scope	Academia
Participants	Scuola Superiore Sant'Anna (coordinator), Simon Listens.
Comment	Astro mobile robot with voice recognition system and access to telephone and multimedia. It incorporates a physical device to help it as a walker.
Users	N/A
State	Project closed. <a href="https://www.youtube.com/watch?v=PDkEe4G4PX4">https://www.youtube.com/watch?v=PDkEe4G4PX4</a> <a href="https://www.youtube.com/watch?v=2ZxWOmP_4D8&amp;t=7s">https://www.youtube.com/watch?v=2ZxWOmP_4D8&amp;t=7s</a>
Results	The ASTRO software architecture and its integration into the intelligent environment with all defined functionalities was finalised. <a href="http://www.echord.info/blogs/astromobile/public-summary-month-5-2012.html">http://www.echord.info/blogs/astromobile/public-summary-month-5-2012.html</a> Additional information behind the <i>paywall</i> .
Link web	<a href="http://www.echord.info/wikis/website/astromobile.html">http://www.echord.info/wikis/website/astromobile.html</a>

## AXO-Suit

Objective	Analyse the mobility, reach and strength needs of older people to continue to manage their daily activities related to voluntary employment and community participation. Core products including upper, lower and whole-body support exoskeletons will be designed, developed and validated.
Programme	AAL Programme
Dates	2014-2018
Funding received	1.641.470 €
Scope	Academia
Participants	Aalborg University (coordinator), University of Gävle, University of Limerick, Welldana A/S, Bioservo Technologies AB, MTD Precision Engineering, COMmeto bvba, Hjälpmedelsteknik Sverige
Comment	Exoskeletons equipped with user intention detection sensors.
Users	Tests with 20 users. Under 50 years old for level 1 tests and between 50 and 55 years old for level 2 tests.
State	Project closed.
Results	Prototypes designed. In 2020, the startup Biox is created to bring comfortable and easy-to-use smart exoskeletons to the market. <a href="https://www.bioxgroup.dk">https://www.bioxgroup.dk</a>
Link web	<a href="https://www.axo-suit.eu/">https://www.axo-suit.eu/</a>



## CAMI

Objective	Create an integrated AAL ( <i>Ambient Assisted Living</i> ) solution that provides services for health management, home management and wellbeing (including socialisation and reduced mobility support). CAMI builds an artificial intelligence ecosystem, which enables the seamless integration of any number of environmental and wearable sensors with a mobile robotic platform equipped with multimodal interaction (touch, voice, human detection), including a telepresence robot with manipulation capabilities. CAMI ecosystem services address both healthy people and people with age-related disabilities.
Programme	AAL Programme
Dates	2015-2018
Funding received	2.028.517,28 €
Scope	Academia
Participants	University Politehnica of Bucharest (coordinator), Centrul IT pentru Stiinta si Tehnologie, CNet Svenska AB, Mälardalen Universit, Ecotopias, Alivate Development ApS, Eclexys Sagl, Knowledge Society Association
Comment	Human-machine interaction, intelligent context management, perception of the environment and reactive behaviour. Pepper and TIAGo <sup>90</sup> robots.
Users	N/A
State	Project closed.
Results	<a href="https://github.com/cami-project/cami-project">https://github.com/cami-project/cami-project</a> The plan was to commercialise the CAMI solution within 2-3 years of project completion.
Link web	<a href="https://web.archive.org/web/20240617225852/http://www.camiproject.eu/">https://web.archive.org/web/20240617225852/http://www.camiproject.eu/</a>

<sup>90</sup> This information, available in the files of the IRI (CSICUPC) No ha could be contrasted on the project website, which is not accessible.

## CARESSES - Culture Aware Robots and Environmental Sensor Systems for Elderly Support

Objective	To build culturally competent assistive robots, capable of autonomously reconfiguring the way they act and speak when providing a service, to adapt to the culture, customs and etiquette of the person they are assisting.
Programme	H2020-EU.3.1. / H2020-EU.3.1.4. / Ministry of Internal Affairs and Communications of Japan
Dates	2017-2020
Funding received	2.084.248,75 € + 60.000.000 JPY
Scope	Academia
Participants	Universita degli Studi di Genova (coordinator), Orebro University, Middlesex University Higher Education Corporation, University of Bedfordshire, Softbank Robotics EU, Advinia Health Care Limited, Japan Advanced Institute of Science and Technology, Nagoya University, Chubu University
Comment	Social robot Pepper with voice and dialogue recognition and gaze tracking functionalities.
Users	Tests in the UK, Japan and India.
State	Project closed.
Results	<a href="http://caressesrobot.org/en/category/research/Basic%20guidelines%20for%20a%20culturally%20competent%20robot">http://caressesrobot.org/en/category/research/Basic guidelines for a culturally competent robot</a> (downloadable)
Link web	<a href="http://caressesrobot.org/en/">http://caressesrobot.org/en/</a>

## CHIRON

Objective	To develop a general purpose robotic system with AI for the dexterous manipulation of complex and unfamiliar objects in rapidly changing, dynamic and unpredictable real-world environments. Aimed at assisting patients or elderly people with limited physical capacity in their tasks of manipulating everyday objects, e.g. fetching a bottle of water and pouring it into a glass, by means of an intuitive robot that they can teleoperate themselves.
Programme	N/A
Dates	N/A
Funding received	N/A
Scope	Academia
Participants	N/A
Comment	TIAGo++ dualarm robot. Intuitive embedded robotic teleoperation under optimised shared control between the human operator enhanced with an intuitive haptic interface and the robot controller equipped with vision and learning skills.
Users	N/A
State	Under development at iROSA Lab <a href="https://pearl-lab.com/">https://pearl-lab.com/</a> <a href="https://pal-robotics.com/blog/georgia-chalvatzaki-interview-part-2/">https://pal-robotics.com/blog/georgia-chalvatzaki-interview-part-2/</a>
Results	N/A
Link web	<a href="https://chiron.website/">https://chiron.website/</a>

## CLOTHILDE - CLOTH manipulation Learning from Demonstrations

Objective	Develop a theory of textile manipulation and take it through to the implementation of prototypes in the laboratory. Characterise the state of textile objects and their transformations under certain actions by combining recent powerful tools from computational topology and machine learning. The robot learns manipulation skills from an initial human demonstration, which will be further refined by reinforcement learning and timely requests to the user.
Programme	H2020-EU.1.1.
Dates	2018-2023
Funding received	2.499.149 €
Scope	Academia
Participants	Agencia Estatal Consejo Superior de Investigaciones Científicas (coordinator), Universitat Politècnica de Catalunya
Comment	TIAGo robots equipped with extra sensors and in-house software.
Users	N/A
State	Ongoing project (Perception and manipulation laboratory). Planned to develop prototypes for 3 applications: recognising and folding clothes, putting an elastic cover on a mattress or car seat, and helping older people and disabled people to get dressed.
Results	N/A
Link web	<a href="https://clothilde.iri.upc.edu/">https://clothilde.iri.upc.edu/</a>

## ClothIRI - Robotic Cloth Manipulation at IRI

Objective	Preserving the expertise of the 'Perception and Manipulation' group of the IRI Robotics Department in perception, planning and learning of robotic manipulation tasks, as well as maintaining cutting-edge research so that the group is in a position to meet its current commitments and participate in new European project proposals.
Programme	Intramural project
Dates	2023-2026
Funding received	
Scope	Academia
Participants	Institute of Robotics and Industrial Informatics (IRI) CSIC-UPC
Comment	The 'Perception and Manipulation' group of the IRI Robotics Department aims to improve the perception, planning and learning capabilities of robots to increase their autonomy and ease of use in manipulation tasks. While the robotic manipulation of rigid objects is a topic that has been worked on intensively by a number of universities and research centres, and is an everyday reality in some industrial environments, the manipulation of deformable objects is a field of research that is still in its infancy.
Users	
State	Project in progress.
Results	
Link web	<a href="https://www.iri.upc.edu/project/show/305">https://www.iri.upc.edu/project/show/305</a>

## CompanionAble - Integrated Cognitive Assistive and Domotic Companion Robotic Systems for Ability and Security

Objective	Care concept that combines the strengths of a mobile robotic companion with the advantages of a smart home and tele-care. Two scenarios will be designed in which long-term field experiments will be conducted to evaluate and test the system, determining its strengths and weaknesses. The development of a global and integrated care scenario will be initiated.
Programme	FP7-ICT
Dates	2008-2012
Funding received	7.799.997 €
Scope	Academia
Participants	The University of Reading (coordinator), AIT Austrian Institute of Technology GmbH, AKG Acoustics GmbH, Cure Centrum für die Untersuchung und Realisierung endbenutzerorientierter interaktiver Systeme, Innovatiecentrum voor Huisvesting met Aangepaste Middelen, Technische Universitaet Ilmenau, Metralabs GmbH Neue Technologien und Systeme, Bioingenieria Aragonesa, S.L., Universidade da Coruna, Fundacion Instituto Gerontologico Matia – INGEMA, Fundacion Tecnalia Research & Innovation, Fundacion Robotiker, Chambre de Commerce et d'Industrie de Paris, Institut Mines-Telecom, Legrand, Association de Gestion de l'Ecole Supérieure d'Ingenieurs en Informatique et Genie des Telecommunications, Assistance Publique Hopitaux de Paris, Universite d'Evry-Val d'Essone, Eaton Industries (Netherlands) BV, Verklizan B.V., Stichting Smart Homes.
Comment	Sensorised domotic house and Hector mobile robot with touch screen for communication.

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Users	The system was installed in several demonstration houses and studies were carried out with older people.
State	Project closed.
Results	High system reliability and low maintenance costs were found, paving the way for the commercialisation of the smart technologies developed by the project. <a href="https://cordis.europa.eu/article/id/88915-feature-stories-robotic-assistance-for-the-elderly">https://cordis.europa.eu/article/id/88915-feature-stories-robotic-assistance-for-the-elderly</a>
Link web	<a href="https://cordis.europa.eu/project/id/216487">https://cordis.europa.eu/project/id/216487</a>

## DALi - Devices for Assisted Living

Objective	Older people can find it difficult to walk unaided, especially in crowded places. The aim of the project is to develop an intelligent robotic walker that can be carried or picked up on site and that helps the person to navigate the space safely. The device takes corrective actions when the user encounters obstacles or incidents that he/she wishes to avoid.
Programme	FP7-ICT
Dates	2011-2014
Funding received	3.022.000 €
Scope	Academia
Participants	Universita degli Studi di Trento (coordinador), Siemens Aktiengesellschaft Osterreich, Visual Tools SA, Indra Software Labs SLU, Institut National de Recherche en Informatique et Automatique, Idryma Technologias Kai Erewnas, Universita degli Studi di Siena, University of Northumbria at Newcastle.
Comment	c-Walker robotic support.
Users	Tests in old people's homes in Ciudad Real and Trento. The feedback allowed the prototype to be advanced.
State	Project closed.
Results	Having reduced the cost of the robots to around 2.000 euros, the consortium's plan was to bring it to market in 2020, via a spinoff or investment from a technology manufacturer. <a href="https://cordis.europa.eu/article/id/164931-dali-robot-walker-for-elderly-people-in-public-spaces/es">https://cordis.europa.eu/article/id/164931-dali-robot-walker-for-elderly-people-in-public-spaces/es</a>
Link web	<a href="https://www.h2020.md/en/dali-robot-walker-elderly-people-public-spaces">https://www.h2020.md/en/dali-robot-walker-elderly-people-public-spaces</a> <a href="http://www.ict-dali.eu/dali/">http://www.ict-dali.eu/dali/</a> (project website not accessible)

## DIH-HERO - Digital Innovation Hubs in Healthcare Robotics

Objective	Digital Innovation Hub Healthcare Robotics is an independent and sustainable platform for all those active in the healthcare ecosystem. Our mission is to create a sustainable network that connects companies and stakeholders and enables them to develop innovative products and services for the healthcare market. This innovation will accelerate and reduce time to market through a pan-European network. Our online portal for network members offers services to facilitate collaboration on various innovations and share best practices to help the industry develop an efficient product.
Programme	H2020-EU.2.1.1.
Dates	2019-2023
Funding received	19.485.844,33 €
Scope	Academia
Participants	Universiteit Twente (coordinator), Universitaetsklinikum Aachen, Fraunhofer Gesellschaft zur Foerderung der Angewandten Forschung EV, Commissariat a l'Energie Atomique et aux Energies Alternatives, Scuola Superiore di Studi Universitari e di Perfezionamento S Anna, Politecnico di Milano, Fondazione Politecnico di Milano, Fondazione Istituto Italiano di Tecnologia, Fundacion Tecnalia Research & Innovation, Deutsches Zentrum für Luft- und Raumfahrt EV, Imperial College of Science Technology and Medicine, Teknologisk Institut, Interuniversitair Micro-electronica Centrum, Elektrotehnicki Fakultet Univerzitet u Beogradu, Eidgenoessische Technische Hochschule Zuerich, Fundacja Rozwoju Kardiologii im Prof Zbigniewa Religi, Fundacio Eurecat, iTechNic GmbH.
State	Project in progress.
Results	<a href="https://dih-hero.eu/robotic-innovations/">https://dih-hero.eu/robotic-innovations/</a>
Link web	<a href="https://dih-hero.eu/">https://dih-hero.eu/</a>

## DOMEO

Objective	Development of an open robotic platform for the integration and adaptation of personalised home care services, as well as cognitive and physical assistance.
Programme	AAL Programme
Dates	2011-2014
Funding received	2.160.000 €
Scope	Academia
Participants	Robosoft SA (coordinator), Centre Hospitalier Universitaire de Toulouse, Université Pierre et Marie Curie – ISIR, Thales Alenia Space SA, Vienna University of Technology, National Institute for Medical Rehabilitation, Budapest University of Technology and Economics, Meditech Ltd.
Comment	2 types of robots, cognitive and physical. RobuMate: cognitive support robot on Kompaï platform. RobuWalker: walker with monitoring capabilities. Technologies: graphical and tactile interfaces; voice recognition and synthesis; cloud services for telepresence; tools for the integration of various sensors and services. .
Users	Field tests with final prototypes in Hungary and France.
State	Project closed.
Results	DOMEO was the first project to bring assistive robots into real homes with real people over a period of more than a year. This research continued with the MARIO project.
Link web	<a href="http://www.aal-europe.eu/projects/domeo/">http://www.aal-europe.eu/projects/domeo/</a> <a href="http://www.aal-domeo.eu/">http://www.aal-domeo.eu/</a> (project website not accessible)



## DRAPer - Dressing Robotic Assistants for Persons with Reduced Mobility

Objective	The project focuses on how robotic assistants can be used to provide independence and empower people with different types of mobility problems. Specifically, the main goal is to help these people with dressing, which has been identified as an important task for independent living.
Programme	H2020-EU.1.3. / H2020-EU.1.3.2.
Dates	2018-2020
Funding received	170.121,60 €
Scope	Academia
Participants	Agencia Estatal Consejo Superior de Investigaciones Cientificas.
Comment	Programming by demonstration, reinforcement and interactive learning to create sophisticated manipulative skills and safe assistive behaviours.
Users	Laboratory development.
State	Project closed.
Results	N/A <a href="https://cordis.europa.eu/project/id/753556/results">https://cordis.europa.eu/project/id/753556/results</a>
Link web	<a href="https://cordis.europa.eu/project/id/753556">https://cordis.europa.eu/project/id/753556</a>

## DREAM - Development of Robot-Enhanced therapy for children with AutisM spectrum disorders

Objective	To study and develop artificial cognitive robotic systems to support psychotherapy for children with mental disorders, in particular children with autism spectrum disorders (ASD). The project aimed to develop more autonomous therapeutic robots to reduce the burden on human therapists, to provide consistent therapeutic experiences for children with ASD and give therapists a powerful tool for clinical interventions and diagnostic analysis.
Programme	FP7-ICT
Dates	2014-2019
Funding received	6.690.000,00 €
Scope	Academia
Participants	Hogskolan I Skovde (coordinador), Vrije Universiteit Brussel, Aldebaran, Universitatea Babes Bolyai, University of Plymouth, University of Portsmouth Higher Education Corporation, De Montfort University.
Users	A total of 416 people from Romania, Belgium, the Netherlands and England participated in the study. 23% of participants were parents of children with ASD and 17% of participants were therapists or teachers of children with ASD. Participants were recruited from databases of people involved in previous research and messages were posted on relevant blogs, Facebook, newsletters and autism organisations' websites.
State	Project closed.
Results	The outcome report provides findings and discussions on the use of social robots in therapy for children with autism spectrum disorders. Some of the key points include the potential benefits of social robots in therapy, the importance of considering the ethical implications and the need for further research on the long-term effects of using social robots in therapy. <a href="https://www.researchgate.net/publication/323593615_Robot_Enhanced_Therapy_for_Children_with_Autism_DREAM_A_Social_Model_of_Autism">https://www.researchgate.net/publication/323593615_Robot_Enhanced_Therapy_for_Children_with_Autism_DREAM_A_Social_Model_of_Autism</a>

## ENRICHME - Enabling Robot and assisted living environment for Independent Care and Health Monitoring of the Elderly

Objective	The project proposes an integrated Ambient Assisted Living (AAL) platform with a mobile service robot for long-term monitoring and human interaction, which helps older people to remain independent and active for longer.
Programme	H2020-EU.3.1. / H2020-EU.3.1.4.
Dates	2015-2018
Funding received	3.990.002,50 €
Scope	Academia
Participants	Althea Italia SpA (coordinator), University of Lincoln, Kontor 46 di Bonasso Matteo SAS, Robosoft Services Robots, Association pour la Recherche et le Developpement des Methodes et Processus Industriels, Ecole Nationale Supérieure de Techniques Avancées, Stichting Smart Homes, Fondazione Don Carlo Gnocchi Onlus, Uniwersytet Medyczny im Karola Marcinkowskiego w Poznaniu, Lace Housing Limited, Aktios Ypiresies Ygeias kai Perithalpsis Ilikomenon kai Chronos Paschonton Anonymi Etaireia, PAL Robotics SL.
Comment	TIAGo robotics platform.
Users	Tested in three AAL labs in Italy and the Netherlands. Validated for 2.5 months in two centres for the elderly in the UK and Greece and in a community in Poland.
State	Project closed.
Results	ENRICHME found that there are potential beneficiaries of robot interaction among older people with multiple cognitive impairments (MCI) who want to live independently. In these cases, cognitive, physical and social activity increased, nutrition improved. <a href="https://www.youtube.com/watch?v=gGOqzk1BvDk">https://www.youtube.com/watch?v=gGOqzk1BvDk</a>
Link web	<a href="https://cordis.europa.eu/project/id/643691">https://cordis.europa.eu/project/id/643691</a>

## euROBIN

Objective	euROBIN is the Network of Excellence bringing together European expertise in robotics and artificial intelligence (AI). It will establish a unified pan-European platform for research and development. For the first time, a large number of distinguished research laboratories across Europe are jointly investigating AI-based robotics. The objectives include both significant scientific breakthroughs in basic questions of AI-based robotics and strengthening the scientific robotics community in Europe by providing an inclusive community platform. The network is open to the entire robotics community and offers cascading funding mechanisms to double its membership in the coming years.
Programme	HORIZON.2.4. / HORIZON.2.4.5.
Dates	2022-2026
Funding received	11.499.999 €
Scope	Academia
Participants	Deutsches Zentrum Fur Luft - und Raumfahrt EV (coordinator), Karlsruher Institut Fuer Technologie, Institut National de Recherche en Informatique et Automatique, Commissariat a L Energie Atomique et aux Energies Alternatives, Teknologisk Institut, Ceske Vysoke Ucení Technické v Praze, C.R.E.A.T.E. Consorzio di Ricerca per l'Energia l'Automazione e le Tecnologie dell'Elettromagnetismo, Interuniversitair Micro-Electronica Centrum, Kungliga Tekniska Hogskolan, Sorbonne Université, Orebro University, Centre National de la Recherche Scientifique CNRS, IST-ID Associacao do Instituto Superior Tecnico para a Investigacao e o Desenvolvimento, Università di Pisa, Universidad de Sevilla, Fondazione Istituto Italiano di Tecnologia, Technische Universität München, Fundacion Tecnalia Research & Innovation, Universiteit Twente, Institut Jozef Stefan, ASTI Mobile Robotics SA, DHL Express Spain SL, PAL Robotics SL, Volkswagen Aktiengesellschaft, Universität Bremen, Fraunhofer Gesellschaft zur Förderung der Angewandten Forschung EV, Fundingbox Accelerator SP Zoo, Siemens Aktiengesellschaft, Matador Industries AS, Ecole Polytechnique Federale de Lausanne, Eidgenössische Technische Hochschule Zurich.

