

# Stereotyping of social robots in eldercare: An explorative analysis of ethical problems and possible solutions

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**Abstract.** Due to demographic aging, the relevance of social robots in eldercare is increasing. Studies indicate that gender stereotypes can play an important role in human-robot interaction and could be used strategically to optimize care processes and outcomes. However, as gender roles among older people become more diverse and societal recognition of different needs and preferences grows, such stereotypical notions appear increasingly problematic. Against this backdrop, our contribution provides an explorative ethical analysis of gender stereotyping in social robotics for eldercare. Starting from a principlist approach, we map potential problems and conflicts and discuss possible solutions for culturally sustainable social robots for eldercare in late-modern pluralistic societies.

**Keywords.** stereotypes, gender, care, ethics, robotics, queer theory

## 1. Introduction

Due to demographic aging, the change of traditional familial care structures and the lack of professional carers, the relevance of care robotics will increase in the next decades. In the field of eldercare, social robots are supposed to function as companions to relieve loneliness and facilitate communication, social interaction or entertainment. A more detailed discussion of the ethical implications of social robots is needed regarding this vulnerable population.

Social-psychological studies indicate that technology development and human-robot interaction are influenced by gender stereotypes. A prominent example are virtual voice-operated assistants such as Amazon's Alexa, Microsoft's Cortana or Google's Siri. In eldercare, this trend has continued. For example, care robots like RIKEN's ROBEAR or Fraunhofer's Care-O-bot 3 often have masculine attributes, such as strong 'muscular' arms. By contrast, many social robots use a soft feminine voice that may evoke a comforting female caregiver like Catalia Health's Mabu. However, as gender roles among older people become more diverse and the diversity of their needs and preferences receives more recognition, such stereotypical notions could pose a significant challenge to the implementation of culturally sustainable social robotics in modern pluralist societies. Stereotypical social robots may not meet the needs of all older users and in the worst case, might even reinforce social prejudice and discrimination.

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Against this backdrop, we provide an explorative ethical analysis of the acceptability of gender stereotyping in social robotics for eldercare. For this purpose, we use a broad concept of social robotics, also including robots that were not originally developed for eldercare as well as robots designed for but never actually used in eldercare. Starting from a principlist approach comprising autonomy, non-maleficence, beneficence, and justice, we map possible problems and conflicts such as the tension between a potentially beneficial impact of stereotyping on user compliance and wellbeing, and its implications for pluralistic values such as diversity and mutual recognition. Finally, we discuss possible solutions for culturally sustainable social robots for eldercare in modern pluralistic societies.

## 2. Background

People often tend to anthropomorphise technical devices, applying social categories to them and treating them like human actors [1]. This phenomenon has been widely examined in recent years, revealing that social categories are also relevant in human-robot interaction. For example, studies indicate that the presumed social group membership of a robot is relevant for its evaluation and that users prefer to interact with robots that appear to belong to their own group [2, 3, 4].

Gender is an especially important focus of recent socio-psychological research into human-robot interaction [5, 6, 7]. There are various studies on users' perceptions of a robot's gender and the relevant cues and markers. The studies make clear that these markers can be categorised in morphological, vocal and behavioural cues as well as individual-related information, e.g., name and corresponding pronouns [8].

As physical appearance is considered to be an essential element to define an individual's gender [9], *morphological cues* have a special role in human-robot interaction. Minor morphological cues can create a gendered perception of a robot, while robots without chosen gender cues are often identified as male [10]. The robot's body shape is one example of a morphological cue. Thus, waist-to-hip ratio and/or shoulder width can influence the perception of a robot as male or female [11, 12, 13]. Additionally, facial cues matter: A short-haired robot is perceived as more masculine than a long-haired one [5].

Other studies demonstrate the relevance of *vocal cues* for the perception of a robot as a gendered entity [14]. Cross-gender effects can be shown when the non-gendered appearance of a robot is combined with a male or female voice [7]. Vocal cues also effect gender-related occupational ascriptions [15]. They are closely related to *behavioural cues* like communication style that are also proved to have an effect on human-robot interaction [8].

Several effects of such gender attributions in human-robot interaction have been observed: Gender cues are relevant for the ascription of stereotypically male or female traits [13]. A robot's perceived gender also appears to factor into judgements of its competence [12]. The assumed suitability of a robot for a specific task seems to be closely linked to the perception of its gender. For example, when a security robot is equipped with a male or female voice and name, the 'male' robot is evaluated as more useful than the 'female' one [16]. This task-specificity is particularly important given that many robots tested or actually used in the care sector were not originally and specifically designed for care purposes but, for example, as industrial robots like Kuka's LBR robotic arms, or as companion robots in general like SoftBank's Pepper.

