

A Short-Survey of Existing EU Research Projects on Robotics and AI for Older Adults

Um breve levantamento de projetos de pesquisa existentes na UE sobre robótica e IA para idosos

Luis Figueredo^{1,2†}, Tianyu Ren^{2†}, Hamid Sadeghian², Abdeldjalil Naceri², Sami Haddadin²



Resumo: Este trabalho apresenta um levantamento abrangente de 32 projetos de pesquisa financiados pela UE, iniciados após 2015, focando no papel da robótica e da IA no cuidado a idosos. Os projetos são classificados em áreas-chave de aplicação, como robótica social, robótica em saúde, melhoria da mobilidade e assistência física nas tarefas diárias. Além disso, as áreas de foco da pesquisa, incluindo personalização, monitoramento de saúde, suporte para comprometimento cognitivo e considerações éticas, são avaliadas. Ao desenvolver uma taxonomia com base nesses critérios, este artigo destaca os esforços em curso para integrar robótica e IA no cuidado a idosos, oferecendo insights valiosos sobre o futuro das tecnologias assistivas na abordagem dos desafios de uma população em envelhecimento. A abordagem unificada da UE em pesquisa e seu papel proativo no financiamento de iniciativas em larga escala fazem dela um estudo de caso ideal para examinar o potencial da robótica e da IA na melhoria da qualidade do cuidado aos idosos.

Palavras-chave: Geriatrônica. Gerontotecnologia. Projetos financiados pela UE. Robótica e IA. Cuidado. Idosos.

Abstract: This paper provides a comprehensive survey of 32 EU-funded research projects initiated after 2015, focusing on the role of robotics and AI in the care of older adults. The projects are classified into key application areas such as social robotics, healthcare robotics, mobility improvement, and physical assistance with daily living tasks. In addition, the research focus areas, including personalization, health monitoring, cognitive impairment support, and ethical considerations, are evaluated. By developing a taxonomy based on these criteria, this paper highlights the ongoing efforts to integrate robotics and AI into elder care, offering valuable insights into the future of assistive technologies in addressing the challenges of an aging population. The EU's unified approach to research and its proactive role in funding large-scale initiatives make it an ideal case study for examining the potential of robotics and AI in improving the quality of care for older adults.

Keywords: Geriatrics. Gerontechnology. EU-Funded projects. Robotics and AI. Care. Older adults

Introduction

The global population is undergoing a major demographic shift, with individuals aged 60 and older expected to increase by 34% by 2030. By 2050, this number will more than double, reaching 2.1 billion. This trend has created one of the most significant social transformations of the 21st century, impacting labor markets, financial systems, housing, and intergenerational relationships (OECD, 2022). The rapid increase in older populations is also straining healthcare and social care systems, which face labor shortages and rising costs. For example, in the UK, the annual turnover rate for care workers is 38%, hindering the delivery of consistent, quality care (UKRI, 2022). All the aforementioned challenges are even more pressing in Europe where a quarter of the population is already 65 or older. In response, innovative solutions are needed to ensure that older adults can maintain their independence and quality of life for as long as possible (Jahn et al., 2023).

This is where robotics and artificial intelligence (AI) emerge as promising alternatives. Recent advancements in robotics and AI led to assistive technologies that support health monitoring, social interaction, mobility, and activities of daily living (ADLs), playing a vital role in promoting healthy aging.

Take, for instance, projects like RAMCIP (2018) focused on robots that assist with complex tasks like medication management and meal preparation, supporting individuals with cognitive decline. In a complementary fashion, innovative social robots, such as those in the SPRING project focused on social support and healthcare monitoring in geriatric settings, easing the burden on healthcare workers and enhancing patient interaction.

The United Nations (UN) and the World Health Organization (WHO) have recognized the importance of developing supportive environments and technologies for older adults through the Decade of Healthy Ageing (2021–2030), see (UN/WHO 2021, UN/WHO 2022). This initiative focuses on defining and assessing healthy ageing around the world and activities that can influence the intrinsic capacity, functional ability, and environments to empower older people. Robotics and AI align with these goals by offering solutions that can boost independence, improve healthcare outcomes, and support active participation in society. For instance, EU-funded projects such as (PHAR-ON, 2024) integrate cutting-edge IoT and AI technologies to offer tailored care solutions within smart homes, promoting older adults' physical and mental well-being.