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State	Project in progress.
Link web	Web of the project: <a href="https://www.eurobin-project.eu/">https://www.eurobin-project.eu/</a> Funding instruments: <a href="https://eurobin-project.fundingbox.com/">https://eurobin-project.fundingbox.com/</a>

## eWare - Early Warning (by Lifestyle Monitoring) Accompanies Robotics Excellence

Objective	To support the autonomy and health of older people affected by dementia and their informal caregivers, using a system based on a social robot and a sensorised environmental infrastructure. Nine user-caregiver pairs signed up to test the system for 6 months.
Programme	AAL Programme
Dates	2017-2020
Funding received	1.300.000 €
Scope	Academia
Participants	Vilans, national expert enter for the long-term care for The Netherlands (coordinator), Sensara B.V., Tinybots B.V., ZZG Zorggroep, INRCA, Università Politecnica Delle Marche, JEF S.r.l., terzStiftung, NTNU, ASCOM, Stjørdal Kommune.
Comment	The technology and services used in eWare consist of existing lifestyle tracking or lifestyle pattern tracking, connected and integrated with new support robots (Tessa from Tinybots)..
Users	Field trial in Italy with 9 people over 65 years of age with diagnosed mild to moderate cognitive impairment and their informal caregivers. The study was conducted during the first confinement by COVID. This represented both a challenge and an opportunity for the researchers and allowed to understand the potential role of social robotics and lifestyle monitoring technology in a real context of need for assistance and social connection. <a href="https://www.youtube.com/watch?v=PA-gPDYlRZg">https://www.youtube.com/watch?v=PA-gPDYlRZg</a>
State	Project closed.

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**Results** The results show a positive impact of the system in supporting the achievement of participants' personal goals, as well as in supporting the quality of life of informal caregivers. However, the impact of the system on reducing caregiver burden needs to be further investigated. This research shows the potential of the eWare system but modifications will have to be made, especially in the interactivity capabilities, to meet the peculiar needs and wishes of older people with dementia and to support the long-term use of the system.

<https://www.mdpi.com/1660-4601/19/20/13334>

**Link web** <http://aal-eware.eu> (project website not accessible)

## ExCITE - Enabling Social Interaction through Embodiment

**Objective** Assess users' needs for social interaction that can be realised through robotic telepresence. An existing prototype is deployed to end users and refined through close involvement with them in prototype development cycles throughout the project.

**Programme** AAL Programme

**Dates** 2010-2013

**Funding received** 1.448.430 €

**Scope** Academia

**Participants** Örebro University (coordinator), Giraff AB, Consiglio Nazionale delle Ricerche ISTC, RatioConsulta SpA, University of Malaga, Örebro City Council.

**Comment** The project uses the Giraff robot, a telepresence device that allows anyone (professional caregivers, family and friends) to virtually visit a home, move freely and communicate with residents using video conferencing technology.

**Users** Evaluation carried out in different settings (private homes, rehabilitation centres, geriatric centres and health centres) in Sweden, Spain and Italy.

**State** Project closed.

**Results** User response to interaction with Giraff in the short and medium term was analysed in terms of usability, quality of communication, emotional response, physical appearance, acceptance, social presence and spatial presence. The findings would be used to evolve the prototype.  
[http://www.aal-europe.eu/wp-content/uploads/2019/12/ExCITE\\_D2.3\\_M24\\_User\\_Evaluation.pdf](http://www.aal-europe.eu/wp-content/uploads/2019/12/ExCITE_D2.3_M24_User_Evaluation.pdf)

**Link web** <http://www.aal-europe.eu/projects/excite/>

## EXO-LEGS

Objective	Develop lower body mobility exoskeletons to help people move to perform normal daily life tasks: standing up, sitting down, walking upright on flat ground, stepping on objects, walking on smooth and uneven terrain, climbing up and down stairs, etc. Theoretical and modular frameworks for different device prototypes will be developed.
Programme	AAL Programme
Dates	2012-2015
Funding received	2.776.346 €
Scope	Academia
Participants	University of Gävle (coordinador), Karlsruhe Institute of Technology, Universidad Politécnica de Cartagena, Chas A Blatchford & Sons Limited, Hocoma AG, GIGATRONIK Technologies GmbH, MRK Systeme GmbH, Proyecto Control Montaje S.L., Mobile Robotics Sweden AB, Gävle kommun i altres partners de Gävleborg.
Comment	Prototype images: <a href="https://web.archive.org/web/20150419220019/http://exo-legs.org/about.html">https://web.archive.org/web/20150419220019/http://exo-legs.org/about.html</a>
Users	User trials in Sweden, Germany, Spain, Switzerland and the UK. <a href="https://www.youtube.com/watch?v=Noxu6Zh12EI">https://www.youtube.com/watch?v=Noxu6Zh12EI</a>
State	Project closed.
Results	In 2018, a project is presented to bring a simpler and more affordable product to the market, lowering the price of the EXOLEGS from 11.500 euros to 1.700 euros. <a href="https://www.mynewsdesk.com/se/hogskolan_i_gavle/pressreleases/hoegskolans-forskning-om-axo-suit-prisad-i-italien-2723269">https://www.mynewsdesk.com/se/hogskolan_i_gavle/pressreleases/hoegskolans-forskning-om-axo-suit-prisad-i-italien-2723269</a>
Link web	<a href="http://www.aal-europe.eu/projects/exo-legs/">http://www.aal-europe.eu/projects/exo-legs/</a> <a href="http://www.exo-legs.org/">http://www.exo-legs.org/</a> (project website not accessible)

## FATE - Fall Detector for the Elder

Objective	The correct detection of falls that occur with older people. Apart from the identification of falls, the main complementary objectives of FATE are to contribute to the reduction of the fear of falling and to prevent prolonged standing syndrome. The FATE system will be able to detect falls both at home and outdoors.
Programme	CIP-Competitiveness and innovation framework.
Dates	2012-2015
Funding received	2.205.000 €
Scope	Commercial (Angel4 Fall Detector marketed through Sense4Care) <a href="https://accent-systems.com/project/sense4care/">https://accent-systems.com/project/sense4care/</a>
Participants	Universitat Politècnica de Catalunya (coordinador), Hospital Clinic i Provincial de Barcelona, Fundacio TicSalut, FlowLab Proyectos de Innovacion SL, Sistema d'Emergencies Mediques, Gema Active Business Solutions S.L., Ateknea Solutions Hungary Kft, National University of Ireland Galway, Emergency Response Limited, Cooperativa Sociale COOSS Marche ONLUS Societa Cooperativa per Azioni, Fondazione Santa Lucia.
Comment	The system consists of a highly sensitive fall detector based on accelerometers and specific detection algorithm. This main element is complemented by a telecommunication layer based on wireless technologies to send alarms and location in case of falls. In case of significant walking difficulties, it can be complemented by the iWalker.
Users	Tested and validated in 3 pilot studies involving real scenarios in Spain, Italy and Ireland. In close collaboration with the relevant public authorities in each country. For efficient and meaningful validation, the pilot test selected 175 people with a high risk of falls.
State	Project closed.
Results	<a href="https://cordis.europa.eu/article/id/188519-eu-funding-helps-bring-fall-detector-to-market">https://cordis.europa.eu/article/id/188519-eu-funding-helps-bring-fall-detector-to-market</a>
Link web	<a href="https://cordis.europa.eu/project/id/297178">https://cordis.europa.eu/project/id/297178</a>



## Florence - Multi Purpose Mobile Robot for Ambient Assisted Living

Objective	Maintaining the independence of older people for much longer by providing different services with the support of robots: social networking and web 2.0, coaching on specific activities such as physical exercises, advice on activities of daily living, care support and safety of use..
Programme	FP7-ICT
Dates	2010-2013
Funding received	5.554.933 €
Scope	Academia
Participants	Philips Electronics Nederland BV (coordinador), Offis EV, Fundacion Fatronik, Agencia de Servicios Sociales y Dependencia de Andalucia, Fundacion Tecnalía Research & Innovation, Telefonica Investigacion y Desarrollo SA, Fundacion Andaluza de Servicios Sociales, Wany SA, Stichting Novay, NEC Europe Ltd.
Comment	KEETOU telepresence robot, FALHAN falls management service, LIFIMP lifestyle coaching service, AGEREM reminder service and HOMINT home integration system.
Users	Pre-tests developed in the experimental labs Philips Home Lab and OFFIS IDEAAL Lab. The end-user test was conducted with 5 participants living alone in their flat, as in real Living Labs.
State	Project closed.
Results	The combination of services on one platform was highly appreciated. The services could also be provided separately, but the integration and ease of use contributes to acceptance. There would be more clarity on the benefit produced by the different services; otherwise the robot is not considered useful. <a href="https://cordis.europa.eu/docs/projects/cnect/0/248730/080/deliverables/001-D66FlorenceFinalEvaluationoftheFlorenceSystemv10.pdf">https://cordis.europa.eu/docs/projects/cnect/0/248730/080/deliverables/001-D66FlorenceFinalEvaluationoftheFlorenceSystemv10.pdf</a>
Link web	<a href="https://cordis.europa.eu/project/id/248730">https://cordis.europa.eu/project/id/248730</a>

## GATEKEEPER - Smart Living Homes - Whole Interventions Demonstrator for People at Health and Social Risks

Objective	Large-scale multi-centre European pilot on smart living environments. The aim is to enable the creation of a platform that connects healthcare providers, businesses, entrepreneurs and older people and the communities in which they live, to create an open and trust-based environment for matching ideas, technologies, user needs and processes to ensure healthier independent living for ageing populations.
Programme	H2020-EU.3.1. / H2020-EU.3.1.4.1. / H2020-EU.2.1.1.3.
Dates	2019-2023
Funding received	19.598.327,19 €
Scope	Platform
Participants	Medtronic Iberica SA (coordinador), Engineering - Ingegneria Informatica SPA, Samsung Electronics (UK) Limited, Hewlett Packard Italiana SRL, Universidad Politecnica de Madrid, Ethniko Kentro Erevnas kai Technologikis Anaptyxis, STMicroelectronics (Alps) SAS, Mysphera SL, GEIE ERCIM, HL7 International Foundation, ECHAlliance Company Limited by Guarantee, UDG Alliance, Mandat International Alias Fondation pour la Cooperation Internationale, Universiteit Utrecht, Consorcio Centro de Investigacion Biomedica en Red M.P., Panepistimio Ioanninon, Fundacion Tecnalía Research & Innovation, The University of Warwick, Fondazione Politecnico di Milano, Multimed Engineers SRL, Medisante AG, Open Evidence, Funka Nu AB, Regione Puglia, Agenzia Regionale per la Salute ed il Sociale, Innova Puglia SPA, Servicio Aragones de Salud, Servicio Vasco de Salud Osakidetza, Asociacion Instituto de Investigacion Sanitaria BioBIZZKaia, Sense4Care SL, Technische Universitaet Dresden, Carus Consilium Sachsen GmbH, The Open University, Charokopeio Panepistimio, Anaptixiaki Diadimotiki Eteria Psifiakes Polis Kentrikis Elladas AE OTA (Intermunicipal Development Company Digital Cities of Central Greece SA), Panepistimio Patron, Stegi Evgiras Archaggelos Michael Kaimaklioy, Pagkyrios Syndesmos Karki-

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	nopathon kai Filon 1986, Ibermatica SA, Instituto Ibermatica de Innovacion SL, Asociacion Instituto de Investigacion en Servicios de Salud-Kronikgune, EIP on AHA Reference Sites Collaborative Network, BioBeat Technologies Ltd, Fondazione Casa Sollievo della Sofferenza, Bioassist SA, Uniwersytet Medyczny w Lodzi, Orthokey Italia SRL, The University of Hong Kong, Institut Mines-Telecom, ASUS Cloud Corporation, Medisante Group AG.
Users	Participants belong to 4 groups: Academic and Research Institutions, Health Service Providers, Large and Small Industries, and Extended Ecosystem for Standardisation and Impact.
State	Project closed.
Results	Different collaborative use cases have been published on the project website, which serves as a content hub. Gatekeeper also maintains continuous communication in networks. <a href="https://www.gatekeeper-project.eu/blog/successful-twinning-sharing-knowledge-between-greece-and-the-basque-contry-2/">https://www.gatekeeper-project.eu/blog/successful-twinning-sharing-knowledge-between-greece-and-the-basque-contry-2/</a>
Link web	<a href="https://www.gatekeeper-project.eu/">https://www.gatekeeper-project.eu/</a>

## GiraffPlus

Objective	To develop a system for early detection and adaptive support for people's changing needs related to ageing. The system consists of a network of home sensors that measure physiological and movement data. The data from these sensors are interpreted by an intelligent system in terms of activities, health and well-being. Alarms or reminders can be triggered to the person or their caregivers, and the data generated can be analysed over time by a health professional.
Programme	FP7-ICT
Dates	2012-2014
Funding received	3.042.000 €
Scope	Academia
Participants	Orebro University (coordinador), Universidad de Malaga, Servicio Andaluz de Salud, Consiglio Nazionale delle Ricerche, Azienda Unita Sanitaria Locale Roma/A ASL RM/A, Intellicare - Intelligent Sensing in Healthcare Lda, Orebro Lans Landsting, Malardalens Universitet, MAX IV Laboratory - Lund University, Giraff Technologies AB, Xlab Razvoj Programske Opreme in Svestovanje DOO, Tunstall Healthcare (UK) Limited.
Comment	Home sensor system and mobile telepresence robot Giraff, which can be driven remotely by a caregiver. Giraff is a mobile communication platform, with video camera, screen, microphone and speakers.
Users	Evaluation of the system in 15 real households in Sweden, Italy and Spain. <a href="https://www.youtube.com/watch?v=9pTPrA9nH6E">https://www.youtube.com/watch?v=9pTPrA9nH6E</a>
State	Project closed.

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Results	<p>It was demonstrated that the system could identify a potential problem in advance by alerting a family member and act accordingly to the particularities of the user. It was concluded that a compromise between the user's independence and their healthcare could be achieved.</p> <p><a href="https://cordis.europa.eu/docs/projects/cnect/3/288173/080/deliverables/001-GiraffPlusD54Final.pdf">https://cordis.europa.eu/docs/projects/cnect/3/288173/080/deliverables/001-GiraffPlusD54Final.pdf</a></p> <p>In 2013 a business plan was drafted to find partners and investors to bring the solution to market.</p> <p><a href="https://cordis.europa.eu/docs/projects/cnect/3/288173/080/deliverables/001-GiraffPlusD81final.pdf">https://cordis.europa.eu/docs/projects/cnect/3/288173/080/deliverables/001-GiraffPlusD81final.pdf</a></p>
Link web	<a href="https://www.giraffplus.eu/">https://www.giraffplus.eu/</a> (website not accessible)

## GrowMeUp

Objective	Provide an affordable robotic system that learns users' needs over time and improves its functionality to support them to live independently at home for longer. The robotic system will provide personalised assistance and social bonding to motivate and empower older people to continue to carry out meaningful daily activities and social roles, thus maintaining independence and a better quality of life.
Programme	H2020-EU.3.1. / H2020-EU.3.1.4.
Dates	2015-2018
Funding received	2.790.430 €
Scope	Academia
Participants	Universidade de Coimbra (coordinador), Universite de Geneve, Stichting Zuyderland Zorg, University of Cyprus, PAL Robotics SL, Probayes, Citard Services Ltd, Caritas Diocesana de Coimbra.
Comment	GrowMu robot that can adapt to the changes and behaviours of older people to capture their routine to make recommendations and detect potential dangerous situations. GrowMu's functions are synchronised in the cloud.
Users	End-user trials in the Netherlands and Portugal with 60 elderly people over a period of six months. Users were also asked, through questionnaires, to reflect on their daily living habits and patterns and their expectations and ideas for being supported by a robotic service system.
State	Project closed.
Results	The outcome of the project included the development of a robotic platform and a set of algorithms for human-robot interaction. These were expected to contribute to the development of new technologies for older people.
Link web	<a href="https://cordis.europa.eu/article/id/231133-grownups-with-supportive-robots">https://cordis.europa.eu/article/id/231133-grownups-with-supportive-robots</a> <a href="https://www.youtube.com/channel/UCU0zLoDKj7SJBiqei5DlfZg">https://www.youtube.com/channel/UCU0zLoDKj7SJBiqei5DlfZg</a>

## GUARDIAN

Objective	Develop a companion robot with which the district health professional and the informal caregiver can monitor their patient, family member or neighbour remotely.
Programme	AAL Programme
Dates	2020-2023
Funding received	1.171.197 €
Scope	Comercial
Participants	Vilans (coordinator), ConnectedCare, smartrobot.solutions, JEF, Eindhoven University of Technology, University of Geneva, Hospital University of Geneva, Università Politecnica delle Marche, INRCA, Zorggroep Noordwest-Veluwe
Comment	The robot can create an accurate picture of the house through its sensors. In this way, the informal caregiver knows from a distance where their relative has fallen, and can direct the robot to the location and establish a voice-picture connection. .
State	In betatesting in Italy and Switzerland. <a href="https://vimeo.com/631922959">https://vimeo.com/631922959</a> (log in to play the video)
Results	N/A The results will include cost-effectiveness studies and time and cost reductions in long-term care. These studies are essential to secure structural funding through municipalities, health insurance and/or national governments.
Link web	<a href="https://guardian-aal.eu/">https://guardian-aal.eu/</a>

## HOBBIT - The Mutual Care Robot

Objective	The main players in assistive robotics tend to focus on pragmatic single function systems (US) or humanoid robots (Japan, Korea). HOBBIT expands the interaction between robot and owner/user with a new, more user-centric concept called 'Mutual Care'. It allows and attracts people to 'take care' of the robot as if it were a companion, so that they can develop real feelings. It is easier for people to accept the assistance of a robot when they themselves can also assist the machine. In close cooperation with institutional caregivers, the acceptance and usability of robots will be measured and improved.
Programme	FP7-ICT
Dates	2011-2015
Funding received	2.830.000 €
Scope	Academia
Participants	Technische Universitaet Wien (coordinator), Akademie fur Altersforschung am Haus der Barmherzigkeit, Hella Automation GmbH, Metralabs GmbH Neue Technologien und Systeme, Otto Bock Mobility Solutions GmbH, Idryma Technologias kai Erevnas, MAX IV Laboratory, Lund University.
Users	Tests at centres and royal houses in Austria, Greece and Sweden. <a href="https://www.youtube.com/watch?v=ililPj5T8pA">https://www.youtube.com/watch?v=ililPj5T8pA</a>
State	Project closed.
Results	The final results of the project address several impacts: on a societal level, the acceptance of robots in the homes of elderly people will increase thanks to the concept of mutual care. The expected socio-economic impact is to present a prototype of a mutual care robot as a unique selling point for the European industry to increase user acceptance through human-machine bonding. <a href="https://cordis.europa.eu/docs/projects/cnect/6/288146/080/reports/001-HOBBITD103PRPublishableSummary.pdf">https://cordis.europa.eu/docs/projects/cnect/6/288146/080/reports/001-HOBBITD103PRPublishableSummary.pdf</a>
Link web	<a href="http://hobbit.acin.tuwien.ac.at/">http://hobbit.acin.tuwien.ac.at/</a>

## I-DONT-FALL - Integrated prevention and Detection sOlutioNs Tailored to the population and Risk Factors associated with FALLs

Objective	Develop, pilot and evaluate a series of innovative ICT solutions for falls detection and prevention. The platform will be flexibly configured according to the needs of specific stakeholders and risk factors associated with fall incidents. Based on the integrated IDONTFALL platform: (a) end-users will benefit from tailored technological solutions for falls, while (b) medical experts and health professionals will have at their disposal a wide range of tools that will allow them to customise the fall solutions according to the end-users' needs.
Programme	CIP - Competitiveness and innovation framework programme
Dates	2012-2015
Funding received	2.633.995 €
Scope	Academia. Marketing objectives through public bodies and Docobo ( <a href="https://www.docobo.co.uk/">https://www.docobo.co.uk/</a> )
Participants	Engineering - Ingegneria Informatica Spa (coordinador), Hermanas Hospitalarias Sagrado Corazón de Jesús Benito Menni Complejo Asistencial en Salud Mental, Universitat Politècnica de Catalunya, Fundacion Privada Hospital Asil de Granollers, Servicio Madrileño de Salud, Aphoi Koumanakou & Sia Ee, Social Policy Center of the Municipality of Kifissia, SingularLogic Anonymi Etaireia Pliroforiakon Systimaton Kai Efarmogonpliroforikis, Elettronica Bio Medica Spa, Tesan S.p.A., Fondazione Santa Lucia, Scuola Superiore di Studi Universitari e di Perfezionamento S Anna, Fondazione Salvatore Maugeri Clinica del Lavoro e della Riabilitazione, Azienda Usl di Forlì, Technische Universiteit Delft, Stichting Nationaal Ouderenfonds, Docobo Ltd.