Kuchenbrandt and colleagues argue that social roles and attributions concerning gender-connotated tasks need to be considered in the design of robotic systems, and that especially 'traditionally female' professions such as nursing care should be taken into account in further research [17]. Some studies show that a 'male' robot is evaluated useful for stereotypical male tasks like repairing technical equipment or security activities, while a 'female' robot is deemed appropriate for stereotypical female tasks like household and care services [11, 12, 5]. Further research also indicates that gender stereotypes concerning different tasks impact the preferred robotic appearance. Thus, a study with a comparatively small sample of six indicates that older people applied the idea of nursing as a female task when deciding on a robotic appearance [18].

The overview of the existing research on gender stereotypes in human-robot interaction shows that the influence and efficacy of stereotypical gender attributions in robotics deserve closer examination. This is particularly relevant since there are considerations to use such stereotypes strategically in the development, design and implementation of social robots. Thus, the influence of gender cues in human-robot interaction is seen as an opportunity to increase user acceptance and to reach a better user experience [10]. For example, some suggest to use gender and age estimation algorithms to improve the reaction of a humanoid robot to a specific user implying that a specific gender/age behaviour is possible and desirable [19]. However, the ethical and social implications and consequences of gender stereotyping in robotics are rarely discussed. Pertinent comments are usually brief and cursory. Thus, Alesich and Rigby argue that gendering robots will change the understanding of gender in different cultures and societies either by reinforcing gender stereotypes or creating more gender diversity [20]. Eyssel and Hegel at least hint at a possible conflict between the desirability of stereotype-congruent robots to increase user acceptance – “the ‘easy’ road to acceptability” [21:545] – and the reinforcement of social stereotypes [5]. Robertson argues that gendered robots might perpetuate the relationship between body and gender in the area of robotics and this could lead to a robo-sexism with significant social consequences [22]. A more systematic and differentiated ethical consideration of these issues of gender stereotyping in social robots in eldercare is necessary.

### **3. Ethical Analysis of Stereotyping of Social Robots in Eldercare**

Eldercare is a particularly sensitive area regarding gender-stereotyping in robotics as it is traditionally laden with gendered role expectations. While there are ethical considerations of the general issues of robots in elder care [23, 24, 25], the issue of stereotyping in robotic care has not been considered so far.

In order to provide a systematic exploration of the ethical aspects of stereotyping in robotic care, we start from a principlist approach [26]. Originally developed in the field of medical ethics, the principlist approach defines autonomy, care (non-maleficence and beneficence), and justice as a set of middle-range ethical principles of professional practice that cover common moral intuitions as well as main traditions and aspects of ethical thought. Thus, it provides a suitable heuristic framework for detecting and analyzing potential moral problems and conflicts of stereotypes and stereotyping in social robotics for eldercare. In recent years, the approach has been expanded and adapted to other professional areas, not least nursing care [27].

The principle of *autonomy* demands respect for the patient's right to self-determination. In our context, this concerns the question of whether the use of stereotypes

in social robotics for older people rests on well-informed and voluntary user decisions or represents a subliminal manipulation by technology developers or caretakers. This becomes particularly critical when users with cognitive impairments are involved, since they are more vulnerable to deception and manipulation [28]. In addition, the decision for or against robotic stereotyping may also concern other household members and thus become a matter of relational autonomy and family decision making. Apart from the basic decision for or against the implementation of stereotyping in social robotics and the choice of particular features, the problem of autonomy also pertains to the use of stereotyped robots in everyday life and care practices, since these might lead to a subtle manipulation or restriction of user behavior, e.g., by reinforcing particular stereotypical communication styles and personal activities or blocking others. In this regard, the problem of stereotyping in robotic care touches upon the ethical debate on nudging [29]. In the long run, such everyday effects of stereotyping might promote or reinforce prejudiced attitudes and biases and thus lead to a long-term obstruction of the critical reflection of gender stereotypes in users. At the same time, in cases where there is a mismatch between the user's own perceptions of gender and the stereotyping strategies implemented in the social robot, the latter can manifest a latent disrespect towards the respective person, e.g., by constantly promoting or even enforcing conflicting gendered perspectives and practices.