The aforementioned projects are a few of many of the joint efforts aiming to explore robotics and AI capabilities as enablers for improved care. This work highlights these efforts providing a survey of existing 32 EU-Commission funded research projects focused on robotics and AI for older adults care since 2015. Despite excellent research in different places, including funded by individual EU countries, such as the Geriatric Lighthouse Initiative (2019–2027) from

Germany, this work is limited to projects funded by the European Research and Innovation Office as it better depicts the overall research in the region rather than specific country-wise efforts. Furthermore, the European Union has taken a proactive role in funding and coordinating large-scale initiatives aimed at addressing aging-related challenges, making it an ideal case study for this research.

Methodology

To identify relevant research projects, a thorough search was conducted using the European Commission's research platform for EU-funded projects (<https://cordis.europa.eu/>) and the Scopus database. The search targeted projects, started or available after 2015, related to older adults, social care, healthcare, and assistive technologies using combinations of the following keyword sets:

- Target groups: {"older adult", "old adult", "elderly"}
- Care-related: {"care", "healthcare", "social care"}
- Assistive technology: {"robotics and AI", "robot", "assistive technology"}

We reviewed all projects that contained any of such elements within the CORDIS platform. Over 110 projects were checked for the evaluation. From the projects' abstract, publication list, and deliverables, we selected only projects that had a clear connection to the three main topics that is, care for older adults empowered by assistive robots or AI technologies.

Furthermore, we search papers with the target keywords leading to a Cartesian product of the sets, that is, at least one element of all 3 sets should be available as the main topic of the paper. After reviewing the papers, we selected feasible projects based on the acknowledgement within those papers that were funded by the European Union. Finally, we explored existing surveys on assistive technologies for older adults. Particularly, we included a few projects available at Khaksar et al. (2023) and Sawik et al. (2023), which provide a comprehensive review of both healthcare robotics and physical design of robots for care.

Results: EU Robotics and AI Projects for Elderly Care

From the initial assessment, we were left with **32 projects**. From the existing list of projects, we defined a few heuristics for designing a European Taxonomy of European Projects for older adult Care. The first classification aspect refers to the target applications of the project. A detailed discussion of existing projects is given in the following section. In addition to the application, this survey also focused on the potential research topics to address the application area, which refers to the research focus areas. Finally, we evaluate the projects by the type of robotic system deployed. From our review and the aforementioned classification, we proposed the following taxonomy that organizes these projects according to their **applications**, **focus areas**, and the **type of robotic embodiment** used.

Applications

- **Social Robotics (SR):** Robots designed to mitigate loneliness, facilitate physical and social interaction, engagement and improve communication. Social robots are often associated with tasks such as reading stories and news, playing games together, among others.
- **Healthcare Robotics (HR):** Robots assisting with medical tasks such as health monitoring, medication management, and rehabilitation. These robots are mainly divided into monitoring/management, which focuses on perception and privacy issues, and physical rehabilitation which is mainly connected to safety.
- **Mobility Improvement (MI):** Robots focused on enhancing the intrinsic mobility capacity of older adults, including gait monitoring, exoskeletons, smart walkers and robot wheelchairs. Organizing the environment, and cleaning cluttered zones, to enable better walking is also included as a tool for mobility improvement.
- **Physical Activities of Daily Living (pADL):** Robots assisting with daily activity tasks that require physical engagement with the older adult. Those tasks include dressing, feeding, and sit-to-stand, among others.
- **Non-contact Physical Activities of Daily Living (ADL):** Robots designed to support ADLs improving the quality of living of older adults, their loved ones, nursing team, and caregivers. This includes transporting food, medicines, and other common items.

Research Focus Areas

- **[1] Personalization:** Projects aiming to tailor robotic services to the unique needs of each older adult.
- **[2] Physical Interaction:** Robots capable of physically assisting users in performing tasks.
- **[3] Health Monitoring:** perceiving anomalies and changes in behaviour, both cognitive and physical, e.g., gait, grasp, grip forces, highlighting any health anomaly requiring further investigation.
- **[4] Cognitive Impairments:** Robots designed to assist those with cognitive impairments through memory aids and engagement.
- **[5] Safety:** Projects aiming to mitigate risks of older adults living alone or at a care facility. Mainly addressing fall detection, protection during walks and sit-to-stand and contacting emergency.
- **[6] Contact-rich interaction:** Mostly required for household tasks and performing activities of daily living. It addresses one of the main problems in robotics, and the development of the focus area follows the development of manipulation research.
- **[7] Time and Activity Management:** Robots supporting the organization of daily schedules and reminders for

medication or appointments.

- **[8] Ambient Intelligence:** Integration of AI with smart home environments to provide seamless support for older adults.
- **[9] Ethics and regulation:** Addressing ethical concerns around robot use, especially regarding privacy and decision-making control.
- **[10] Discussion with Stakeholders:** Focuses on improving the communication with stakeholders and understanding of challenges from the field.