Comment	The system of solutions includes a cognitive rehabilitation platform; a robotic walker, the iWalker, to support patients in physical rehabilitation; a portable inertial unit to track gait and detect falls; and an Android-based mobile device connected to the iWalker that sends data to an electronic medical record, as well as a fall detection system with remote monitoring.
Users	Pilots in different countries, cultures, age groups and fall risk factors with more than 500 elderly users/patients. Various configurations of the integrated system were deployed to achieve personalisation and enable relevant pilots. At the same time, the effectiveness of the solutions was evaluated in a randomised controlled trial
State	Project closed.
Results	Project trials of these innovations in selected locations showed an impressive 43% reduction in falls over the previous year, a four-point increase in the BARTHEL Index, which measures performance in daily activities, and a two-point increase in the Quality of Life Index.
Link web	<a href="https://cordis.europa.eu/project/id/297225">https://cordis.europa.eu/project/id/297225</a> <a href="https://cordis.europa.eu/article/id/188520-high-tech-help-for-elderly-to-prevent-falls">https://cordis.europa.eu/article/id/188520-high-tech-help-for-elderly-to-prevent-falls</a>



## I-DRESS – Assistive interactive robotic System for support in dressing

Objective	To develop a system that provides proactive assistance in dressing users with disabilities or users such as high-risk healthcare workers, whose physical contact with garments must be limited to avoid contamination. The proposed robotic system consists of two highly dexterous robotic arms, sensors for multimodal human-bot interaction and safety functions.
Programme	CHIST-ERA.eu
Dates	2015-2018
Funding received	740.000 €
Scope	Academia
Participants	Instituto de Robótica e Informática Industrial, CSIC-UPC (coordinador), Bristol Robotics Lab, University of the West of England, IDIAP Research Institute.
Comment	The system consists of three main components: (a) intelligent algorithms for user and garment recognition, specifically designed for close and physical human-robot interaction, (b) cognitive functions based on multimodal user input, environment modelling and safety, which allow the robot to decide when and how to assist the user, and (c) an advanced user interface that facilitates intuitive and safe physical and cognitive interaction for wearable support. The developed interactive system will be integrated into commercial WAM robotic arms.
Users	Validation through user testing and human factor analysis in two healthcare clothing scenarios.
State	Project closed.
Results	Results of the study in terms of human-human interaction, adaptation through multimodal interaction, robot learning and task planning and safety analysis. Final integration and demonstration of jacket/robe scenario in 2018. <a href="https://www.chistera.eu/sites/www.chistera.eu/files/CHIST- ERA%20Call%202014%20-%20RTCP%20Topic%20-%20I-DRESS%202018.pdf">https://www.chistera.eu/sites/www.chistera.eu/files/CHIST- ERA%20Call%202014%20-%20RTCP%20Topic%20-%20I-DRESS%202018.pdf</a>
Link web	<a href="https://www.iri.upc.edu/project/show/154">https://www.iri.upc.edu/project/show/154</a>

## I-Support - ICT-Supported Bath Robots

Objective	An important measure of quality of life is a person's ability to perform daily activities such as bathing, dressing, toileting and eating with dignity. The I SUPPORT initiative is developing a robotic system to help older people bathe and shower, assisting with tasks such as washing, scrubbing, rinsing and reaching hard-to-reach body parts.
Programme	H2020-EU.3.1. / H2020-EU.3.1.4.
Dates	2015-2018
Funding received	3.563.198 €
Scope	Comercial
Participants	Robotnik Automation SLL (coordinador), Erevnitiko Panepistimiako Institutouto Systimaton Epikoinonion kai Ypologiston-Emp, Scuola Superiore di Studi Universitari e di Perfezionamento S Anna, Institut National de Recherche en Informatique et Automatique, Centralesupelec, Karlsruher Institut fuer Technologie, Theofanis Alexandridis kai Sia EE, Fondazione Santa Lucia, Bethanien Krankenhaus - Geriatriisches Zentrum - Gemeinnuetzige GmbH, Frankfurt University of Applied Sciences.
Comment	The advanced system combines cognition, perception, context awareness, machine learning and actuation. This system was integrated into a platform that adapts to the needs of an elderly and frail person with easy-to-use commands via voice and intuitive gestures.
Users	Pilots in two hospitals: Bethanien Hospital in Heidelberg (Germany) and Fondazione Santa Lucia in Rome (Italy).
State	Project closed.
Results	Autonomous and semi-autonomous system available. In autonomous mode, the robot operates by making decisions on its own without any intervention from the person. In semi-autonomous mode, the person interacts with the robot and controls the sequence of washing tasks such as start, finish and repeat. The potential to realise a commercial product is mentioned. <a href="https://cordis.europa.eu/project/id/643666">https://cordis.europa.eu/project/id/643666</a>
Link web	<a href="https://robotnik.eu/projects/i-support/">https://robotnik.eu/projects/i-support/</a> <a href="https://www.sciencedirect.com/science/article/abs/pii/S0921889019304968">https://www.sciencedirect.com/science/article/abs/pii/S0921889019304968</a>

## INBOTS - Inclusive Robotics for a better Society

Objective	To create a community hub that can bring together experts to discuss and create a responsible research and innovation paradigm for robotics. To this end, INBOTS offers a platform to establish a working synergy between four pillars covering all stakeholders of interactive robotics: the technical expertise pillar, the business expertise pillar, the ethical, legal and socio-economic expertise pillar, as well as end-users, policy makers and the general public. The project therefore strives to coordinate and support actions aimed at building bridges between these pillars to promote debate and create a responsible research and innovation paradigm that will enhance EU leadership in robotics.
Programme	H2020-EU.2.1.1.
Dates	2018-2021
Funding received	2.982.973,75 €
Scope	Academia
Participants	Agencia Estatal Consejo Superior de Investigaciones Cientificas, Fundacion Tecnalia Research & Innovation, Scuola Superiore di Studi Universitari e di Perfezionamento S Anna, Universidad Complutense de Madrid, Universiteit Twente, Vrije Universiteit Brussel, Eidgenossische Technische Hochschule Zurich, Universita degli Studi di Siena, Össur hf, Ottobock SE & Co. KGAA, Centro Ricerche Fiat Scpa, Acciona Construcción SA, Space Applications Services NV, iuvo Srl, PAL Robotics SL, Kungliga Tekniska Högskolan, DIN Deutsches Institut fuer Normung EV, VDI/VDE Innovation + Technik GmbH, Dublin City University, University of Leeds, Universitat Wien, Universiteit Utrecht, City University of London, Europaiko Ergastirio Ekpaideftikis Technologias, PKF Attest Income SL.
State	Project closed.
Results	Documents and White Papers in different areas: <a href="https://cordis.europa.eu/project/id/780073/results">https://cordis.europa.eu/project/id/780073/results</a> YouTube Channel: <a href="https://www.youtube.com/channel/UCl6xIOCZY33cH-rR36iepdg">https://www.youtube.com/channel/UCl6xIOCZY33cH-rR36iepdg</a>
Link web	<a href="http://inbots.eu/">http://inbots.eu/</a> (not accessible) <a href="http://inbotsconference2021.inbots.eu/">http://inbotsconference2021.inbots.eu/</a> (not accessible) <a href="https://www.csic.es/en/node/104912">https://www.csic.es/en/node/104912</a>

## INCARE

Objective	Addressing the need for integrative technological solutions for sustainable elderly care. Within INCARE, we will convert nationally and European funded projects into viable products based on two successful solutions developed within previous AAL and European projects (NITICS and RAPP). The platform will provide autonomous, intelligent and adaptive functions together with robotic platform support, being highly configurable and adaptable.
Programme	AAL Programme
Dates	2018-2021
Funding received	1.200.000 €
Scope	Commercial
Participants	Centrul IT pentru Stiinta si Tehnologie (coordinator), ECLEXYS Sagl, University Politehnica of Bucharest, IZRIIS Institute for research, intergenerational relations, gerontology and ICT, Warsaw University of Technology, The Unit for Social Innovation and Research "Shipyard", Bay Zoltán Nonprofit Ltd. for Applied Research, Softic Ltd.
Comment	Business model with monthly end-consumer service fees for its INCARE modules in use based on micro-payment (e.g. EUR 9,50 per module, per month, per account).
Users	End-users from 3 different countries at all stages of design and development.
State	Project closed.
Results	The INCARE product is a software platform compatible with healthcare devices, home automation sensors, robots and dedicated to elderly people living autonomously or in nursing homes. <a href="https://web.archive.org/web/20220709122207/http://www.aal-incare.eu/">https://web.archive.org/web/20220709122207/http://www.aal-incare.eu/</a>
Link web	<a href="https://web.archive.org/web/20221202024920/http://aal-incare.eu/about-incare/index.html">https://web.archive.org/web/20221202024920/http://aal-incare.eu/about-incare/index.html</a>

## ironHand assistive Device (iHand)

Objective	Project aimed at frail older people who suffer from age-related loss of weakness to continue using arms and hands in work and leisure activities. As people age, one of the functions that often declines is grip strength. The resulting reduction in hand function can have a dramatic impact on older people's quality of life.
Programme	AAL Programme
Dates	2014-2017
Funding received	2.221.255 €
Scope	Commercial
Participants	Roessingh Research and Development (coordinator), Bioservo Technologies AB, Hocoma AG, Stichting Nationaal Ouderenfonds, Eskilstuna Kommun, terzStiftung.
Comment	Wearable smart glove that detects and monitors finger and hand pressure during functional tasks.
Users	360° evaluation by users, relatives and health staff.
State	Project closed.
Results	Product marketed by Bioservo (CarbonHand).
Link web	<a href="https://www.bioservo.com/healthcare#:~:text=Carbonhand%20is%20an%20assistive%20aid,to%20ensure%20a%20firm%20grip.">https://www.bioservo.com/healthcare#:~:text=Carbonhand%20is%20an%20assistive%20aid,to%20ensure%20a%20firm%20grip.</a>

## IROPER – Intelligent Robotics for Personal Needs

Objective	To develop a new integrated paradigm of an intelligent robotic assistant for people with different needs: elderly people, disabled people, injured people with special needs, people undergoing rehabilitation and, in general, people in need of some kind of assistance. The specific objectives of the proposal cover three areas: (i) physical assistance to people who cannot perform one or more activities of daily living by themselves in healthcare facilities and at home, (ii) cognitive assistance including mental support, stimulation and social interaction at home and in specialised centres, and (iii) rehabilitation covering medical assessments, collaborative and portable robotic devices, including exoskeletons, in hospitals and healthcare facilities.
Programme	Ministerio de Ciencia e Innovación + Next Generation EU
Dates	2021-2023
Funding received	916.876,44 €
Scope	Academia
Participants	Universidad Carlos III de Madrid (coordinator), PAL Robotics, Asociación de Servicio integral para ancianos.
Comment	TIAGo and TIAGo++ robotic platforms. The proposal covers both social and physical interactions between human robots.
Users	Experimental environments will include both home and medical/healthcare settings with real patients, all under medical supervision.
State	Project in progress.
Results	N/A
Link web	<a href="http://roboticslab.uc3m.es/roboticslab/project/iroper">http://roboticslab.uc3m.es/roboticslab/project/iroper</a>

## iToilet

Objective	The iToilet project addresses the needs of older (or physically disabled) people when using a toilet, by imagining an augmented toilet that can be adapted to the individual needs of each person. The project also responds to the needs of caregivers in their care work.
Programme	AAL Programme
Dates	2016-2019
Funding received	1.000.000 €
Scope	Comercial
Participants	Vienna University of Technology (coordinador), Santis Kft., Smart Com d.o.o., Carecenter Software GmbH, CS Caritas Socialis GmbH, Országos Orvosi Rehabilitációs Intézet, Synthema srl <a href="https://www.aat.tuwien.ac.at/itoilet/pubs/video.mp4">https://www.aat.tuwien.ac.at/itoilet/pubs/video.mp4</a>
Comment	Two prototypes are developed: a) chair type, for private use; b) wall mounted, for institutional use.
Users	iToilet iteratively tested the prototypes with end-users in a lab and in real spaces. The final prototypes were tested over a period of 4 months with 55 primary and 15 secondary end-users as well as 9 tertiary end-users in 2 real locations.
State	Project closed.
Results	Two prototypes were created and are planned to be commercialised through Attris ( <a href="https://www.attris.de/en/">https://www.attris.de/en/</a> ). The business model envisages a modular product with scalability and customisation of functions and services according to individual customer needs and wishes.
Link web	<a href="https://www.aat.tuwien.ac.at/itoilet/">https://www.aat.tuwien.ac.at/itoilet/</a>

## KSERA - Knowledgeable Service Robots for Aging

Objective	To develop a social care robot that helps older people, especially those with chronic obstructive pulmonary disease (COPD), with their daily activities, care needs and self-management of their disease.
Programme	FP7-ICT
Dates	2010-2013
Funding received	2.900.000 €
Scope	Academia
Participants	Technische Universiteit Eindhoven (coordinador), CEIT RALTEC Gemeinnuetzige GmbH, Technische Universitaet Wien, Universitaet Hamburg, Maccabi Sheirutei Briut Foundation, Istituto Superiore Mario Boella Sulle Tecnologie Dell'informazione e Delle Telecomunicazioni Associazione, Consoft Sistemi S.p.A.
Comment	A social robot based on the Nao platform that uses context and sensor-based information from the elderly person to provide useful information and timely assistance to the right place.
Users	Prototype evaluated with end-users in Austria and Israel.
State	Project closed.
Results	<a href="https://cordis.europa.eu/docs/projects/cnect/5/248085/080/reports/001KSERAD77APRyear3PublishableSummary1.pdf">https://cordis.europa.eu/docs/projects/cnect/5/248085/080/reports/001KSERAD77APRyear3PublishableSummary1.pdf</a> (project website not accessible)
Link web	<a href="https://ksera.ieis.tue.nl/index.html">https://ksera.ieis.tue.nl/index.html</a>

## LIFEBOTS Exchange

Objective	Robots can be used to address the challenges facing the healthcare sector, helping with the long-term care of an ageing population. They can also offer patients a better quality of life. To elucidate the impact of the introduction of social robots on people's care, LIFEBOTS Exchange is working to enhance cross-sectoral, international and interdisciplinary collaborations. It proposes a knowledge hub for social robotics to help increase the skills of people working in healthcare and will contribute to the creation of a tri-sectoral network integrating academia, industry and technology users.
Programme	H2020-EU.1.3. - H2020-EU.1.3.3. EXCELLENT SCIENCE - Marie Skłodowska-Curie Actions
Dates	2019-2023
Funding received	740.600 €
Scope	Academia
Participants	Norges Teknisk-Naturvitenskapelige Universitet NTNU (coordinator), Instituto de Sistemas e Robotica-Associacao, Instituto Pedro Nunes Associacao para a Inovacao e Desenvolvimento em Ciencia e Tecnologia, Compexin SA, Caritas Diocesana de Coimbra, Idmind - Engenharia de Sistemas Lda, Technicka Univerzita v Kosiciach, Universite de Geneve, Co-Robotics Srl, Ethniko Kentro Erevnas Kai Technologikis Anaptyxis, Universitetssykehuset Nord-Norge Hf, European Health Telematics Association, Canary Technology Innovations Srl, Adhera Health Slu.
State	Project closed.
Results	LIFEBOTS Exchange has enabled collaboration between companies and academic researchers across Europe since it started in 2019.  LIFEBOTS Exchange Extended (LEE) extends this work with nine Norwegian small and medium-sized enterprises (SMEs) and municipalities. They will bring together a wide range of expertise on multiple levels of gerotechnologies, from robot-seal to design issues, innovative applications and municipal care perspectives.
Link web	<a href="https://web.archive.org/web/20241214134656/https://lifebots.eu/">https://web.archive.org/web/20241214134656/https://lifebots.eu/</a> <a href="https://web.archive.org/web/20240529235929/https://lifebots.eu/lee">https://web.archive.org/web/20240529235929/https://lifebots.eu/lee</a>

## MARIO

Objective	Developing a companion robot that builds resilience and reduces loneliness and isolation in older people with dementia. The aim is to generate fully operational units in 2018, ready to help patients and caregivers alike across the EU.
Programme	H2020-EU.3.1. / H2020-EU.3.1.4.
Dates	2015-2018
Funding received	3.994.857 €
Scope	Academia
Participants	National University of Ireland Galway (coordinator), Robosoft Services Robots, R.U.Robots Limited, Ortelio Ltd, Stockport Metropolitan Borough Council, Consiglio Nazionale delle Ricerche, R2M Solution Srl, Fondazione Casa Sollievo della Sofferenza, Milioti Loukia tou Anastasios, Universitat Passau.
Comment	Continuation of the DOME0 project using a cognitive support robot on the Kompaï2 platform.
Users	Validation in three pilot settings in Ireland, the UK and Italy, over more than a year, with end-users, including people with dementia and caregivers.
State	Project closed.
Results	MARIO evolves and extends several aspects of DOME0, including verbal user interaction, human-robot interaction and natural language processing. TEDx Talk: <a href="https://www.youtube.com/watch?v=eq0FJyYexnQ">https://www.youtube.com/watch?v=eq0FJyYexnQ</a>
Link web	<a href="http://www.mario-project.eu/portal/">http://www.mario-project.eu/portal/</a>



## MOBISERV - An Integrated Intelligent Home Environment For The Provision Of Health, Nutrition And Mobility Services To The Elderly

