# RoboCare Design Workshop: Understanding, Translating, Operationalizing, and Scaling Up Design Knowledge Regarding Robotic Systems for Care Assistance


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## ABSTRACT

Robots and other autonomous agents are well-positioned in the research discourse to support the care of people with challenges such as physical and/or cognitive disabilities. However, designing these robots can be complex as it involves considering a wide range of factors (e.g., individual needs, physical environment, technology capabilities, digital literacy), stakeholders (e.g., care recipients, formal and informal caregivers, technology developers), and contexts (e.g., hospitals, nursing homes, outpatient care facilities, private homes). The challenges are in gaining design insights for this unique use case and translating this knowledge into actionable, generalizable guidelines for other designers. This one-day workshop seeks to bring together researchers with diverse expertise and experience across academia, healthcare, and industry, spanning perspectives from multiple disciplines, including design, robotics, and human-computer interaction, with the primary goal being a consensus on best practices for generating and operationalizing design knowledge for robotic systems for care settings.





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## CCS CONCEPTS

• **Human-centered computing** → **Accessibility design and evaluation methods**; **Participatory design**; • **Computer systems organization** → **Robotics**.

## KEYWORDS

human-robot interaction, care robots, design methods, older adults

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## 1 BACKGROUND AND MOTIVATION

Robots and other autonomous agents are well-positioned in the research discourse to support the care of people with challenges such as physical and/or cognitive disabilities [2]. For example, robots are being designed for supporting well-being and health in care homes [1], for helping to manage depression [6], or for assisting with work in hospitals [8]. However, designing robots for these populations can be complex as it involves considering a wide range of factors (*e.g.,* individual needs, physical environment, technology capabilities, health or digital literacy, *etc.*); stakeholders (*e.g.,* older adults, professional caregivers, technology developers, family, friends, *etc.*); contexts (*e.g.,* hospitals, nursing homes, outpatient care facilities,

*etc.*); and sustainability factors (*e.g.*, robot cost, durability, maintenance, efficacy, *etc.*) [4, 10, 15, 17]. The challenges are not only in gaining design insights for this unique application domain, but also in translating this design knowledge into actionable, generalizable guidelines for other designers [12, 14, 16, 18].

Toward this end, researchers have developed a range of design methodologies which are suitable for investigating robotic systems for care settings [9]. Different design methods such as ethnography, surveys, and participatory design each have their own benefits and drawbacks for accessing this pool of design knowledge. For example, a survey can reach a wide number of potential users and help identify which areas or tasks robotic systems for care assistance seem appropriate. A participatory design workshop with comparatively fewer participants, alternatively, can provide insights into practice and help to understand the tacit knowledge that goes unspoken. The use of robots outside of the laboratory poses challenges of its own due to their complexity—-while it is possible to engage social robots in conversation with people for longer periods in laboratories, there are some technical, social, and ethical as well as legal aspects to using robots for even simple physical tasks such as delivering cups of water.

Yet another challenge revolves around the various stakeholders involved in care support who would need to be involved in the design of the robotic systems [3, 7, 13]. Robot developers can say what is technically feasible. Caregivers know how to prioritize and balance different kinds of care tasks (*e.g.*, discreet or relational), how data should be documented, and what are the considerations of providing physical care. Older adults, as experts of their own daily lives, can provide insights into different ways of utilizing robots. Working with these different stakeholders can pose significant challenges. For example, high rates of caregiver turnover and burnout often leave care facilities short staffed [5], and thus these facilities may be less likely to have resources to participate in research. Additionally, older adults may not be able to verbalize their needs, which can make it difficult to involve them in research activities [11]. As user-centered design is critical to the success of robotic systems for care assistance, finding effective ways to engage various stakeholders is a pressing concern.

This workshop seeks to bring together researchers with a wide range of expertise and experience across academia, healthcare, and industry, spanning perspectives from multiple disciplines including design, robotics, and human-computer interaction. The primary goal of RoboCare Design Workshop is to develop a consensus on best practices on generating and operationalizing design knowledge for robotic systems for care settings.

## 2 WORKSHOP THEMES

RoboCare Design Workshop will focus on the following themes, which we hope will serve as a starting point toward developing best-practice guidelines for designing robotic systems for care settings:

***Design outcomes.*** Robotic systems for care assistance require careful design in all aspects, including their physical appearance, capabilities, interaction paradigms, behaviors, social characteristics, *etc.* Such requirements are commonly identified in design sessions or exploratory user studies. What are appropriate outcomes of a design study? How can we generalize these outcomes?

***Stakeholder involvement.*** Care involves a wide range of stakeholders, including care recipients, formal and informal caregivers, bystanders, *etc.* How do we select which stakeholders to include at which part of the design process? How can we work together with multiple stakeholders, for example either having one multi-stakeholder session or separate single-stakeholder sessions?

***Design methodologies.*** Debate and discussion surround the pros and cons of various methods such as surveys, participatory design, field deployment, lab study, *etc.* When are certain methods appropriate? How can we balance the common criticisms when we employ these methods?

***Reflections on design experiences.*** Conducting design work is challenging, and every researcher who conducts a design study has a wealth of knowledge regarding things that worked, things that could have gone better, or other informal insights that do not fit into formal academic writing but are of value to other researchers in the community.

## 3 WORKSHOP STRUCTURE

The workshop structure will include keynote speakers, author presentations, a panel, and small/large group discussions. Activities in the workshop will relate back to the themes of the workshop discussed in §2. Our primary goal is to encourage interaction and discussion among interdisciplinary researchers. Keynote speakers will share expertise on designing and evaluating assistive robots and on working with a wide range of stakeholders for robot design. Author presentations will create the opportunity for workshop participants to share contributions related to the workshop themes. With our panel, we aim to capitalize on Denmark's many initiative for robots in healthcare to bring a variety of experts from the industry to help enrich and guide our discussions and takeaways. At the end of the workshop, the organizers will lead a wrap-up discussion which will include highlighting key takeaways from the group and outlining next steps.

## 4 GOALS & ANTICIPATED OUTCOMES

The workshop has four goals, ultimately seeking to continue the conversation on the complexities of designing robotic systems for care. Each goal is outlined below:

***Bring together an interdisciplinary group for rich discussion of the challenges, considerations, and opportunities for designing robotic systems.*** Even though individual researchers may only have limited access to various stakeholders or care settings, this workshop will serve as an opportunity to exchange ideas between researchers with similar or different experiences. Overall, this type of discussion will enhance the strength of our community.

***Develop best-practice guidelines for designing robotic systems for care assistance.*** These guidelines could look like something such as suggestions for at which stage in design process which methods are suitable, how to combine methods into multi-faceted or multi-stage studies, how to address "limitations" within your own research, *etc.*, and their precise nature will depend on the topics emerging during the workshop discussion.

***Foster community within this special-interest group, allowing young researchers to interact and network with each other and with more senior researchers.*** The keynote speakers and panelists are leaders in the field, and we particularly find value in facilitating opportunities for young researchers to meet senior faculty in structured, welcoming settings. The workshop will also allow young researchers to meet each other, starting connections that can build a support network for students and young faculty.

***Provide a platform for emerging work, early ideas, or reflection on design practices in this area.*** In particular, many details of design practice and exploratory studies are left out of paper writing due to space constraints or lack of clear research contribution. Our workshop will provide a formal way to share such experiences which other researchers in the community may find valuable, including but not limited to reflections on design work, triumphs, or lessons learned.

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