Embodiment

- **Virtual Agents:** Software-based robots that interact with users through screens or voice commands.
- **Mobile/Social Robots:** Robots designed for social companionship or engagement.
- **Manipulation-capable Robots:** Robots equipped with the ability to manipulate objects, enabling them to assist with physical tasks.

The full taxonomy of such projects is shown in Table 1.

Discussion and Conclusion

The results of the surveyed EU-funded projects highlight significant advancements and diverse applications of assistive technologies. These initiatives are mainly characterized by their focus on (22) personalization and (18) health monitoring, which stand out as the most common **focus area**, followed by (12) cognitive impairment management, mainly for dementia care, and (13) projects on ethics, and stakeholder involvement.

A key finding from the survey is the focus on **Social Robotics (SR)**, which emerges as a central application across 21 out of 32 projects. Examples like ENRICHME (2018) and SPRING (2024) indicate the focus on addressing loneliness, engaging older adults in meaningful activities, while assisting care professionals. Moreover, projects such as CARESSES (2017) aim to enhance social robots' cultural competence, ensuring appropriate interactions.

Among the 20 **healthcare robotics projects (HR)**, it is worth highlighting the effort to integrate ambient intelligence design through IoT and AI technology within 5 projects, e.g., SHAPES (2023). Several projects addressed the importance of privacy and ethics, e.g., PHArA-ON (2024), reflecting the sensitive data management in assistive care environments.

While 2 out of the 6 projects within **Mobility Improvement (MI)** focused on assistive devices – OLEA (2017) and the walker from ACANTO (2018) – the majority focused on exoskeleton design and evaluation, e.g., XoSoft (2019). Those are naturally also connected to health applications.

There are only 3 EU-funded projects addressing **Physical Activities of Daily Living (pADL)**. Those are focused on a

mechanical design for supporting bathing and dressing tasks, I-SUPPORT (2018), and CLOTH (2023) and DRAPPer (2020). Finally, there is only one project addressing **Household Non-contact Physical ADLs** such as transporting items, supporting meal preparation/delivery, and handling medicine – RAMCIP (2018).

Among the **embodiment category**, there are 5 projects which are fully AI-Based on human-human interaction for informing future HRI methods, e.g., ENTWINE (2023), an MSCA-Doctoral Network for training researchers on informal caregivers. Furthermore, a significant amount of (11) projects are designed with purely mobile/social capabilities and 7 have no embodiment, being purely virtual robotic systems. In total, those 18 projects aim at addressing non-contact-based tasks within SR and HR. This reinforces the argument that most projects are purely focused on social robotics and/or healthcare monitoring without fully being able to interact, assist with ADLs, or physically support older adults. Indeed, only 4 projects focused on robots capable of physical interaction, mainly for dressing (2).

Regarding the **embodiment**, 5 projects are fully **AI-based** for human-human interaction to inform future HRI – e.g., ENTWINE (2023), an MSCA-DN, aimed to train researchers on informal caregiving. Additionally, 11 projects focus solely on **mobile or social robots**, while 7 are purely **virtual robots** with no embodiment. These 18 address non-contact-based tasks in SR/HR, reinforcing the observation that the majority of the initiatives focused on purely social engagement or monitoring. This highlights a significant gap in addressing physical assistance with ADLs or direct interaction with older adults. Only a few projects (4) involve **manipulation-capable robots**, with two focused on assisting with dressing tasks.

These results highlight that a key challenge for advancing the field lies in improving **manipulation** and **contact-rich interaction** for pADLs and household ADLs in care settings. Despite significant progress in SR and HR, the technical difficulties of manipulation – such as grasping, lifting, and executing precise tasks – remain unresolved. Addressing these challenges is crucial for enabling robots to provide comprehensive physical assistance and support older adults in performing everyday tasks at home, allowing them to maintain independence for longer periods and improving their overall autonomy and quality of life.

Conclusion

While robotics and AI are poised to play a transformative role in care, there remains a critical need to advance the field of manipulation and contact-rich interaction for pADLs and ADLs. Future efforts should focus on improving robotic capabilities for physical tasks, and enhancing independence and quality of life for older adults.