Objective	Design and evaluate a system and service to support independent living for the elderly through a proactive personal robot integrated with smart textiles, innovative sensors and a smart home environment. The system monitors physical activity and health indicators through wearable textiles, monitors nutritional habits through smart home sensors and provides a comprehensive secure portal for informal and professional caregivers to use, configure and adjust the support system.
Programme	FP7-ICT
Dates	2009-2013
Funding received	2.750.000 €
Scope	Academia
Participants	Stichting Smart Homes (coordinator), CSEM Centre Suisse d'Electronique et de Microtechnique SA - Recherche et Developpement, Lappeenrannan-Lahden Teknillinen Yliopisto LUT, Robosoft Services Robots, Aristotelio Panepistimio Thessalonikis, Systema Teknolotzis Anonymi Etaireia Efarmogon Ilektronikis Kai Pliroforikis, Smartex Srl, Stichting St Anna Zorggroep, University of the West of England, Bristol.
Comment	Three assistive subsystems: health status monitoring with smart sensors woven into the underwear; secure tele-alarm system and health reporting; nutritional support system with reminders when food and drink are missed and encouragement when people experience loss of appetite. Mobile robot on Kompaï platform.
Users	User validations in adapted spaces in the UK and the Netherlands. <a href="https://www.youtube.com/watch?v=v1s2Hbad1l0">https://www.youtube.com/watch?v=v1s2Hbad1l0</a>
State	Project closed.
Results	<a href="https://cordis.europa.eu/docs/projects/cnect/4/248434/080/deliverables/001-MOBISERVD24Issue2.pdf">https://cordis.europa.eu/docs/projects/cnect/4/248434/080/deliverables/001-MOBISERVD24Issue2.pdf</a>
Link web	<a href="https://cordis.europa.eu/project/id/248434">https://cordis.europa.eu/project/id/248434</a> <a href="http://www.mobiserv.info/">http://www.mobiserv.info/</a> (web not accessible)

## MOBOT - Intelligent Active MObility Aid RoBOT integrating Multimodal Communication

Objective	Supporting mobility and thereby enhancing fitness and vitality by developing intelligent active mobility assistance robots for indoor environments that provide natural, context-sensitive and user-centred support.
Programme	FP7-ICT
Dates	2013-2016
Funding received	3.149.912 €
Scope	Academia
Participants	University of the West of England, Bristol (coordinator), Technische Universitaet Muenchen, Bethanien Krankenhaus – Geriatisches Zentrum – Gemeinnützige GmbH, Ruprecht-Karls-Universitaet Heidelberg, Institut National de Recherche en Informatique et Automatique, Erevnitiko Panepistimiako Institouto Systimatou Epikoinonion kai Ypolgiston-Emp, Athina-Erevnitiko Kentro Kainotomias stis Technologies tis Pliroforias, ton Epikoinonion kai tis Gnosis, Diaplasia Rehabilitation Center SA, Stanczyk Bartlomiej, Ecole Centrale des Arts et Manufactures.
Comment	Multimodal action recognition analyses contextual cues and behavioural patterns of the person to prevent falls and provide optimal physical support. It is implemented in a robotic structure in the form of a walker..
Users	Tested with end-users in Diaplasia.
State	Project closed.
Results	The evaluation with questionnaires to 30 end-users showed that they were generally very satisfied with the functionalities implemented in the robot. The human-robot communication model was found to be satisfactory and useful. Challenges to be solved included the need to advance speech recognition and computer vision technologies for more effective speech and gesture recognition. <a href="https://www.mdpi.com/2227-7080/5/4/73">https://www.mdpi.com/2227-7080/5/4/73</a>
Link web	<a href="https://accreea.com/mobot-project/">https://accreea.com/mobot-project/</a>

## MoveCare - Multiple-actOrs Virtual Empathic CARgiver for the Elder

Objective	A platform that, by integrating a SAR into an AAL framework, aims to monitor, assist and provide social, cognitive and physical stimulation to older people living alone in their homes and at risk of becoming frail.
Programme	H2020-EU.2.1.1.
Dates	2017-2020
Funding received	5.933.611,25 €
Scope	Academia
Participants	Universita degli Studi di Milano (coordinador), Ab.Acus Srl, Fondazione IRCCS Ca' Granda - Ospedale Maggiore Policlinico, Fundació Eurecat, Joicecare Ab, Signalgenerix Limited, Politecnico di Milano, Smart Com Doo Informacijski in Komunikacijski Sistemi, Vicepresidencia Segunda y Consejería de Sanidad y Servicios Sociales - Junta de Extremadura, Orebro University, University of Plymouth, Universidad de Malaga, The Chancellor, Masters and Scholars of the University of Oxford, Korian, Segesta Gestioni Srl, Segesta2000 Srl, Camanio Care Ab, The University of Manchester.
Comment	The platform integrates different technologies: IoT subsystem, specific smart objects, and a community-based activity centre, coordinated by an intelligent virtual caregiver, integrated in a SAR (on GiraffX platform).
Users	System tested in a deployment in the homes of the elderly for a minimum of 10 consecutive weeks, collecting a total of more than 300 weeks of usage data. The evaluation of the system was carried out using structured questionnaires and analysing the data collected.
State	Project closed.

**Results** It shows that SARs integrated with monitoring and stimulation platforms can be successfully used for long-term support of older people. The presence of the robot significantly boosted the use of the system, but slightly reduced the overall acceptability. It is highlighted that long-term deployment of SARs in the real world introduces significant technical, organisational overhead and logistical costs that should not be neglected or underestimated in the search for robust systems in the long term.

[https://mapir.uma.es/papersrepo/2022/2022\\_luperto\\_movecare\\_project.pdf](https://mapir.uma.es/papersrepo/2022/2022_luperto_movecare_project.pdf)

**Link web** <https://cordis.europa.eu/project/id/732158>  
<http://www.movecare-project.eu/> (not accessible)

## MOVEMENT – Modular Versatile Mobility Enhancement Technology

Objective	To create a new robotic system to support the mobility of elderly and disabled people. The key innovation of this research project is the use of the concept of 'Modular Mobility'. According to this concept, the system consists of a mobile (robotic) platform as a central system and several dedicated 'application modules'. On demand, the platform is assigned to a specific task and automatically connects to a suitable application module to perform the given task.
Programme	FP6-IST
Dates	2004-2006
Funding received	1.800.000 €
Scope	Academia
Participants	Technische Universität Wien (coordinador), ARC Seibersdorf Research GmbH, BlueBotics SA, Katholieke Universiteit Leuven, Otto Bock Healthcare GmbH, Scuola Superiore di Studi Universitari e di Perfezionamento Sant'Anna, Stichting Wetenschappelijk Onderzoek Revalidatievraagstukken, Technische Universitaet Muenchen.
Comment	The project also includes the development of new solutions for the navigation of mobile robot systems including a 'low-cost' sensor system as well as adaptive HMI components.
State	Project closed.
Results	<a href="https://link.springer.com/chapter/10.1007/978-3-540-70540-6_187">https://link.springer.com/chapter/10.1007/978-3-540-70540-6_187</a>
Link web	<a href="https://cordis.europa.eu/project/id/511670">https://cordis.europa.eu/project/id/511670</a>

## NHoA – Never Home Alone

Objective	Co-design of a socially intelligent care robot as a key to robustness, adaptability, patient acceptance and engagement. The NHoA robot should be a care actor that senses the social and emotional environment and proactively intervenes to build a caring relationship with the user. The long-term vision of the project is the development of a social assistive robot to help elderly people live independently at home and prevent loneliness and isolation.
Programme	Next Generation EU
Dates	2021-2024
Funding received	904.030,64 € <a href="https://www.aei.gob.es/sites/default/files/convocatory_info/2021-10/ESEDE_PR_PLEC2021.pdf">https://www.aei.gob.es/sites/default/files/convocatory_info/2021-10/ESEDE_PR_PLEC2021.pdf</a>
Scope	Academia
Participants	Eurecat (coordinador), Universidad Pablo de Olavide (UPO), Universitat Oberta de Catalunya (UOC), PAL Robotics, LIGHT-HOUSE Disruptive Innovation Group Europe, S.L., FUNDESALUD, Fundació Sant Joan de Déu (FSJD).
Comment	SAR robot on TIAGo platform.
Users	N/A
State	Project in progress.
Results	N/A
Link web	<a href="https://nhoa-project.eu/">https://nhoa-project.eu/</a>

## NurseBot – Personal Robotic Assistants for the Elderly

Objective	To develop mobile and personal service robots that help chronically ill elderly people in their daily lives. NurseBot is an autonomous mobile robot that 'lives' in a private home of a chronically ill elderly person. The robot provides a research platform for testing a range of ideas to help older people.
Programme	N/A
Dates	2002-2005
Funding received	N/A
Scope	Academia
Participants	Carnegie Mellon University, University of Pittsburgh School of Nursing, Stanford University, University of Michigan, Art Institute of Pittsburgh.
Comment	Robot sobre plataforma Pearl. Combina búsqueda de vanguardia en robótica, inteligencia artificial, diseño de interacciones, asistencia sanitaria y ciencias sociales y psicología para ofrecer funciones como recordatorios inteligentes, telepresencia, recogida de datos y vigilancia, manipulación e interacción social.
Users	Prototype tested at Longwood Retirement Community in Oakmont, PA.
State	Project closed.
Results	The project found that this type of service has great potential to reduce social isolation and improve the well-being of the elderly. Residents reported feeling less depressed, anxious and lonely after receiving companionship services. It is concluded that companionship services are a promising strategy to promote active and supportive ageing, but more research and maturing technologies are needed to reduce costs. At the end of the project, the estimated cost to Pearl was \$100,000.
Link web	<a href="https://theindexproject.org/post/nursebot">https://theindexproject.org/post/nursebot</a>

## PHArA-ON - Pilots for Healthy and Active Ageing

Objective	Support Europe's ageing population by integrating digital services, devices and tools into open platforms that can be easily deployed, maintaining the dignity of older people and enhancing their independence, security and capabilities.
Programme	H2020-EU.3.1. / H2020-EU.3.1.4.1. / H2020-EU.2.1.1.3.
Dates	2019-2023
Funding received	18.835.551,25 €
Scope	Academia
Participants	Universita degli Studi di Firenze (coordinador), Hewlett Packard Italiana Srl, Hewlett-Packard Global Delivery Bulgaria Center Eood, Fondazione Casa Sollievo della Sofferenza, UP Umana Persone Impresa Sociale R&S, G. Di Vittorio-Societa' Cooperativa Sociale - Onlus, Il Quadrifoglio Societa Cooperativa Sociale Onlus, Progetto 5 Societa' Cooperativa Sociale, Coop 21 Cooperativa Sociale, Societa Cooperativa Sociale Sintesi-Minerva, Pane&Rose Societa Cooperativa Sociale, Societa Cooperativa Sociale GiovaniValdarno, Zelig Sociale Societa Cooperativa Sociale Onlus, Uscita di Sicurezza Societa Cooperativa Sociale Onlus, Co- Robotics Srl, Orthokey Italia Srl, Medea Srl, Asociacion Empresarial de Investigacion Centro Tecnologico del Mueble y la Madera de la Region de Murcia, Servicio Murciano de Salud, Fundacion para la Formacion e Investigacion Sanitarias de la Region de Murcia, Universidad Politecnica de Cartagena, My Energia Oner SL, Universidad de Jaen, Fundacion Ageing Social Lab, Robotnik Automation Sll, Indra Soluciones Tecnologias de la Informacion SL, Irmandade da Santa Casa da Misericordia da Amadora Ipss, Universidade da Beira Interior, Caritas Diocesana de Coimbra, Universidade de Coimbra, Maastricht Instruments, Roessingh Research and Development BV, Stichting Nationaal Ouderenfonds, Universiteit Twente, Adsysco BV, Innorenew Coe Center Odlicnosti za Raziskave in Inovacije na Področju Obnovljivih Materialov in Zdravega Bivanjskega Okolja, Nacionalni Institut za Javno Zdravje, Dom Upokojenцев Izola - Casa del Pensionato Isola, Ericsson Nikola Tesla d.d., Ascora GmbH,

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	Stelar Security Technology Law Research UG (haftungsbeschränkt) GmbH, GIP Gerontopole Nouvelle-Aquitaine, Information Catalyst for Enterprise Ltd, Information Catalyst SL, AGE Platform Europe, Minds & Sparks GmbH, Domalys, Glintt Healthcare Solutions SA, Glintt Inov SA, HLTsys - HealthySystems Lda, Senlab Druzba za Informacijsko Tehnologijo Doo, Sentab Estonia OU, Tallinna Tehnikaülikool, DIN Deutsches Institut für Normung EV, Uninfo Associazione, Tartu Ülikool, Diputacion Provincial de Jaen, Scuola Superiore di Studi Universitari e di Perfezionamento S Anna, Engineering - Ingegneria Informatica Spa.
Comment	The project uses a range of digital tools including connected devices, artificial intelligence, robotics, cloud and edge computing, smart wearable devices, big data and intelligent analytics.
Users	Pilots in Andalusia, Italy, Murcia, Netherlands, Portugal and Slovenia.
State	Project in progress.
Results	N/A
Link web	<a href="https://www.pharaon.eu/">https://www.pharaon.eu/</a>

## RAADiCal

Objective	The aim of the project is to help elderly or disabled people to maintain a healthy physical and mental life through intelligent robotic systems. This includes maintaining and improving social relationships, having healthy meals and performing daily physical and mental exercise routines. To achieve this, we propose an intelligent robotic system capable of helping people to communicate, supervise the person and motivate them mentally and physically. A remote human operator can help in case of unmanaged events or risk situations in real time.
Programme	Ministerio de Ciencia e Innovación + Next Generation EU
Dates	2021-2024
Funding received	796.168,43 € <a href="https://www.aei.gob.es/sites/default/files/convocatory_info/2021-12/ESEDE_PLEC21_RC_f.pdf">https://www.aei.gob.es/sites/default/files/convocatory_info/2021-12/ESEDE_PLEC21_RC_f.pdf</a>
Scope	Academia
Participants	LEITAT (coordinador), Fundación Instituto de Robótica para la Dependencia, Institut de Robòtica i Informàtica Industrial (IRI) CSIC-UPC, PAL Robotics.
Comment	SAR Robot on ARI or TIAGo platform.
Users	All functionalities will be tested in real environments.
State	Project in progress.
Results	N/A
Link web	N/A



## RADIO – Robots in Assisted Living Environments

**Objective** Defining a new monitoring approach in which the sensing equipment is not unobtrusive, but an obvious and accepted part of the user's daily life. By using the integrated intelligent assistant/domestic robot system as sensing equipment for health monitoring, we divert the users' attention from the functionality of the sensors instead of the sensors themselves. In this way, the sensors need not be discrete and distant or masked and cumbersome to install; however, they should be perceived as a natural component of the assistant robot/intelligent home automation functionalities.

Programme	H2020-EU.3.1. / H2020-EU.3.1.4.
Dates	2015-2018
Funding received	3.805.625 €
Scope	Academia
Participants	National Centre for Scientific Research "Demokritos" (coordinator), Technological Educational Institute of Western Greece, Ruhr Universitaet Bochum, Robotnik Automation SLL, Sensing & Control Systems S.L., AVN Innovative Technology Solutions Ltd., Fondazione Santa Lucia, Fundació Hospital Asil de Granollers, Frontida Zois.
Comment	Mobile robot on Kobuki platform.
Users	Tests carried out in Greece (AAL Lab in Nafpaktos) and Spain (Hospital General de Granollers).
State	Project closed.
Results	To measure the level of acceptance of RADIO technology, researchers distributed a structured questionnaire both before and after a RADIO demonstration at the pan-European Researchers' Night celebration and other science fairs. More than 200 questionnaires confirmed that people had a biased opinion in linking the use of monitoring cameras to safety. After the demonstration, there was a significant change in people's opinion about allowing a system like RADIO. The commercialisation of the system as a whole is considered financially unviable at this time. <a href="https://github.com/RADIO-PROJECT-EU">https://github.com/RADIO-PROJECT-EU</a> <a href="https://vimeo.com/264989948">https://vimeo.com/264989948</a>
Link web	<a href="http://www.radio-project.eu/">http://www.radio-project.eu/</a>

## RAMCIP - Robotic Assistant for MCI patients at home

**Objective** Development of a home service robot aimed at helping MCI (Mild Cognitive Impairment) and AD (Alzheimer's disease) patients in their daily lives. The RAMCIP robot will have high-level cognitive functions, driven by advanced human activity and modelling and monitoring of the home environment, enabling it to optimally decide when and how to help. The robot will provide subtle training of the user's physical and cognitive skills, maintaining an optimal balance between providing physical assistance and stimulating the user to act.

Programme	H2020-EU.3.1. / H2020-EU.3.1.4.
Dates	2015-2018
Funding received	3.981.178 €
Scope	Academia
Participants	Ethniko Kentro Erevnas Kai Technologikis Anaptyxis (coordinator), Technische Universitaet Muenchen, Scuola Superiore di Studi Universitari e di Perfezionamento S Anna, Idryma Technologias Kai Erevnas, Stanczyk Bartłomiej, Uniwersytet Medyczny w Lublinie, Fundacio ACE, The Shadow Robot Company Limited.
Comment	Autonomous mobile robot with RAMCIP manipulator arm.
Users	The ACE Foundation has been in charge of carrying out the pilot tests of the RAMCIP robot in the homes of patients with mild cognitive impairment and mild dementia in Barcelona.
State	Project closed.
Results	Different capabilities of the robot were developed and demonstrated: human activity recognition, multimodal communication and manipulation capabilities in the home environment. <a href="https://cordis.europa.eu/article/id/240840-advanced-robot-provides-assistance-at-home-to-older-persons-in-need">https://cordis.europa.eu/article/id/240840-advanced-robot-provides-assistance-at-home-to-older-persons-in-need</a> <a href="https://www.youtube.com/watch?v=xB1uq3IOdEg">https://www.youtube.com/watch?v=xB1uq3IOdEg</a>
Link web	<a href="https://cordis.europa.eu/project/id/643433">https://cordis.europa.eu/project/id/643433</a> <a href="https://www.ramcip-project.eu/">https://www.ramcip-project.eu/</a> (website not accessible)

## ReMeDi – Remote Medical Diagnostician

Objective	The ReMeDi project addresses telediagnosis in clinical settings. A multifunctional robotic device is developed that will enable a real physical and ultrasonographic (USG) examination to be performed remotely. Working as a multidisciplinary consortium (physicians, human-robot interaction researchers such as psychologists and social scientists and engineers), we want to enable remote examinations that come as close as possible to direct examinations and thus follow the most natural and common medical techniques. The aim is to make the ReMeDi robot easy to use for doctors and acceptable for patients, enhancing (tele)presence with intelligent autonomous functions.
Programme	FP7-ICT
Dates	2013-2017
Funding received	3.079.995 €
Scope	Academia
Participants	University of the West of England Bristol (coordinator), Paris-Lodron-Universität Salzburg, Eidgenössische Technische Hochschule Zuerich, Technische Universität München, Scuola Superiore di Studi Universitari e di Perfezionamento S Anna, Stanczyk Bartłomiej, Uniwersytet Medyczny w Lublinie, Politechnika Wroclawska.
Users	N/A
State	Project closed.
Results	In 2017 the prototype was in a hospital in Poland and had been shown as a prototype at medical conferences around the world. Doctors in Australia and Canada had been interested, as it can take several hours to transport rural patients to a doctor's office or hospital. <a href="https://cordis.europa.eu/article/id/122560-remote-medical-diagnostics-and-treatment-can-help-to-ease-pressure-on-europes-healthcare-syst">https://cordis.europa.eu/article/id/122560-remote-medical-diagnostics-and-treatment-can-help-to-ease-pressure-on-europes-healthcare-syst</a> <a href="https://www.youtube.com/watch?v=UOMyE8pf09k">https://www.youtube.com/watch?v=UOMyE8pf09k</a>
Link web	<a href="https://cordis.europa.eu/project/id/610902">https://cordis.europa.eu/project/id/610902</a> <a href="http://www.remedi-project.eu/">http://www.remedi-project.eu/</a> (web not accessible)

## ReMember-Me

Objective	Intelligent system to address the prevention and detection of cognitive impairment, promote cognitive function and social inclusion among older people. The system includes: sleep, activity and mood assessment, time orientation, daily short and alternative assessment exercises and socialisation through knowledge sharing. <a href="https://www.youtube.com/watch?v=Wfg7rVuVnJ0">https://www.youtube.com/watch?v=Wfg7rVuVnJ0</a>
Programme	AAL Programme
Dates	2020-2023
Funding received	867.699,80 €
Scope	Commercial (assume same intention as previous ReMIND project).
Participants	Materia (coordinator), Universitatea Tehnica Romania, Ana Aslan International Foundation, Fondazione Santa Lucia, Escalable, Art of Info, Sense-Garden, Sjbberchmans Rusthuizen.
Comment	James Robot from Zora Robotics.
Users	More than 447 sessions will be held in 4 European countries with users of different characteristics to help develop, test and adjust the solution according to users' needs. Testimonials: <a href="https://www.youtube.com/watch?v=z--oUl1S42A">https://www.youtube.com/watch?v=z--oUl1S42A</a>
State	Project in progress
Results	N/A
Link web	<a href="https://www.rememberme-aal.eu/">https://www.rememberme-aal.eu/</a>

## ReMIND - Robotic ePartner for Multitarget INnovative activation of people with Dementia

**Objective** Improve the quality of life of patients with mild neurocognitive impairments by stimulating cognitive and physical activity through music, imagery and physical exercises, to evoke positive moods and emotions and to support social interactions. The holistic ReMIND solution is an interactive combination of robot and tablet that integrates existing modules: (1) physical exercises in combination with music (James robot), (2) a bibliographic application to increase memory (Keosity) and (3) a platform for caregivers.

Programme	AAL Programme
Dates	2018-2021
Funding received	1.379.554 €
Scope	Commercial
Participants	Zora Robotics (coordinator), Universiteit Gent, Technical University of Cluj- Napoca, University of Medicine and Pharmacy "Victor Babes" Timisoara , Ovos Media GmbH, University of Applied Sciences - FH Campus Wien, Medizinische Universität Wien.
Comment	Robot James from Zora Robotics.
Users	Robot/tablet tested in three different test centres for 2 years with about 550 patients and caregivers. Physical and mental state, mood, social activity and quality of life are assessed before and after applying ReMIND. <a href="https://www.youtube.com/watch?v=2FG9LBZYMIM">https://www.youtube.com/watch?v=2FG9LBZYMIM</a>
State	Project closed.
Results	The team includes two SMEs that already have products on the market and a tertiary end-user group including patient organisations and policy makers. The project coordinator already sells robots in Europe to hospitals, nursing homes and schools. The aim is to expand the existing market in all European countries by selling or renting the robot/tablet solution.
Link web	<a href="https://zorabots.wixsite.com/remind">https://zorabots.wixsite.com/remind</a>

## RESPECT - Secure and Privacy-preserving Indoor Robotics for Healthcare Environments

**Objective** AI and robotics are key to the transformation of the healthcare sector. At the same time, their advances open the door to new types of cyber threats, making many organisations reluctant to adopt them in the workplace. RESPECT aims to design and develop defence strategies for the secure and privacy-preserving operation of indoor mobile robotics solutions in healthcare. At the core of the planned activities is the creation of a European, cross-sectoral network of organisations involved in a collaborative research programme, working together to achieve the objectives.

Programme	H2020-EU.1.3. / H2020-EU.1.3.3. EXCELLENT SCIENCE - Marie Skłodowska-Curie Actions
Dates	2021-2024
Funding received	1.094.800 €
Scope	Academia
Participants	Universite d'Orleans (coordinator), Stream Vision, Joanneum Research Forschungsgesellschaft mbH, University of Cyprus, 3ae Health Ltd, Sphynx Analytics Limited, Universitat Politècnica de Valencia, Alias Robotics S.L., Robotnik Automation Sll, Erevnitiko Paneptimiakē Institouto Systimaton Epikoinonion kai Ypologiston-EMP, SingularLogic Anonymi Etaireia Pliroforiakon Systimaton kai Efarmogonpliroforikis.
State	Project in progress.
Results	Not published yet.
Link web	<a href="https://www.project-respect.eu/">https://www.project-respect.eu/</a>

## ROB-IN – Robot for continual personalized assistance able to explain itself

Objective	ROBIN aims to develop new enabling technologies for assistive robots in three key areas: personalisation, continuous understanding of dialogue and explainability. Personalisation because robots must make decisions that are tailored to the needs and preferences of the user and caregiver; continuous dialogue understanding because the most natural interactions are conversations in which the robot can extract useful information about the user by both asking questions and having conversational dialogues; explainability because users must build trust by understanding why the robot is making particular decisions and what data it is collecting, providing privacy control mechanisms.
Programme	Next Generation EU
Dates	2021-2024
Funding received	507.483,91 €
Scope	Academia
Participants	Instituto de Robótica e Informática Industrial (IRI) CSIC-UPC (coordinador), Centre de Technologies i Aplicacions del Llenguatge i la Parla (TALP) - UPC, Suara Servicis, Datision
Comment	TIAGo robotic platform.
State	Project in progress.
Link web	<a href="https://projecte-robin.github.io/">https://projecte-robin.github.io/</a> <a href="https://www.iri.upc.edu/project/show/278">https://www.iri.upc.edu/project/show/278</a>

## Robot-Era

Objective	Robot-Era develops, implements and demonstrates the overall feasibility, scientific/technical effectiveness and social/legal plausibility and acceptability of a plurality of complete advanced robotic services, integrated in intelligent environments. These robotic services actively work in real conditions and cooperate with real people and with each other to support independent living, improve quality of life and efficiency of care for the elderly.
Programme	FP7-ICT
Dates	2012-2015
Funding received	6.470.000 €
Scope	Academia
Participants	Scuola Superiore di Studi Universitari e di Perfezionamento S Anna (coordinador), MetraLabs GmbH Neue Technologien und Systeme, Youse GmbH, Universitaet Hamburg, Robotech Srl, STMicroelectronics Srl, Comune di Peccioli, TechnoDeal Srl, Istituto Nazionale di Riposo e Cura per Anziani INRCA, Lansgarden Fastigheter Aktiebolag, Orebro University, University of Plymouth.
Comment	The Domestic, Condominium and Outdoor robotic platforms are developed and Robot-Era services are defined. These platforms work collaboratively to provide various services, such as transport, shopping, waste disposal and cleaning, to support elderly users in their living environment.
Users	For 6 months, 70 elderly people used and tested the Robot-Era system in realistic indoor and outdoor environments in Italy and Sweden.
State	Project closed.
Results	Robot-Era integrated advanced robotics, artificial intelligence, navigation and sensor technologies to create a seamless and adaptive robotic assistance system. It demonstrated the effectiveness of a comprehensive robotic assistance system to improve the lives of older people, laying a solid foundation for future developments in the field of assistive robotics: user-centred design, scalability and reproducibility, impact on policy and standards, and awareness and acceptance. <a href="https://www.youtube.com/watch?v=lv43z8YVQkY">https://www.youtube.com/watch?v=lv43z8YVQkY</a> <a href="https://eeas.europa.eu/archives/delegations/japan/wp-content/uploads/21_Cavallo_ROBOT-ERA.pdf">https://eeas.europa.eu/archives/delegations/japan/wp-content/uploads/21_Cavallo_ROBOT-ERA.pdf</a>

## Robot Maid

Objective	Multi-purpose mobile robot for performing household tasks.
Dates	2008
Participants	Tokyo University
Comment	The research centre predicted that it would take a decade to mass-produce such a robot.
Results	<a href="https://www.youtube.com/watch?v=G5Vd9k3-3LM">https://www.youtube.com/watch?v=G5Vd9k3-3LM</a>

## ROGER - ROBot-assisted Gait training in orthopedic rehabilitation

Objective	To develop a completely new type of personal training robot that assists patients after orthopaedic surgery on the foot, knee or hip in outpatient or inpatient rehabilitation with personalised gait exercises to restore a normal physiological gait pattern.
Programme	TMWWDG - Thuringian Ministry of Economics, Science and Digital Society Funding
Dates	2016-2019
Funding received	N/A
Scope	Academia
Participants	MetraLabs GmbH (coordinator), Waldkliniken Eisenberg GmbH, TU Ilmenau - Department of Neuroinformatics and Cognitive Robotics, Barmer Thuringia.
Comment	Continuation of the ROREAS project
Users	N/A
State	Project closed.
Results	N/A
Link web	<a href="https://www.roger-projekt.de/">https://www.roger-projekt.de/</a>



## ROREAS - Interactive RObotic REhaAssistent for the walking and orientation training of patients after strokes

Objective	To develop a robotic rehabilitation assistant for gait and orientation exercise in self-training during clinical follow-up of stroke. The rehabilitation assistant accompanies hospitalised patients during walking exercises, practising both mobility and spatial orientation skills. He will also address patients' insecurity and anxiety ('Am I able to do it', 'Am I going to find my way back?'), which are possible reasons for failure of self-training.
Programme	BMBF – Bundesministerium für Bildung und Forschung
Dates	2013-2016
Funding received	N/A
Scope	Academia
Participants	MetraLabs GmbH (coordinator), TU Ilmenau, Fachgebiet Neuroinformatik und Kognitive Robotik, m&i-Fachklinik Bad Liebenstein, SIBIS Inst. für Sozialforschung & Projektberatung GmbH, Barmer GEK, Wuppertal. Plataforma robótica Cora.
Comment	The assistant also monitors exercises and stores clinical records for accounting and compensation with insurance funds, thus combining enhanced training capabilities for patients and organisational efficiency for the care or treatment facility.
Users	Evaluation of the system in 3 stages: 1) skills and behaviours in a controlled environment and with laboratory technicians; 2) with healthcare staff in the clinical setting, mimicking stroke patients; 3) with real stroke patients.
State	Project closed.
Results	<a href="https://www.tu-ilmenau.de/fileadmin/Bereiche/IA/neurob/Publikationen/journals/Gross-AR-2017.pdf">https://www.tu-ilmenau.de/fileadmin/Bereiche/IA/neurob/Publikationen/journals/Gross-AR-2017.pdf</a>
Link web	<a href="https://www.roreas.org/">https://www.roreas.org/</a> <a href="https://www.tu-ilmenau.de/en/university/departments/departments-of-computer-science-and-automation/profile/institutes-and-groups/institute-of-computer-and-systems-engineering/group-for-neuroinformatics-and-cognitive-robotics/research/finished-projects/roreas">https://www.tu-ilmenau.de/en/university/departments/departments-of-computer-science-and-automation/profile/institutes-and-groups/institute-of-computer-and-systems-engineering/group-for-neuroinformatics-and-cognitive-robotics/research/finished-projects/roreas</a>

## SACRO - Semi Autonomous Care Robot

Objective	To develop an assistive robot to support elderly people at home, performing ADL tasks at the user's request, autonomously or under manual control from a remote care centre, operated by the user or a caregiver. The robot is able to perform a variety of tasks enabling people to live independently for longer and keep control in private hands.
Programme	Ministerio de Economía y Competitividad – Eurostars-2
Dates	2015-2017
Funding received	N/A
Scope	Academia
Participants	Heemskerk Innovative Technology (HIT), PAL Robotics. Al inicio del proyecto en abril también formaba parte del equipo la empresa holandesa Rose. Rose BV ha cesado sus operaciones. El papel de Rose dentro del proyecto SACRO ha sido asumido por HIT. Plataforma TIAGo.
Comment	TIAGo platform.
State	Project closed.
Results	Summary in 2016: <a href="https://www.rvo.nl/files/file/2016/06/HiT-Semi-Autonomous-Care-Robot-SACRO.pdf">https://www.rvo.nl/files/file/2016/06/HiT-Semi-Autonomous-Care-Robot-SACRO.pdf</a> <a href="https://www.youtube.com/watch?v=TolaWtmNA3M&amp;t=2s">https://www.youtube.com/watch?v=TolaWtmNA3M&amp;t=2s</a>
Link web	<a href="https://pal-robotics.com/projects/sacro/">https://pal-robotics.com/projects/sacro/</a>

## SANDRo – Semi Autonomous Night and Day Robot

Objective	Teleoperation and telepresence help provide an opportunity for human-bot collaboration to perform cooperative tasks in environments that may be dynamic or unstructured. SANDRo offers assistance services to people with difficulties in activities of daily living through a mobile robot that can be teleoperated by a remote operator when needed (e.g. on call or when an alert is triggered). The operator, located in a support centre, can communicate with users via voice and video, allowing for a secure and detailed remote visual inspection.
Programme	H2020-ICT-2018-2020 a través del Digital Innovation Hubs (DIH) in Healthcare Robotics.
Dates	2021-2022
Funding received	N/A
Scope	Academia
Participants	Heemskerk Innovative Technology (coordinador), PAL Robotics.
Comment	TIAGo platform. <a href="https://www.youtube.com/watch?v=7GsxxWh-c0M">https://www.youtube.com/watch?v=7GsxxWh-c0M</a>
Users	Evaluation in several care centres and testing facilities in the Netherlands, Paris and Barcelona.
State	Project in progress.
Results	Not published yet.
Link web	<a href="https://dih-hero.eu/sandro/">https://dih-hero.eu/sandro/</a> <a href="https://www.hisparob.es/en/robot-assistance-teleoperation-and-telepresence-in-project-sandro/">https://www.hisparob.es/en/robot-assistance-teleoperation-and-telepresence-in-project-sandro/</a>

## SeRoDi - Service Robotics for Personal Services

Objective	Develop two robotic solutions for hospital care: an intelligent transport trolley and a service assistant. It navigates autonomously in common rooms, recognises people and offers and serves them drinks or snacks.
Programme	BMBF – Bundesministerium für Bildung und Forschung
Dates	2014-2018
Funding received	N/A
Scope	Academia
Participants	Fraunhofer IPA (coordinador), Institute for Control Engineering of Machine Tools and Manufacturing Units (ISW), Institute of Human Factors and Technology Management (IAT) - University of Stuttgart, University of Greifswald, Altenpflegeheime Mannheim (care homes), University Hospital Mannheim.
Comment	The robotic service assistant was well received in the residence, attracting the curiosity and interest of the residents. The residents could select from the available drinks, which the robots served them. Once all supplies were exhausted, the robot returned to the kitchen to be reloaded.
Users	Real-world testing in one hospital, The University Clinic, and two residential homes, Seniorenzentrum Waldhof and Ida Scipio Heim.
State	Project closed.
Results	<a href="https://www.youtube.com/watch?v=dQ5p0h_-p4M">https://www.youtube.com/watch?v=dQ5p0h_-p4M</a>
Link web	<a href="https://www.ipa.fraunhofer.de/en/reference_projects/serodi.html">https://www.ipa.fraunhofer.de/en/reference_projects/serodi.html</a>

## SERROGA – Service Robotics for the health assistants by involving helpers

Objective	In a survey conducted by VDE <sup>91</sup> (German Association for Electrical, Electronic and Information Technologies) on service robotics scenarios that are considered valuable by older people, considerable acceptance was found for a 'health' robot in a broader sense that provides health monitoring, reminding of medication, birthdays or appointments, motivating for health benefits, helping to keep in touch with friends and family, reading newspapers or poems, managing notes and shopping lists and playing the role of fitness trainer. SERROGA aims to develop this robot. Using demonstrators in the roles of 'communication assistant', 'movement motivation' and 'reminder service', various combinations of the above specifications are implemented.
Programme	Financed by the Thuringian Ministry of Economics, Technology and Labour with funding from the European Social Fund.
Dates	2012-2015
Funding received	N/A
Scope	Academia
Participants	TU Ilmenau – FG Neuroinformatics and Cognitive Robotics, TU Ilmenau – Department of Media Psychology and Media Conception.
Comment	Robot de servicio sobre plataforma Hector. Proyectos relacionados: CompanionAble (previo) y SYMPARTNER (posterior).

Users	Functional tests carried out in 12 flats of project staff and elderly people. Case study conducted with nine elderly people (aged 68-92) at home, investigating both instrumental and socio-emotional functions of a robotic health assistant. The robot accompanied the older people to their homes for up to three days, assisting them in their daily schedule tasks and health care, without external supervision.
State	Project closed.
Results	"Robot companion for domestic health assistance: Implementation, test and case study under everyday conditions in private apartments". <a href="https://ieeexplore.ieee.org/document/7354230">https://ieeexplore.ieee.org/document/7354230</a>
Link web	<a href="https://www.serroga.de/">https://www.serroga.de/</a>

<sup>91</sup> S. Meyer: My friend the robot. Service robotics for the elderly: an answer to demographic change? ISBN 978-3-8007-3342-2, VDE-Verlag 2011

## SHAPES – Smart & Healthy Ageing through People Engaging in Supportive Systems

Objective	Building, piloting and deploying an EU-standardised open platform on a large scale. Integrating a wide range of technological, organisational, clinical, educational and social solutions, it aims to facilitate long-term active and healthy ageing and the maintenance of a high-quality standard of living. Through technology, local home and community environments interact with health and care (H&C) networks contributing to the reduction of H&C costs, hospitalisations and institutional care.
Programme	H2020-EU.3.1. / H2020-EU.3.1.4.1. / H2020-EU.2.1.1.3.
Dates	2019-2023
Funding received	18.732.468,25 €
Scope	Academia
Participants	National University of Ireland Maynooth (coordinator), Access Earth Limited, Age Platform Europe, Associazione Italiana per l'Assistenza agli Spastici Provincia di Bologna, Aristotelio Panepistimio Thessalonikis, Carus Consilium Sachsen GmbH, Clinika de Kay SL, Edgeneering LDA, European Union of the Deaf AISBL, Fakultni Nemocnice Olomouc, Fraunhofer Gesellschaft zur Forderung der Angewandten Forschung EV, Fint Future Intelligence Limited, Gnomon Plirophorikis AE, Institut fur Gesundheitswirtschaft(GEWI) e.V., Intracom SA Telecom Solutions, Kompai Robotics, Laurea-Ammattikorkkeakoulu Oy, Medicalsyn GmbH, Northern Health and Social Services Trust, Mid and East Antrim Agewell Partnership, Omnitor AB, Univerzita Palackeho v Olomouci, Pal Robotics SL, 5 Ygionomiki Periferia Thessalias & Stereas Elladas, Asociacion Benefico-Social El Salvador, Rock Couture Productions Ltd, Epistimi gia Sena Astiki Mi Kerdoskopiki Etaireia, Elliniko Mesogeiaako Panepistimio, Tree Technology SA, Universidad de Castilla – La Mancha, Universidade de Aveiro, University College Cork – National University of Ireland, Cork, Universidade do Porto, Erevnitiko Idrima P.L., University of Ulster, Fundacion Centro de Tecnologias de Interaccion Visual y Comunicaciones Vicomtech, The World Federation of the Deafblind (WFDB).