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Table 1 | Summary of European Projects Evaluated in this Review Based on Applications, Focus Area and System

Projects	Funding Prog.	Years	Appl	Focus Area	Syst	Application and Research Focus Description
INBOTS	ICT	2018-2021	SR	[9, 10]	O	Collaborative robotics to promote widespread adoption of interactive robotic systems through engagement with stakeholders across industry, education, and regulatory fields.
OLEA	SME	2017	MI	[3, 7]	O	Development of the OLEA (Outdoor Lean Elderly Assist), a robotic device that funct. as both a rollator and scooter, designed to assist older adults with mobility, balance, and physical activity, indoors /outdoors.
Perlis ElderCare	SME	2018	[HR, SR]	[3, 5, 7, 8]	O	Ambient Assisted Living (AAL) system using AI to detect early frailty in elderly patients through monitoring daily activities, providing continuous early warning for caregivers.
GrowMeUp	H2020-PHC	2015 - 2018	[SR, HR]	[1, 7, 9]	●	Adaptive robotic system aimed at supporting independent living for older adults, learning from interactions to provide personalized assistance.
Acanto	H2020-PHC	2015 - 2018	[SR, HR, MI]	[1, 3, 7]	●	Focused on a robotic walker (FriWalk) designed to promote health by embedding training into daily activities., acting as a trainer and creating a network of users. Monitors well-being and enables group activities.
I-SUPPORT	H2020-PHC	2015 - 2018	[HR, pADL]	[2, 4, 5, 6, 9]	●	Assistive robotic system to help elderly individuals with daily self-care tasks, specifically in the bathroom environment.
RISE	H2020-MSC A-RISE	2016-2019	[HR]	[3, 4, 8]	O	Developed a SenseCare platform using AI, sensory data, and affective computing to monitor emotional and cognitive states in dementia care. Aimed at costs and improving well-being through personalized care.
ENRICHME	H2020-PHC	2015 - 2018	[SR, HR]	[3,4,5, 7,8,10]	●	Monitors older adults long-term and provide interaction to support mental fitness and social inclusion, and aids caregivers by identifying cognitive impairments and emergencies.
MoveCare	H2020-ICT	2017 - 2020	[SR, HR]	[1, 3, 4, 8,	●	Monitors and promotes activities to combat decline and isolation via a virtual caregiver and a community of peers
eNHANCE	H2020-ICT	2015 - 2019	[SR, HR]	[1, 2, 3, 4, 6]	●	Assists people with motor impairm., e.g., stroke-like conditions, by providing mechanical support to help them perform complex daily tasks. Focused on grasping and evaluates their strength.
ACCRA	H2020-SC1	2016 - 2020	[SR]	[1, 3, 9]	●	Cross-border collaboration to develop robotic solutions for older adults, focusing on adaptability and user-centered care in various environments.
EMPATHIC	H2020-SC1	2017 - 2021	[SR, HR]	[1, 3, 8, 9]	●	Personalized multi-modal virtual agent to assist older adults living independently. Provides, emotionally supportive interactions to combat loneliness, improve health, and simplify telecare access
MovAiD	H2020-FoF-2015	2015 - 2018	[HR, MI]	[1, 2, 3, 5, 9]	●	Designs and produces personalized assistive devices, such as braces and prosthetics, using advanced manufacturing techniques.
INCLUSIVE	H2020-IND-CE (RIA)	2016-2019	[SR, MI]	[1, 2, 7]	●	Focused on adaptive human-machine interfaces tailored to workers' capabilities, enhancing comfort and productivity in manufacturing. Support older adults, disabled, and inexperienced workers by reducing cognitive load and improving their interaction with machines.
SHAPES	IA - H2020-SC1-FA-DTS	2021 - 2023	[SR, HR]	[1, 3, 7, 8]	●	Focuses on smart environments for healthy aging, combining IoT, AI, and robotics to create adaptive living spaces that support elderly well-being.
ENTWINE	H2020-MSC A-ITN	2018 - 2023	[SR, HR]	[9. 10]	O	Addresses informal care systems, needs and challenges of caregivers across EU, and develops support technology for the well-being of both caregivers and individuals through digital tools and social support.
MAIA	H2020-MSC A-RISE	2020-2025	[MI]	[1, 2, 3]	●	Addresses the challenges of an aging workforces. Focuses on enhancing ergonomics, reducing physical strain, and preserving productivity and safety in manufacturing via immersive VR, smart tools, and exoskeletons.
ESSENCE	H2020-SC1-PHE-CORO NAVIRUS	2020-2023	[SR, HR]	[3, 7, 8]	●	Designed tele-assistance and virtual social-rooms with AI-based monitoring of cognitive and emotional state for early detection of risks in older adults and children focusing on prevention.