Comment	ARI and Kompai robotic platforms.
Users	The SHAPES pilot activity will consist of 36 activities to be carried out in 15 pilot sites in 10 EU Member States, involving more than 2.000 users and targeting different themes, such as a smart living environment for healthy ageing, physical rehabilitation at home or care for elderly people with neurodegenerative diseases.
State	Project in progress.
Results	Deliverables: <a href="https://shapes2020.eu/deliverables/">https://shapes2020.eu/deliverables/</a>
Link web	<a href="https://shapes2020.eu/">https://shapes2020.eu/</a> <a href="https://cordis.europa.eu/project/id/857159">https://cordis.europa.eu/project/id/857159</a>

## SI-ROBOTICS - Healthy and active aging through Social ROBOTICS

Objective	Parkinson's disease (PD) is a major cause of disability in older people. Recent studies show that dance has positive effects on mobility and balance in people in the early stages of PD. This study aims to propose and evaluate a new approach to PD rehabilitation, focusing on the use of Irish dance, together with a new technological system focused on helping the patient to perform the dance steps and collecting kinematic and performance parameters used both by the physiotherapist (for the assessment and planning of subsequent sessions) and by the system (to profile the levels of difficulty of the exercise).
Programme	Programma Operativo Nazionale Ricerca e Innovazione (ARS01_01120)
Dates	2019-2021
Funding received	4.402.913,52 €
Scope	Academia
Participants	Exprivia (Capofila), Item Oxygen srl, R2M Solution srl, Grifo Multimedia srl, Next2U srl, Cupersafety srl, Istituto Nazionale Riposo e Cura Anziani (INRCA), Fondazione Neurone Onlus, Fondazione religione e di culto "Casa Solievo della Sofferenza" – Opera di San Pio da Pietralcina, Scuola Superiore di Studi Universitari e Perfezionamento Sant'Anna, Università degli studi di Milano. Università degli studi di Genova, Università degli studi di Roma "La Sapienza", Università politecnica delle Marche, Fondazione Bruno Kessler, Consiglio Nazionale delle Ricerche, Istituto Internazionale per gli Alti Studi Scientifici "Eduardo R. Caianiello".
Comment	Social robot on mobile platform MoVeR1.
Users	20 patients with PD. Sixteen 50-minute therapy sessions (two training sessions per week for 8 weeks) are carried out at the Clinical Unit of Physical Rehabilitation of the Istituto Nazionale Ricovero e Cura per Anziani IRCCS INRCA, Ancona, Italy.

State	Project closed.
Results	Unpublished <a href="https://clinicaltrials.gov/ct2/show/NCT05005208">https://clinicaltrials.gov/ct2/show/NCT05005208</a> Protocol of the study <a href="https://www.researchgate.net/publication/357240676_Dancing_With_Parkinson's_Disease_The_SI-ROBOTICS_Study_Protocol">https://www.researchgate.net/publication/357240676_Dancing_With_Parkinson's_Disease_The_SI-ROBOTICS_Study_Protocol</a>
Link web	N/A

## SILVER - Supporting Independent LiVing for the Elderly through Robotics

Objective	SILVER is looking for new robotics-based technologies to help older people in their daily lives. Its purpose is to help older people continue to live independently at home, even if they have physical or cognitive disabilities. What is unique about SILVER is that it uses a pre-commercial procurement process (PCP) to identify and select new technologies and solutions. In Europe, PCP has so far been an underused tool to promote innovation. One of the objectives of this project is to demonstrate the effectiveness of the PCP approach in addressing societal and governmental needs.
Programme	FP7-ICT
Dates	2012-2016
Funding received	2.609.529 €
Scope	Academia
Participants	The Technology Strategy Board (coordinator), Region Syddanmark, Odense Kommune, Aalto Korkeakoulusaatio SR, Oulun Kaupunki, Vantaan Kaupunki, Forum Virium Helsinki Oy, Gemeente Eindhoven, Brainport Development NV, Ministerie Van Economische Zaken En Klimaat, Verket For Innovationssystem, Vasteras Kommun, Stockport Metropolitan Borough Council.
Comment	Some 33 bids were received and a panel of experts identified a total of seven promising proposals, before narrowing them down to three and finally to one: the LEA (Lean Elderly Assistant) robot. This was subsequently commercialised.
State	Project closed.
Results	<a href="https://vimeo.com/171714584">https://vimeo.com/171714584</a>
Link web	<a href="https://cordis.europa.eu/project/id/287609">https://cordis.europa.eu/project/id/287609</a> <a href="https://cordis.europa.eu/article/id/118523-helping-public-authorities-drive-healthcare-rd-forward">https://cordis.europa.eu/article/id/118523-helping-public-authorities-drive-healthcare-rd-forward</a>

## Smart BEAR

Objective	To develop an innovative platform to support healthy and independent living for older people with various conditions such as hearing loss, cardiovascular disease, cognitive impairment, mental health problems, balance disorders and frailty. The platform offers evidence-based smart interventions for lifestyle, medically significant risk factors and chronic disease management.
Programme	H2020-EU.3.1. / H2020-EU.3.1.4.1. / H2020-EU.2.1.1.3.
Dates	2019-2024
Funding received	19.993.818,75 €
Scope	Academia
Participants	Consiglio Nazionale Delle Ricerche (coordinator), Atos Spain SA, Philips Electronics Nederland BV, IBM Israel – Science and Technology Ltd, Azienda Regionale per l'Innovazionee gli Acquisti S.p.A., Perifereia Peloponnissou, Dimos Palaio Faliro, Comunita Sociale Cremasca ASC, Fondazione Centro San Raffaele, Ospedale San Raffaele Srl, Association Catel Club des Acteurs de la Telemedecine, IDCQ Hospitales y Sanidad SL, Instituto Policlinico Santa Teresa SA, Policlinica Gipuzkoa SA, Idcsalud Mostoles SA, United Surgical Partners Madrid SL, Idcsalud Valdemoro SA, Integracion Sanitaria Balear SL, USP Instituto Dexeus SA, Clinica de Sabadell SL, Idcsalud Villalba SA, Clinica Esperanza de Triana SA, QS Instituto de Investigacion e Innovacion SL, Fundatia Ana Aslan International, Idryma Technologias Kai Erevnas, Ethniko Kai Kapodistriako Panepistimio Athinon, Panepistimio Ioanninon, Universita degli Studi di Milano, Universidad del Pais Vasco/ Euskal Herriko Unibertsitatea, City University of London, Erevnitiko Panepistimiako Institutouto Systimaton Epikoinonion Kai Ypolgiston-Emp, Sphynx Technology Solutions AG, Stream Vision, IT Support Solutions Srl, Innovatec Sensorizacion y Comunicacion, S.L., Athens Technology Center Anonymi Viomichaniki Emporiki Kai Techniki Etaireia Efarmogon Ypsilis Technologias, Dupui Touboul Barbi

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	Fiedl Lemar Molebloch, Uninova-Instituto de Desenvolvimento de Novas Tecnologias-Associacao, Secretaria Regional da Saude, Bird & Bird (Belgium) LLP.
Users	Pilot carried out in Madeira. Full-scale validation of the platform (ongoing) in France, Greece, Italy, Romania and Spain.
State	Project in progress.
Results	N/A
Link web	<a href="https://www.smart-bear.eu/">https://www.smart-bear.eu/</a>

## SOCRATES - Social Cognitive Robotics in The European Society

Objective	SOCRATES is a training programme for 15 PhD students, created to develop the field of social robotics with a focus on robotics for the elderly. To support them and their training, a consortium of seven universities/research institutes, three industrial partners, two end-user-oriented partners and three business-oriented organisations has been created.
Programme	H2020-EU.1.3. - H2020-EU.1.3.1. EXCELLENT SCIENCE - Marie Skłodowska-Curie Actions
Dates	2016-2020
Funding received	3.874.726,44 €
Scope	Academia
Participants	Participants: Umea Universitet (coordinator), Agencia Estatal Consejo Superior de Investigaciones Cientificas, Orebro University, Ben-Gurion University of the Negev, University of the West of England, Bristol, Universitaet Hamburg, Fraunhofer Gesellschaft zur Forderung der Angewandten Forschung EV. Partners: PAL Robotics SL, Adele Robots SL, Alfred Nobel Science Park, Urquhart-Dykes & Lord LLP, CDI - Negev Ltd., Uminova Innovation AB, Asea Brown Boveri SA, Fundació ACE.
Comment	Five thematic areas are identified as particularly important: Emotion, Intention, Adaptability, Design and Acceptance. The disciplinary perspective specifies the need for inter/multidisciplinary and cross-sectoral solutions.
Users	15 PhD students selected: <a href="http://www.socrates-project.eu/recruitment/">http://www.socrates-project.eu/recruitment/</a>
State	Project closed.
Results	A new generation of researchers with the capacity to interact with scholars from different 'schools of thought' in areas both within and outside their areas of specialisation. Additional value and impact is generated by the unique multidisciplinary collaboration between academic disciplines that do not normally work together; computer science, cognitive sciences, biomechanics, ethics, social psychology and social sciences.
Link web	<a href="https://web.archive.org/web/20230204131626/http://www.socrates-project.eu/">https://web.archive.org/web/20230204131626/http://www.socrates-project.eu/</a>

## SPRING – Socially Pertinent Robots in Gerontological Healthcare

Objective	Develop social care robots with the ability to interact with different people at the same time and in open dialogues. Specific objectives along three lines: 1) enable robust perception in complex, unstructured and human-involved environments; 2) enable sensor-based (data-driven) and knowledge-based robot actions for multi-person multimodal interaction and communication; 3) validate the technology for gerontological healthcare needs.
Programme	H2020-EU.2.1.1.
Dates	2020-2024
Funding received	8.360.385 €
Scope	Academia
Participants	Institut National de Recherche en Informatique et Automatique (coordinator), Università degli Studi di Trento, Ceske Vysoke Ucení Technické v Praze, Heriot- Watt University, Bar Ilan University, ERM Automatismes Industriels, PAL Robotics SL, Assistance Publique Hopitaux de Paris.
Comment	7 ARI social robots deployed for partners.
Users	Validation of the technology in healthcare scenarios and, in particular, in a day hospital for the elderly. The aim of the robotic platform is to reduce patient stress and alleviate waiting time, to attend to patients and accompany them to the next scheduled medical appointment, or to signal demands and anomalies to medical staff.
State	Project in progress.
Results	Halfway through the project: <a href="https://spring-h2020.eu/news/springs-achievements-in-its-first-half/">https://spring-h2020.eu/news/springs-achievements-in-its-first-half/</a> Privacy and ethics guide for data use (validated). <a href="https://spring-h2020.eu/wp-content/uploads/2020/05/SPRING_D10.3_Privacy-and-Ethics-Guidelines_Vfinal_30.04.2020.pdf">https://spring-h2020.eu/wp-content/uploads/2020/05/SPRING_D10.3_Privacy-and-Ethics-Guidelines_Vfinal_30.04.2020.pdf</a>
Link web	<a href="https://spring-h2020.eu/">https://spring-h2020.eu/</a>

## SRS – Multi-Role Shadow Robotic System for Independent Living

Objective	The project aims to demonstrate an innovative, practical and efficient system called 'shadow robot' for personalised home care. SRS solutions are designed to enable a robot to act as a shadow for its controller, allowing adult children or caregivers to remotely and physically assist their elderly parents with daily tasks.
Programme	FP7-ICT
Dates	2010-2013
Funding received	3.650.000 €
Scope	Academia
Participants	Cardiff University (coordinator), Profactor GmbH, ACMI GmbH, Central Laboratory of Mechatronics and Instrumentation of the Bulgarian Academy of Sciences, Institut po Robotika, Vysoké Učení Technické v Brně, Fraunhofer Gesellschaft zur Förderung der angewandten Forschung EV, Hochschule der Medien, Fundacion Instituto Gerontologico Matia – Ingema, Robotnik Automation SLL, Hewlett Packard Italiana SRL, Fondazione Don Carlo Gnocchi Onlus, University of Bedfordshire.
Comment	Shadow robot on Care-O-Bot platform.
Users	Tests at the S.Maria Nascente centre in Milan and at the IZA Care Center in Donostia.
State	Project closed.
Results	N/A Anticipation that Hewlett-Packard and other industrial partners in the consortium would develop the final solution for a global market with significant potential and volume.
Link web	<a href="https://cordis.europa.eu/project/id/247772">https://cordis.europa.eu/project/id/247772</a>

## Strategic Research Program on Human-Centered Robotics

Objective	Research on 7 specific objectives that apply to human-centred robotics: 1) Natural and empathic robothuman interaction and collaboration; 2) Robotic localisation and solid mapping; 3) Dexterous textile manipulation; 4) Robot learning through natural communication; 5) Energy supply and optimisation; 6) Monitoring and control of complex dynamic systems; and 7) Ethical, regulatory and philosophical aspects of social robotics.
Programme	Unidad de Excelencia María de Maeztu – Ministerio de Ciencia e Innovación
Dates	2017-2021
Funding received	2.000.000 €
Scope	Academia
Participants	Institut de Robòtica i Informàtica Industrial (IRI) CSIC-UPC
Users	N/A
State	Project closed.
Link web	<a href="https://www.iri.upc.edu/project/show/184">https://www.iri.upc.edu/project/show/184</a>

## SYMPARTNER - SYMBiose by PAUL and RoboTer CompaNion for an emotion-sensitive support

Objective	Innovative symbiosis of two complementary solutions to support the elderly in their home environment: the intelligent home care system PAUL from the company CIBEK and the mobile social assistant robot SCITOS, developed by the company MetraLabs in collaboration with the TU Ilmenau. The combination of the two approaches allows the respective range of functions and services to be expanded and combines the advantages of both systems in a unique way: PAUL offers a wide range of functions, from information to home control and communication; SCITOS has options for emotional and social communication with people.
Programme	BMBF – Bundesministerium für Bildung und Forschung
Dates	2015-2018
Funding received	2.400.000 €
Scope	Academia
Participants	TU Ilmenau (coordinator), FG Neuroinformatik und Kognitive Robotik, MetraLabs GmbH, CIBEK technology + trading GmbH, Universität Siegen, Fakultät III, Ubiquitous Design, SIBIS Inst. Für Sozialforschung & Projektberatung GmbH, AWO Thüringen, Ajs gGmbH.
Comment	Previous related projects: SERROGA and ROREAS.
Users	Trials with 20 older people, at home, over 20 weeks and unsupervised.
State	Project closed.
Results	The vision is a companion robot that lives with the user in the long term and feels emotionally attached to the user, but immediate user learning and feedback techniques (such as haptic feedback) will be needed to personalise the robot's behaviour. More research is needed to determine which support services are most useful and how the robot's instrumental and emotional roles can be combined in the long term. Further developments are also needed in different technical aspects of the robot: human-robot interaction, flexible navigation, and the design to overcome obstacles. <a href="https://www.tu-ilmenau.de/fileadmin/Bereiche/IA/neurob/Publikationen/conferences_int/2019/Gross-ICRA-2019.pdf">https://www.tu-ilmenau.de/fileadmin/Bereiche/IA/neurob/Publikationen/conferences_int/2019/Gross-ICRA-2019.pdf</a>
Link web	<a href="https://www.sympartner.de/">https://www.sympartner.de/</a>

## TEXWEAROTS

**Objective** Wearable technologies are in vogue and one of the latest trends is soft robotics. Their adaptable morphologies are made possible by the flexible materials used to manufacture them. Although elastomers and fabrics are cheap and efficient, they are bulky, cannot scale and have limited portability and mobility. TEXWEAROT will seek to develop soft robotic assistive devices, woven without wires, to overcome the current limitations. In particular, a knitted robotic glove with seamlessly integrated activation, sensing and self-propulsion functionalities will be developed. Advances in digital machine knitting will make it possible to manufacture 3D actuators with monolithically integrated functionalities. Thanks to new technologies and techniques, the glove will be a milestone in wearable soft robotics.

Programme	European Research Council (ERC)
Dates	2022-2027
Funding received	1.479.262,50 €
Scope	Comercial
Participants	Istanbul Teknik Universitesi.
Users	N/A
State	Project in progress.
Results	N/A
Link web	N/A

## VictoryaHome

**Objective** Develop a system for comprehensive home care for the elderly with a social robot and a smartphone app including activity monitoring, fall detection and an automatic medicine dispenser. The robot can identify at-risk situations and contact caregivers. Thus, care is not entirely dependent on automated functions, but augmented by immediate human presence when needed or desired by the user. The project promotes self-care and lets caregivers know that all is well.

Programme	AAL Programme
Dates	2013-2016
Funding received	1.310.000 €
Scope	Academia (marketing possible)
Participants	Four trials in Norway, Sweden, the Netherlands and Portugal, where older adults at home and informal caregivers at a distance will interact with the developed product.
Comment	Robot Giraff.
Users	Stichting Smart Homes, FFO Funksjonshemmedes Fellesorganisasjon, SOS International, Envida Care, Norwegian Centre for Integrated Care and Telemedicine – University Hospital of North Norway, Bluecaring, Giraff Technologies AB, Tromsø Telemedicine Consult As, R&D Council – Sörmland County.
State	Project closed.
Results	Winning project of the AAL Award 2015. <a href="https://www.youtube.com/channel/UC1pZHelimsTa-OnwcJ34dAg">https://www.youtube.com/channel/UC1pZHelimsTa-OnwcJ34dAg</a>
Link web	N/A

## VIZIER – The Elderly Friendly Interface to Modern Online Services and Internet of Things Appliances

Objective	Design and develop an innovative solution for elderly users to bridge the digital divide and empower people to fully benefit from the latest technological innovations to improve their daily life management and stay physically, mentally and socially active. Through an intuitive and natural user interface, the envisaged smart system solution aims to support older people in their daily life and promote behavioural changes.
Programme	AAL Programme
Dates	2017-2020
Funding received	1.800.000 €
Scope	Academia (marketing possible)
Participants	University of Geneva, Dublin City University, Servisource Healthcare Ltd T/A Myhomecare, NetUnion sàrl, Verhaert New Products & Services NV, Acapela Group S.A., Familiehulp vzw, VIVA Association, Salaso Health Solutions Ltd.
Comment	Open architecture to facilitate the development of an ecosystem in collaboration with companies offering their products and services, making the commercial solution more viable and scalable.
Users	10 personas were created representing the casuistries of the end users: men and women of all ages, living independently or needing some domestic support or people dependent on others for domestic activities, personal hygiene or medical conditions. Some people take computer classes, use a smartphone, and others are reluctant. The 3 care organisations in the consortium, Viva, Familiehulp and Myhomecare worked with that person and user experience journeys. <a href="https://www.aal-europe.eu/wp-content/uploads/2020/01/D1.2a-Use-Case-Scenarios-Specification-V1.1.pdf">https://www.aal-europe.eu/wp-content/uploads/2020/01/D1.2a-Use-Case-Scenarios-Specification-V1.1.pdf</a>
State	Project closed.
Results	<a href="https://www.aal-europe.eu/projects/vizier/">https://www.aal-europe.eu/projects/vizier/</a> Final report not available.
Link web	<a href="https://www.aal-europe.eu/projects/vizier/">https://www.aal-europe.eu/projects/vizier/</a>

## Analysis of Participants

The organisations that have participated in 5 or more of the projects listed in the previous section are described below. In brackets, next to the number of project participations, the number of times they have been project coordinators.

ORGANIZATION	N. PROJ.	AREAS OF ROBOTICS RESEARCH
PAL Robotics	12	Development of robotic platforms for service and research. Areas: Mobile robotics, robotic manipulation, artificial intelligence, computer vision and human-bot interaction.
Scuola Superiore di Studi Universitari e di Perfezionamento S Anna	12 (2)	Centre of excellence in research and advanced education. In the field of robotics, it collaborates on research projects in mobile robotics, medical robotics, robotic manipulation and artificial intelligence.
Fraunhofer Gesellschaft zur Foerderung der Angewandten Forschung EV	10 (1)	The largest applied research organisation in Europe. Robotics research areas include personal mobility, home care, rehabilitation and therapy, emotional and social support, medical and surgical robots.
MetraLabs GmbH Neue Technologien und Systeme	7 (2)	Company specialised in the development of intelligent robotic solutions for different applications. Areas: mobile robotics, navigation and localisation, human-bot interaction, computer vision, artificial intelligence and machine learning.

ORGANIZATION	N. PROJ.	AREAS OF ROBOTICS RESEARCH
Örebro University	7 (2)	Within the field of robotics and AI, the university is known for its Centre for Applied Autonomous Sensor Systems (AASS). AASS conducts interdisciplinary research in areas such as mobile robotics, cognitive robotics, computer vision, artificial intelligence and sensor systems.
Technische Universität Ilmenau	7 (2)	Specialisation in engineering and natural sciences. In the field of robotics, he conducts research in areas such as mobile robotics, robotic manipulation, computer vision, human-robot interaction and artificial intelligence.
Consiglio Nazionale delle Ricerche (CNR)	6 (1)	Italy's largest public research organisation. In the field of robotics, it specialises in: perception systems, mechatronics, artificial intelligence, robot control and dynamics, human-robot interaction, robot simulation and moulding, and electromechanical microsystems.
Erevnitiko Panepistimiako Institutouto Systimaton Epikoinonion kai Ypolgiston- EMP	6	The Inter-University Research Institute for Information Systems, Cooperation and Delivery has a multidisciplinary approach and good expertise in advanced robotics research, mainly focusing on artificial intelligence and perception with computer vision and sensors.
Fundación Tecnalia Research & Innovation	6	It is positioned as one of the main players in robotics research in Spain. It has extensive experience and capabilities in technologies related to robotics: computer vision, artificial intelligence, human-robot interaction, robot control, electronics and advanced mechatronics, among others.

ORGANIZATION	N. PROJ.	AREAS OF ROBOTICS RESEARCH
Technische Universität München	6 (1)	It focuses its robotics research on: autonomous mobile robots, collaborative robots, human-robot interaction using gesture recognition techniques, shared guidance and safety, sensor development and applied artificial intelligence, such as machine vision, language processing and machine learning.
Institut de Robòtica i Informàtica Industrial (IRI) CSIC-UPC	5 (3)	The main areas of robotics research include: collaborative robots and cobots, medical robotics, autonomous mobile robots, artificial intelligence with machine learning, natural language processing and reasoning, and electro-mechanical systems implementation.
Institut National de Recherche en Informatique et Automatique (INRIA)	5 (1)	INRIA is a leader in robotics research in France with emphasis on: autonomous mobile robots, humanoid robotics and cobots, intelligent robot design and control through mechanical modelling, and medical robotics, including intelligent prosthetics and surgical robots.
Universiteit Twente	5 (1)	Robotics research focuses mainly on: cobots and collaborative robotics, sensory robotics, machine vision and image processing, artificial intelligence and robot control and dynamics.



# Annex 2. Assistive robots

## Commercial robots



Device	<b>Aeo</b>
Type	Multi-purpose mobile robot
Manufactur	Aeolus
State	Manufacturer Closed manufacturer. Available through distributors.
Functions	MOB DOM CUR INF COM ACO <b>MON</b>
Link web	<a href="https://aeolusbot.com/solutions/Care_Monitoring">https://aeolusbot.com/solutions/Care_Monitoring</a>



Device	<b>Aido</b>
Type	Mobile social robot
Manufactur	Aido Robot
State	Available in the 2nd quarter 2023
Functions	MOB DOM CUR <b>INF COM</b> ACO MON
Link web	<a href="https://aidorobot.com/">https://aidorobot.com/</a>



Device	<b>Bestic Eating Assistive Device</b>
Type	Robotic spoon
Manufactur	Bestic AB
State	Closed manufacturer. Available through distributors.
Functions	MOB DOM <b>CUR</b> INF COM ACO MON
Link web	<a href="https://gies2020.hkcss.org.hk/en/expo/exhibition-products/detail/168.html">https://gies2020.hkcss.org.hk/en/expo/exhibition-products/detail/168.html</a>



Device	<b>BRO Power wheelchair</b>
Type	Robotic wheelchair adapted to stairs
Manufactur	Scewo
State	Available
Functions	<b>MOB</b> DOM CUR INF COM ACO MON
Link web	<a href="https://www.scewo.com/en/">https://www.scewo.com/en/</a>



Device	<b>Companion Pet Cat</b>
Type	Companion robot and emotional therapy
Manufactur	Joy for All
State	Available
Functions	MOB DOM CUR INF COM <b>ACO</b> MON
Link web	<a href="https://joyforall.com/products/companion-cats">https://joyforall.com/products/companion-cats</a>



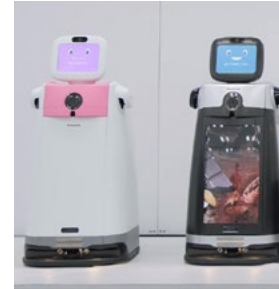
Device	<b>CarbonHand</b>
Type	Robotic glove
Manufactur	Bioservo Technologies AB
State	Available
Functions	MOB DOM <b>CUR</b> INF COM ACO MON
Link web	<a href="https://www.bioservo.com/healthcare">https://www.bioservo.com/healthcare</a>



Device	<b>Gita</b>
Type	Mobile companion robot
Manufactur	Piaggio Fast Forward
State	Available (mini and plus versions)
Functions	MOB <b>DOM</b> CUR INF COM ACO MON
Link web	<a href="https://mygita.com/">https://mygita.com/</a>



Device	<b>Cutii</b>
Type	Mobile Social Robot
Manufactur	Cutii
State	Available
Functions	MOB DOM CUR INF <b>COM</b> ACO MON
Link web	<a href="https://web.archive.org/web/20240830065833/https://www.cutii.io/">https://web.archive.org/web/20240830065833/https://www.cutii.io/</a>



Device	<b>HOSPI-Rimo</b>
Type	Mobile social robot
Manufactur	Panasonic
State	Not available
Functions	MOB DOM CUR <b>INF COM</b> ACO MON
Link web	<a href="https://web.archive.org/web/20241204163833/https://news.panasonic.com/global/press/en110926-2">https://web.archive.org/web/20241204163833/https://news.panasonic.com/global/press/en110926-2</a>



Device	<b>ElliQ</b>
Type	Fixed social robot
Manufactur	Intuition Robotics
State	Available
Functions	MOB DOM CUR <b>INF COM</b> ACO MON
Link web	<a href="https://www.intuitionrobotics.com/">https://www.intuitionrobotics.com/</a>



Device	<b>Hug</b>
Type	Robot to assist in moving and transferring the user
Manufactur	Fuji
State	Available
Functions	<b>MOB</b> DOM CUR INF COM ACO MON
Link web	<a href="https://www.fuji.co.jp/en/about/hug/">https://www.fuji.co.jp/en/about/hug/</a>



Device	<b>Ibot</b>
Type	Robotic wheelchair
Manufactur	2Kerr Mobility
State	Available
Functions	<b>MOB</b> DOM CUR INF COM ACO MON
Link web	<a href="https://www.2kerr.com/en/products/ibot-personal-mobility-device/">https://www.2kerr.com/en/products/ibot-personal-mobility-device/</a>



Device	<b>Jennie</b>
Type	Companion robot and emotional therapy
Manufactur	Tombot
State	Pre-order (March 2023)
Functions	MOB DOM CUR INF COM <b>ACO</b> MON
Link web	<a href="https://tombot.com/">https://tombot.com/</a>



Device	<b>iToilet</b>
Type	Robotic toilet
Manufactur	Developed in the iToilet project
State	Marketed through Attris
Functions	MOB DOM <b>CUR</b> INF COM ACO MON
Link web	<a href="https://www.attris.de/en/">https://www.attris.de/en/</a>



Device	<b>Jibo</b>
Type	Fixed social robot
Manufactur	NTT Disruption
State	Discontinued in March 2023
Functions	MOB DOM CUR <b>INF</b> COM ACO MON
Link web	<a href="https://web.archive.org/web/20190322023327/https://www.jibo.com/">https://web.archive.org/web/20190322023327/https://www.jibo.com/</a>



Device	<b>James</b>
Type	Mobile social robot
Manufactur	Zora Robotics
State	Commercial
Functions	MOB DOM CUR INF <b>COM</b> ACO MON
Link web	<a href="https://www.zorarobotics.be/robots/james">https://www.zorarobotics.be/robots/james</a>



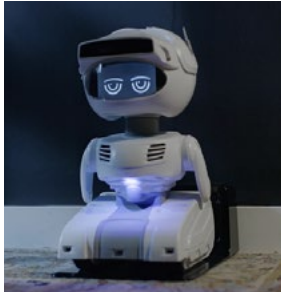
Device	<b>LEA Lean Empowering Assistant</b>
Type	Robotic walker
Manufactur	Spark Design
State	Available
Functions	<b>MOB</b> DOM CUR INF COM ACO MON
Link web	<a href="https://www.sparkdesign.nl/projects/lea-care-robot">https://www.sparkdesign.nl/projects/lea-care-robot</a>



Device	<b>Mabu</b>
Type	Fixed social robot
Manufactur	Catalia Health
State	Available
Functions	MOB DOM CUR <b>INF</b> <b>COM</b> ACO MON
Link web	<a href="https://robotsguide.com/robots/mabu">https://robotsguide.com/robots/mabu</a>



Device	<b>Obi</b>
Type	Robotic Spoon
Manufactur	Obi Robotics
State	Available
Functions	MOB DOM <b>CUR</b> INF COM ACO MON
Link web	<a href="https://meetobi.com/">https://meetobi.com/</a>



Device	<b>Misty</b>
Type	Mobile social robot
Manufactur	Misty Robotics
State	Available (on waiting list)
Functions	MOB DOM CUR <b>INF</b> COM ACO MON
Link web	<a href="https://www.mistyrobotics.com/">https://www.mistyrobotics.com/</a>



Device	<b>Paro</b>
Type	Companion robot and emotional therapy
Manufactur	Parabots
State	Available
Functions	MOB DOM CUR INF COM <b>ACO</b> MON
Link web	<a href="http://www.parorobots.com/">http://www.parorobots.com/</a>



Device	<b>Model Ci-Whill</b>
Type	Robotic wheelchair
Manufactur	Whill
State	Available
Functions	<b>MOB</b> DOM CUR INF COM ACO MON
Link web	<a href="https://web.archive.org/web/20240524013901/https://whill.inc/us/model-ci/">https://web.archive.org/web/20240524013901/https://whill.inc/us/model-ci/</a>



Device	<b>Robin</b>
Type	Mobile Social Robot
Manufactur	Expeer Technology
State	Available
Functions	MOB DOM CUR INF COM <b>ACO</b> MON
Link web	<a href="https://www.expper.tech/">https://www.expper.tech/</a>



Device	<b>Temi</b>
Type	Mobile social and telepresence robot
Manufactur	Roboterly
State	Available
Functions	MOB DOM CUR <b>INF</b> <b>COM</b> ACO MON
Link web	<a href="https://www.roboterly.com/robots/temi-robot">https://www.roboterly.com/robots/temi-robot</a>



Device	<b>Zenbo</b>
Type	Mobile social robot
Manufactur	ASUS
State	Available (normal and Junior version)
Functions	MOB DOM CUR <b>INF</b> <b>COM</b> ACO MON
Link web	<a href="https://zenbo.asus.com/">https://zenbo.asus.com/</a>



Device	<b>Tessa</b>
Type	Fixed social robot
Manufactur	Tinybots
State	Available
Functions	MOB DOM CUR <b>INF</b> <b>COM</b> ACO MON
Link web	<a href="https://www.tinybots.nl/">https://www.tinybots.nl/</a>

## Prototypes



Device	<b>AgeWell</b>
Type	Mobile social robot
Manufactur	Developed in the AgeWell Project
State	Prototype
Functions	MOB DOM CUR <b>INF</b> <b>COM</b> ACO MON
Link web	<a href="https://robo-explorer.github.io/">https://robo-explorer.github.io/</a>



Device	<b>Walking Assist</b>
Type	Exoskeleton
Manufactur	Honda
State	Available
Functions	<b>MOB</b> DOM CUR INF COM ACO MON
Link web	<a href="https://global.honda/en/newsroom/news/2008/c081107-eng.html">https://global.honda/en/newsroom/news/2008/c081107-eng.html</a>

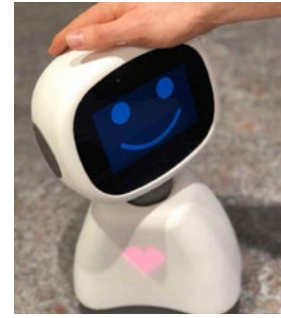


Device	<b>ALAN</b>
Type	Robotic arm
Manufactur	Robo-Explorer
State	Prototype. Presented at ICRA 2023
Functions	MOB <b>DOM</b> CUR INF COM ACO MON
Link web	<a href="https://robo-explorer.github.io/">https://robo-explorer.github.io/</a>





Device	<b>Concept 3E-B18</b>
Type	Compact wheelchair
Manufactur	Presented at CES 2018
State	Prototype
Functions	<b>MOB</b> DOM CUR INF COM ACO MON
Link web	<a href="https://global.honda/innovation/CES/2018/004.html">https://global.honda/innovation/CES/2018/004.html</a>



Device	<b>ELMo</b>
Type	Fixed social robot
Manufactur	Norwegian University of Science and Technology
State	Prototype
Functions	MOB DOM CUR <b>INF</b> COM ACO MON
Link web	<a href="https://www.dlr.de/rm/en/desktopdefault.aspx/tabid-11670/20388_read-47709/">https://www.dlr.de/rm/en/desktopdefault.aspx/tabid-11670/20388_read-47709/</a>



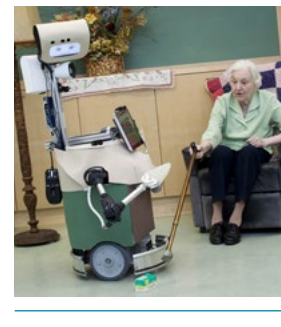
Device	<b>c-Walker</b>
Type	Robotic walker
Manufactur	Developed in DALi project
State	Prototype
Functions	<b>MOB</b> DOM CUR INF COM ACO MON
Link web	<a href="https://cordis.europa.eu/article/id/164931-dali-robot-walker-for-elderly-people-in-public-spaces/es">https://cordis.europa.eu/article/id/164931-dali-robot-walker-for-elderly-people-in-public-spaces/es</a>



Device	<b>Hair Washing Robot</b>
Type	Robotic head washer
Manufactur	Panasonic
State	Prototype
Functions	MOB DOM <b>CUR</b> INF COM ACO MON
Link web	<a href="https://web.archive.org/web/20240919143022/https://news.panasonic.com/global/stories/600">https://web.archive.org/web/20240919143022/https://news.panasonic.com/global/stories/600</a>

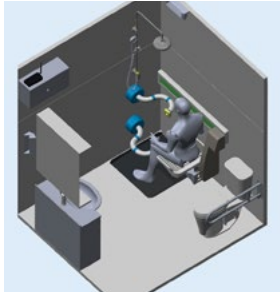


Device	<b>EDAN</b>
Type	Robotic wheelchair with manipulator arm
Manufactur	DLR Institute of Robotics and Mechatronics
State	Prototype
Functions	<b>MOB DOM</b> CUR INF COM ACO MON
Link web	<a href="https://www.dlr.de/rm/en/desktopdefault.aspx/tabid-11670/20388_read-47709/">https://www.dlr.de/rm/en/desktopdefault.aspx/tabid-11670/20388_read-47709/</a>

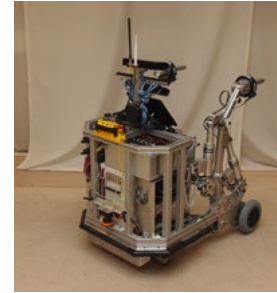


Device	<b>Hobbit</b>
Type	Multi-purpose mobile robot
Manufactur	Developed for project Hobbit
State	Prototype
Functions	MOB DOM CUR <b>INF COM</b> ACO MON
Link web	<a href="http://hobbit.acin.tuwien.ac.at/">http://hobbit.acin.tuwien.ac.at/</a>





Device	<b>I-Support</b>
Type	Robotic shower
Manufactur	Developed for project I-SUPPORT
State	Automatic and semi-automatic prototypes
Functions	MOB DOM <b>CUR</b> INF COM ACO MON
Link web	<a href="https://robotnik.eu/projects/i-support/">https://robotnik.eu/projects/i-support/</a>



Device	<b>Mobot Assistant</b>
Type	Robotic Walker
Manufactur	Developed in Mobot project
State	Prototype
Functions	<b>MOB</b> DOM CUR INF COM ACO MON
Link web	<a href="https://accreea.com/mobot-project/">https://accreea.com/mobot-project/</a>



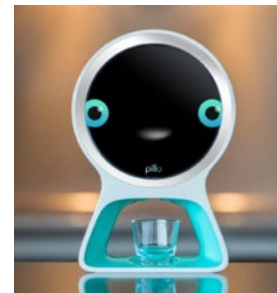
Device	<b>i-Walker</b>
Type	Robotic walker
Manufactur	Universitat Politècnica de Catalunya
State	[In the process of being transferred toTOPRO]
Functions	<b>MOB</b> DOM CUR INF COM ACO MON
Link web	<a href="https://www.topromobility.co.uk/">https://www.topromobility.co.uk/</a>



Device	<b>Pearl</b>
Tipo	Multi-purpose mobile robot
Manufactur	Developed in the NurseBot project
State	Not available
Functions	MOB DOM CUR <b>INF</b> COM ACO MON
Link web	<a href="https://theindexproject.org/post/nursebot">https://theindexproject.org/post/nursebot</a>



Device	<b>Milton</b>
Type	Mobile social robot
Manufactur	Academy of Robotics
State	Prototype
Functions	MOB DOM CUR <b>INF</b> COM ACO MON
Link web	<a href="https://www.academyofrobotics.co.uk/helper-bots/">https://www.academyofrobotics.co.uk/helper-bots/</a> (project website not accessible)



Device	<b>Pillo</b>
Type	Multifunction robot
Manufactur	Pillo Health
State	Not available
Functions	MOB DOM CUR <b>INF</b> COM ACO MON
Link web	<a href="http://pillohealth.com/">http://pillohealth.com/</a> (web not accessible)



Device	<b>RAMCIP Robot</b>						
Type	Multi-purpose mobile robot						
Manufactur	Developed in the RAMCIP project						
State	Not available. Marketing under study						
Functions	MOB	DOM	CUR	INF	COM	ACO	MON
Link web	N/A						



Device	<b>Robot Maid</b>						
Type	Multi-purpose mobile robot						
Manufactur	Robotmaid Project						
State	Prototype						
Functions	MOB	DOM	CUR	INF	COM	ACO	MON
Link web	N/A						



Device	<b>ReMeDi Robot</b>						
Type	Multi-purpose teleoperated robot						
Manufactur	Developed in the ReMeDi project						
State	Not available						
Functions	MOB	DOM	CUR	INF	COM	ACO	MON
Link web	N/A						



Device	<b>SeRoDi – Service assistant</b>						
Type	Beverage dispenser						
Manufactur	Fraunhofer IPA (SeRoDi project)						
State	Prototype						
Functions	MOB	DOM	CUR	INF	COM	ACO	MON
Link web	<a href="https://www.ipa.fraunhofer.de/en/reference_projects/serodi.html">https://www.ipa.fraunhofer.de/en/reference_projects/serodi.html</a>						



Device	<b>Robot-Era</b>						
Type	Multi-purpose mobile robot						
Manufactur	RobotEra Project						
State	Prototype						
Functions	MOB	DOM	CUR	INF	COM	ACO	MON
Link web	N/A						