LIFEBOTS	H2020-MSC A-RISE	2019-2025	[SR]	[1, 4, 10]	●	Develops robots that interact socially with older adults providing companionship, and creating a knowledge hub for social robotics, improving care quality and patient well-being based on ADLs.
SOCRATES	H2020-MSC A-ITN	2016-2020	[SR, HR]	[1, 3, 4]	●	Focused on interaction quality, including emotion and intention recognition with social robots, supporting social and health monitoring.
e-VITA	H2020-SC1-DTH (RIA)	2021-2024	[SR]	[1, 4, 8]	●	Virtual coach to support active aging, improving quality of life for the elderly through virtual engagement, recomm.. and health monitoring.
RADIO	H2020-PHC (RIA)	2015-2018	[HR]	[3, 4, 8, 9]	●	Assistive robots to unobtrusively monitor older adults' daily activities, detecting early signs of cognitive or physical decline – maintaining privacy while ensuring secure data sharing among caregivers.
RAMCIP	H2020-PHC -2014-2015	2015-2918	[HR, ADLs]	[2, 3, 4, 6, 9]	●	Focuses on developing robots that can perform complex manipulation tasks, such as meal preparation and medication management, for individuals with cognitive decline.
CLOTH	ERC-ADG - Advanced Grant	2018-2023	[pADL]	[1, 2, 5, 6]	●	Aimed at developing a robots for manipulating textiles, addressing tasks like folding, putting on covers, and dressing assistance. Using ML, computational topology and RL to adapt to human needs and refines its skills, enhancing autonomy and physical support.
SPRING	ICT - H2020-ICT (RIA)	2020-2024	[SR]	[1,4,5]	●	Focused on socially-aware robots that engage in multi-party conversation in hospitals and geriatric care. Explored multimodal capabilities and open-domain dialogue to assist healthcare professionals, mainly in hospital settings, and notify staff of anomalies.
CARESSES	H2020-SC1-2016-2017	2017–2020	[SR, HR]	[1, 8, 9]	●	To develop culturally competent care robots, which can autonomously adapt their behavior, speech, and actions based on cultural context. The goal is to enhance the robot's sensitivity to the user's context, providing more personalized, culturally appropriate, and intuitive care.
Mario	H2020-PHC -2014-2015	2015–2018	[SR, HR]	[1, 4, 8]	●	Mario robot supports older adults with cognitive impairments, particularly in dementia care, via engagement and cognitive stimulation.
DRAPer	MSCA-IF-2016 - IF	2018-2020	[pADL]	[1, 2, 5, 6]	●	Focused on creating a robotic assistant to help individuals with reduced mobility dress themselves through pHRI and manipulation, using learning to adapt to user needs. The goal was to enhance independence.
XoSoft	ICT-24-2015 - Robotics	2016–2019	[MI, HR]	[1, 2, 3, 5, 9]	●	Focuses on developing soft, wearable exoskeletons for individuals with mobility impairments such as stroke or spinal cord injury patients. The design aims to improve comfort and adaptability in assisting movement
SOCIAL ROBOTS	ERC-STG - Starting Grant	2016-2023	[SR]	[1, 10]	●	Focuses on understanding how humans, including older adults, interact with social robots, emphasizing on the understanding of developmental, aging and cross-cultural neurocognitive perspectives on HRI.
CO-ADAPT	H2020-SC1-DTH-18-20	2019–2022	[SR]	[1, 8, 9, 10]	●	Adapts digital tools to help elderly individuals and their caregivers manage cognitive decline and stress through personalized interventions.
PHARa-ON	H2020-SC1-FA-DTS	2019-2024	[SR, HR]	[1, 3, 7, 9]	●	To integrate advanced IoT to support older adults' quality of life at home. It involves large-scale pilots across multiple countries to evaluate AI-powered care solutions and interfaces, and improve interoperability.

Applications: Social (SR), Health (HR), Mobility, (MI), Phys. (pADLs) / non-phys. Activit. of Daily Living (ADLs) **Focus Area:** [1] Personalizat.; [2] Phys. Interact.; [3] Health Monit.; [4] Cognit. Impairm.; [5] Safety; [6] Contact-rich; [7] Time Manag. [8] Ambient Intellig.; [9] Ethics/ regulat.; [10] Discuss. w/ Stakeholders; **System:** o- None, ● virtual, ● Companion-Monit., ● Mobility/wearable., ● Manipulation-Capable Robot.

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- Author¹  L.F.C. Figueredo is with the School of Computer Science, University of Nottingham, UK. He is also an Associated Fellow at the MIRMI - TUM.
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Authors²  The authors are with the Munich Institute of Robotics and Machine Intelligence (MIRMI), Technische Universität München (TUM), Germany.

Correspondence and requests for materials should be addressed to figuereido@ieee.org.