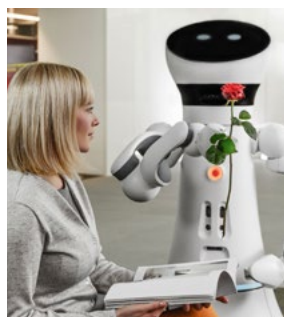


Device	<b>SI-ROBOTICOS robot</b>						
Type	Multi-purpose mobile robot						
Manufactur	University of Genova + Co-Robotics						
State	Prototype						
Functions	MOB	DOM	CUR	INF	COM	ACO	MON
Link web	<a href="https://www.ipa.fraunhofer.de/en/reference_projects/serodi.html">https://www.ipa.fraunhofer.de/en/reference_projects/serodi.html</a>						

## Platforms



Device	<b>ARI</b>
Type	Multi-purpose mobile robot
Manufactur	PAL Robotics
State	Available
Functions	MOB DOM CUR <b>INF</b> COM ACO MON
Link web	<a href="https://pal-robotics.com/es/robot/ari/">https://pal-robotics.com/es/robot/ari/</a>



Device	<b>Care-o-Bot</b>
Type	Multi-purpose mobile robot
Manufactur	Fraunhofer IPA
State	Available through Mojin Robotics
Functions	MOB <b>DOM</b> CUR <b>INF</b> COM ACO MON
Link web	<a href="https://www.care-o-bot.de/en/care-o-bot-4.html">https://www.care-o-bot.de/en/care-o-bot-4.html</a>



Device	<b>Cora</b>
Type	Mobile social robot
Manufactur	TU Ilmenau
State	Not available
Functions	MOB DOM CUR <b>INF</b> <b>COM</b> ACO MON
Link web	



Device	<b>Eve</b>
Type	Mobile manipulator robot
Manufactur	1X Technologies
State	Available
Functions	MOB <b>DOM</b> CUR INF COM ACO MON
Link web	<a href="https://www.1x.tech/eve">https://www.1x.tech/eve</a>



Device	<b>Giraff</b>
Type	Telepresence robot
Manufactur	Giraff Technologies AB
State	Not available
Functions	MOB DOM CUR INF <b>COM</b> ACO MON
Link web	<a href="http://giraff.org/">http://giraff.org/</a> (web not accessible)



Device	<b>GrowMu</b>
Type	Mobile social robot
Manufactur	N/A
State	Not available
Functions	MOB DOM CUR <b>INF</b> COM ACO MON
Link web	<a href="http://growmeup.deec.uc.pt/">http://growmeup.deec.uc.pt/</a> (web not accessible)



Device	<b>Hector</b>
Type	Mobile social robot
Manufactur	TU Ilmenau. Used in various projects funded by the German Ministry.
State	Not available
Functions	MOB DOM CUR <b>INF</b> COM ACO MON
Link web	<a href="https://www.edad-vida.org/wp-content/uploads/2011/03/670Arantxa_Renteria.pdf">https://www.edad-vida.org/wp-content/uploads/2011/03/670Arantxa_Renteria.pdf</a>



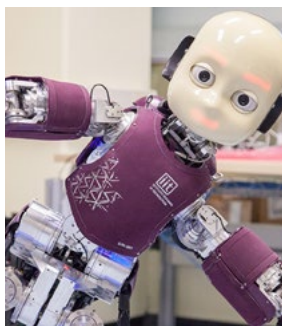
Device	<b>Kompai Robotics</b>
Type	Mobile social robot
Manufactur	Kompai Robotics
State	Available
Functions	<b>MOB</b> DOM CUR INF COM ACO MON
Link web	<a href="https://www.kompairobotics.com/kompai-assist">https://www.kompairobotics.com/kompai-assist</a>



Device	<b>HSR – Human Support Robot</b>
Type	Multipurpose Mobile robot
Manufactur	Toyota
State	Available
Functions	MOB <b>DOM</b> CUR INF COM ACO MON
Link web	<a href="https://toyotatimes.jp/en/report/supported_tokyo2020/057.html">https://toyotatimes.jp/en/report/supported_tokyo2020/057.html</a>



Device	<b>Nao</b>
Type	Mobile social robot
Manufactur	Softbank Robotics
State	Available
Functions	MOB DOM CUR <b>INF</b> COM <b>ACO</b> MON
Link web	<a href="https://www.aldebaran.com/en/nao">https://www.aldebaran.com/en/nao</a>



Device	<b>iCub</b>
Type	Multi-purpose mobile robot
Manufactur	Istituto Italiano di Tecnologia
State	Design available under GPL Open Source (about 40 robots are available)
Functions	MOB DOM CUR <b>INF</b> COM ACO MON
Link web	<a href="https://icub.iit.it/">https://icub.iit.it/</a>



Device	<b>Neo</b>
Type	Mobile manipulator robot
Manufactur	1X Technologies
State	Available during 2023
Functions	MOB <b>DOM</b> CUR INF COM ACO MON
Link web	<a href="https://www.1x.tech/neo">https://www.1x.tech/neo</a>



Device	<b>Pepper</b>
Type	Mobile social robot
Manufactur	Softbank Robotics
State	Available
Functions	MOB DOM CUR <b>INF</b> COM <b>ACO</b> MON
Link web	<a href="https://www.aldebaran.com/fr/pepper">https://www.aldebaran.com/fr/pepper</a>



Device	<b>Stevie</b>
Type	Mobile social robot
Manufactur	Trinity College Dublin
State	Available via Akara Robotics
Functions	MOB DOM CUR <b>INF</b> COM <b>ACO</b> MON
Link web	<a href="https://www.akara.ai/">https://www.akara.ai/</a>



Device	<b>PR2</b>
Type	Multi-purpose mobile robot
Manufactur	Willow Garage
State	Manufacturer closed. Maintenance by the user community.
Functions	MOB <b>DOM</b> CUR INF COM ACO MON
Link web	<a href="http://wiki.ros.org/Robots/PR2">http://wiki.ros.org/Robots/PR2</a>



Device	<b>TIAGo</b>
Type	Multi-purpose Mobile robot
Manufactur	PAL Robotics
State	Available
Functions	MOB <b>DOM</b> <b>CUR</b> INF COM ACO MON
Link web	<a href="https://pal-robotics.com/es/robot/tiago/">https://pal-robotics.com/es/robot/tiago/</a>



Device	<b>SCITOS</b>
Type	Mobile social robot
Manufactur	MetraLabs + TU Ilmenau
State	Available
Functions	MOB DOM CUR INF <b>COM</b> ACO MON
Link web	<a href="https://www.metalabs.com/en/scitos-a5-2/">https://www.metalabs.com/en/scitos-a5-2/</a>



# Annex 3. Congresses and conferences on assistive robotics

The congresses and conferences are presented in order of the date of the next event (at the time of writing).

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## ACM/IEEE International Conference on Human-Robot Interaction (HRI)

<https://humanrobotinteraction.org/2023/>

Stockholm, 13–16 March 2023

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## Health Revolution Congress

<https://healthrevolutioncongress.com/>

Barcelona, 17 March 2023

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## DIH-HERO Knowledge Conference

<https://dih-hero.eu/2nd-kc-program/>

Barcelona, 25 April 2023

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## International Conference on Assistive Robotics Technologies (ICART)

<https://waset.org/assistive-robotics-conference>

London, 15–16 May 2023

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## International Conference on Assistive Robotics (ICAR)

<https://waset.org/assistive-robotics-conference-in-may-2023-in-vancouver>

Vancouver, 22–23 May 2023

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## Furhat Conference on social robotics

<https://furhatrobotics.com/furhat-conference-on-social-robotics-spring-23/>

Online, June 2023

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## IEEE International Conference on Robotics and Automation (ICRA)

<https://www.icra2023.org/>

London, 29 May - 2 June 2023

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## The Rehabilitation Engineering and Assistive Technology Society of North America Annual Conference (RESNA)

<https://www.resna.org/Events/RESNA-2023-Annual-Conference>

New Orleans, LA, 24–26 July 2023

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## International Conference on Social Robotics (ICSR)

<https://waset.org/social-robotics-conference-in-august-2023-in-amsterdam>

Amsterdam, 3–4 August 2023

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## The IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)

<http://ro-man2023.org/main>

Busan (Korea), 28–31 August 2023 (on-site and online)

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## The Association for the Advancement of Assistive Technology in Europe Congress (AAATE)

<https://aaate2023.eu/>

Paris, 30 August–1 September 2023

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## International Conference on Rehabilitation Robotics (ICORR)

<https://icorr-c.org/>

Singapore, 24–28 September 2023



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**International Conference on Robotics and Intelligent Systems (IROS)**

<https://ieee-iros.org/>

Detroit, MI 1–5 October 2023

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**Closing The Gap Annual Conference**

<https://www.closingthegap.com/conference/>

Minneapolis, MN, 11–13 October 2023

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**International Exhibition and Conference on Human Augmentation Robots**

<https://www.exo-berlin.de/>

Berlin, 24–25 October 2023

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**International Conference on Ubiquitous Computing and Ambient Intelligence (UCAmI)**

<https://www.ucami.org/>

Riviera Maya, México, 28–30 November 2023

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**IEEE-RAS International Conference on Humanoid Robots**

<https://2023.ieee-humanoids.org/>

Austin, TX, 12–14 December 2023

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**Assistive Technology Industry Association Conference (ATIA)**

<https://www.atia.org/conference/>

Orlando, FL, 25–27 January 2024 (on-site and online)

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**XPatient Barcelona Congress**

<https://xpatientbcncongress.com/>

[Dates next edition not published at the time of going to press.]

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# Annex 4. Research centres in robotic areas

## Catalonia

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Centre d'Enginyeria de Microsistemes per a Instrumentació i Control (CEMIC) – UB  
<https://www.cemic.ub.edu/>

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CITCEA-UPC  
<https://www.citcea.upc.edu/>

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CVC Centro de Visión por Computador  
<https://www.cvc.uab.es/>

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Eurecat, Centre Tecnològic de Catalunya  
<https://eurecat.org/>

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GILAB Laboratori de Gràfics i Imatge, UdG  
<https://gilab.udg.edu/>

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IIIA Instituto de Investigación en Inteligencia Artificial, CSIC  
<https://www.iiia.csic.es/>

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Instituto de Robótica e Informática Industrial (IRI) CSIC-UPC  
<https://www.iri.upc.edu/>

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Instituto de Robótica para la Dependencia (IRD)  
<https://institutorobotica.org/>

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Institute of Industrial and Control Engineering (IOC) – UPC  
<https://ioc.upc.edu/en>

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IRIS Technology Group  
<https://www.iris-eng.com/>

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LaSalle, Universitat Ramon Llull  
<https://www.salleurl.edu/>

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Leitat  
<https://www.leitat.org/>

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Vicorob – UdG  
<https://vicorob.udg.edu/>

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## Spain

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Tecnalia – Laboratorio de Robótica flexible y colaborativa  
<https://www.tecnalia.com/>

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Universidad de Alicante - Robotics and Tridimensional Vision Research Group (RoViT)  
<https://rovit.ua.es/>

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Universidad de Almería - Automatic Control, Electronics, And Robotics R&D Group  
<https://arm.ual.es/arm-group/>

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Universidad de Extremadura - The Robotics And Artificial Vision Laboratory (RoboLab)  
<https://robofab.unex.es/>

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Universidad de Jaén - Group Of Robotics, Automation And Computer Vision  
<https://grav.ujaen.es/>

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Universidad de Málaga - Higher Technical School Of Telecommunications Engineering  
<https://www.uma.es/etsi-de-telecomunicacion/>

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Universidad de Oviedo - Multisensor Systems And Robotics Laboratory (SIMUR)  
[https://simur.dieecs.com/portada\\_alternativa](https://simur.dieecs.com/portada_alternativa)

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Universidad Miguel Hernandez de Elche (UMH) - Departamento de Ingeniería de Sistemas y Automática  
<https://disa.umh.es/>

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Universidad Miguel Hernandez de Elche (UMH) - Neuroengineering Biomedical Group (nBio)  
<https://nbio.umh.es/>

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Universidad de las Islas Baleares - Systems, Robotics And Vision Group (SRV)  
<https://srv.uib.es/>

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Universidad Jaume I (UJI) - The Robotic Intelligence Laboratory  
<https://www.robot.uji.es/>

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Universidad Politécnica de Valencia (UPV) - Instituto de Automática e Informática Industrial (AI2)  
<https://www.ai2.upv.es/>

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## Europe

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École polytechnique fédérale de Lausanne (EPFL) - Learning Algorithms and Systems Laboratory, France  
<https://lasa.epfl.ch/>

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Eindhoven University of Technology, Netherlands  
<https://www.tue.nl/en/research/institutes/eindhoven-artificial-intelligence-systems-institute/robotics>

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ETH Zürich - Robotic Systems Lab, Switzerland  
<https://rsl.ethz.ch/>

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Fraunhofer IPA - Robot and Assistive Systems, Germany  
<https://www.ipa.fraunhofer.de/en/expertise/robot-and-assistive-systems.html>

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Friedrich-Alexander-Universität - Assistive Intelligent Robotics Lab, Germany  
<https://www.airob.tf.fau.de/research/the-laboratory/>

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Imperial College London - Personal Robotics Lab, United Kingdom  
<https://www.imperial.ac.uk/personal-robotics/>

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Institute of Cognitive Science and Technology (ISTC-CNR), Italy  
<https://www.cnr.it/en/institute/078/institute-of-cognitive-sciences-and-technologies-istc>

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iRosa, TU Darmstadt, Germany  
<https://irosalab.com/>

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KTH Royal Institute of Technology - Robotics, Perception and Learning Lab, Sweden  
<https://www.kth.se/is/rpl>

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PRISCA Lab (Projects of Intelligent Robotics and Advanced Cognitive Systems), Italy  
<https://www.prisca.unina.it/>

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Robotdalen, Sweden  
<https://robotdalen.se/>

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Robotics by Design Lab, France  
<https://www.roboticslab.design/>

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Roessingh Research Development (RRD), Netherlands  
<https://www.rrd.nl/en/>

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Scuola Sant'Anna - The Biorobotics Institute, Italy  
<https://www.santannapisa.it/en/institute/biorobotics>

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Technische Universität München (TUM) - Geriatrics Lab, Germany  
<https://geriatrics.mirmi.tum.de/en/what-is-geriatrics/>

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Technische Universität München (TUM) - Smart Robotics Lab, Germany  
<https://srl.cit.tum.de/>

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The Bremen Ambient Assisted Living Lab (BAALL), DFKI GmbH, Germany  
<https://www-cps.hb.dfki.de/research/baall>

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The Hamlyn Centre, Imperial College London - Assistive Robots, United Kingdom  
<https://www.imperial.ac.uk/hamlyn-centre/>

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Trinity College Dublin - Robotics & Innovation Lab, Ireland  
<https://www.tcd.ie/mecheng/research/robotics-and-innovation-lab/>

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TU Eindhoven - Social Robotics Lab, Netherlands  
<https://www.tue.nl/en/research/research-areas/humans-and-technology/social-robotics-lab/>

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TU Ilmenau - Neuroinformatics and Cognitive Robotics Lab, Germany  
<https://www.tu-ilmenau.de/en/university/departments/department-of-computer-science-and-automation/profile/institutes-and-groups/institute-of-computer-and-systems-engineering/group-for-neuroinformatics-and-cognitive-robotics/research>

---

TU Wien - Applied Assistive Technologies Group, Austria  
[https://www.aat.tuwien.ac.at/index\\_en.html](https://www.aat.tuwien.ac.at/index_en.html)

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TU Wien - Institute of Visual Computing and Human-Centered Technology, Austria  
<http://igw.tuwien.ac.at/hci/>

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Université Paris-Saclay - ENSTA ParisTech, France  
<https://www.ensta-paris.fr/>

---

University of Oxford - Robotics Research Group, United Kingdom  
<https://ori.ox.ac.uk/>

---

University of Twente - Robotics and Mechatronics Lab, Netherlands  
<https://www.ram.eemcs.utwente.nl/>

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UWE Bristol - Robotics Laboratory, United Kingdom  
<https://www.bristolroboticslab.com/>

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## Resto del mundo

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Australian Centre for Robotic Vision (ACRV), varies universitats, Australia  
<https://www.roboticvision.org/>

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Carnegie Mellon University - The Robotics Institute, USA  
<https://www.ri.cmu.edu/>

---

Clemson University - Assistive Robotics Laboratory, USA  
<https://cecas.clemson.edu/~glv/research/>

---

Georgia Institute of Technology - Healthcare Robotics Lab, USA  
<http://healthcare-robotics.com/>

---

Griffith University, Queensland - Menzies Health Institute QLD, Australia  
<https://www.griffith.edu.au/menzies-health-institute-queensland>

---

Hosei University - Assistive Robotics Laboratory, Japan  
<http://assistrobotics.ws.hosei.ac.jp/>

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Indian Institute of Technology Madras (IITM) - Healthcare Robotics Lab, India  
<https://www.iitm.ac.in/>

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Intelligent Assistive Technology and Systems Lab (IATSL), Canada  
<https://iatsl.org/>

---

Johns Hopkins University - Laboratory for Computational Sensing and Robotics, USA  
<https://lcsr.jhu.edu/>

---

Korea Advanced Institute of Science and Technology (KAIST), South Korea  
<https://www.kaist.ac.kr/en/>

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MIT Computer Science and Artificial Intelligence Laboratory (CSAIL) -  
Robotic Assisted Living Group, USA  
<https://www.csail.mit.edu/>

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Nanyang Technological University Singapore - Rehabilitation Research Institute (RRIS), Singapore  
<https://researchdata.ntu.edu.sg/dataverse/RRIS>

---

National Center for Geriatrics and Gerontology - Assistive Robot Center (ARC), Japan  
<https://www.ncgg.go.jp/research/lab/robot/>

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National University of Singapore - Advanced Robotics Centre, Singapore  
<https://arc.nus.edu.sg/>

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Stanford University - Assistive Robotics & Manipulation Laboratory, USA  
<https://arm.stanford.edu/>

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Stanford University - Collaborative Haptics and Robotics in Medicine Lab (CHARM), USA  
<https://charm.stanford.edu/>

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Tsinghua University – Smart Sensing and Robotics Group, China  
<https://ssr-group.net/>

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University of California, Berkeley - Berkeley AI Research (BAIR) Lab, USA  
<https://bair.berkeley.edu/>

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University of South Florida - Center for Assistive, Rehabilitation and Robotics Technologies (CARRT), USA  
<http://carrt.eng.usf.edu/>

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University of Southern California - Robotics and Autonomous Systems Center, USA  
<https://rasc.usc.edu/>

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University of Tokyo - Intelligent Systems and Informatics Lab, Japan  
<https://www.isi.imi.i.u-tokyo.ac.jp/>

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University of Toronto - Assistive Robotics and Technology Lab, Canada  
<http://asblab.mie.utoronto.ca/research-areas/assistive-robotics>

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USC Viterbi School of Engineering - Assistive Robot Center, USA  
<https://uscinteractionlab.web.app/research/areas>

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Vanderbilt University - Rehabilitation Engineering & Socially Assistive Robotics, USA  
<https://www.vanderbilt.edu/cseo/services/broader-impacts/zelik-lab-for-biomechanics-assistive-technology-bat-lab/>

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Virginia Tech - Assistive Robotics Laboratory, USA  
<https://autonomyandrobotics.centers.vt.edu/groups/arlab.html>

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Washington University - Personal Robotics Lab, USA  
<https://personalrobotics.cs.washington.edu/>

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Yale University - Social Robotics Lab, USA  
<https://scazlab.yale.edu/>

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# Annex 5. Version Index

V1.0 June 2023

V1.1 December 2023

V1.2 February 2024