The principle of *care* originally comprises the professional concern for the wellbeing of patients (beneficence) as well as the avoidance of harm (non-maleficence). In our context, this primarily refers to the consequences of stereotypes in social robotics for the users' bodily, psychological and social wellbeing, and quality of life. Thus, the question is whether and to what extent stereotyping leads to a robotically-induced increase in personal satisfaction, fulfilment and orientation or is rather detrimental. For example, on the one hand, the implementation of gender stereotypes may improve users' comfort and compliance with robotic care and thus raise the overall quality of care. On the other hand, however, such stereotypes may also induce or amplify discomfort, especially if there is a mismatch between the user's own perception of gender and the stereotypical features of the robot. Furthermore, the long-term influences of stereotyping on the users' fundamental preference structure itself must be considered. In particular, gender stereotypes in social robots may permit, induce or encourage the development of emotional bonding and could lead to romantic or even sexual relationships which might have problematic consequences, e.g., if the robot is replaced, withdrawn, or interferes with pre-existing relationships [30]. Finally, the effects of robotically induced or intensified gender stereotypes on the wellbeing of partners, caretakers and other persons in the care setting also have to be taken into consideration. After all, the implementation and daily use of stereotypical robots may induce or increase chauvinist and sexist attitudes, or even transgressive or intrusive behavior on the part of the user, thus creating difficulties and discomfort for other caretakers or household members.

The principle of *justice* originally refers to the claim of equal professional care and treatment for all patients, regardless of any medically irrelevant personal aspects and features. In particular, this implies the impermissibility of any discrimination due to sex/gender, age, religion, sexual orientation, ethnic background, etc. Accordingly, one central question refers to distributive justice and the problem of equal access to, and allocation of, stereotypical or non-stereotypical robots and the ensuing benefits or disadvantages for users. If, for example, stereotyping was associated with increased compliance and significantly better quality of care, access to stereotyped robots should arguably not be a matter of morally irrelevant or impertinent factors, such as, e.g., socio-

economic standing or insurance status. On the other hand, justice may also demand the provision of equivalent alternatives for those who do not want to make use of stereotyped social robots. At a more fundamental level, however, there is also the concern that the very idea of stereotyping in and of itself contravenes basic principles of justice in modern moral thought that call for equal respect and mutual recognition. Thus, one could argue that stereotyping of social robots implies the affirmation and reinforcement of traditional gender stereotypes and therefore amounts to a technological promotion of existing societal bias, injustice, and discrimination. Especially in late-modern pluralistic societies, the question is whether and to what extent the scope of stereotypical social robotics can really adequately match the diversity of gender identities of older people and the accompanying user perceptions, needs, and preferences, e.g., when non-binary gender identities come into play [31].

#### **4. Explanation, Neutralization and Queering – Suggestions for Solving the Stereotyping Issue**

Ethical aspects play an important role in the evaluation of social robots for eldercare. However, attributions of social categories such as gender in robotic care can pose ethical problems when they contradict fundamental ethical principles like the respect for autonomy, care, and justice. Three options appear to suggest solutions to these problems; (a) the explanation of robotic functions to dispel gender perspectives, (b) the neutralization of gender attributions, or (c) the queering of the attributions.

Firstly, the solution of *explanation* suggests that if the function and task of the robot is adequately explained to the users, they will learn to see it for what it really is: a machine. They will no longer project anthropomorphic cues and markers onto the robot to define it as a quasi-human companion but see it as a purely technical device. Indeed, some argue that knowledge about the technical characteristics and the presumed suitability for the intended task can reduce stereotypical judgement effects and therefore might function as a “moderator of gender stereotyping” [32]. However, this strategy does not solve the issue of power in the context of stereotyping and attributions. It rests on a questionable model of public understanding of science that conceptualizes technology in terms of essential functions and sees sociocultural attributions as merely subjective projections that can be dispelled by objective information. It does not acknowledge the cultural symbolism and social power structures that create gender attributions and might lead to stereotypes [33]. This is especially challenging in a sensitive area like care robotics that deals with the needs of vulnerable individuals. Thus, attributions and assumptions of gender might lead to an aggravation of autonomy and justice conflicts rather than solving them.

The second option would be *neutralization*. Its aim is to create a care robot which is gender neutral [5]. For example, it could be constructed to look indeterminate and possess features that can neither be ascribed as male or female. It could speak with a neutral voice and act in a gender-neutral manner. The idea of neutralization is appealing as it would solve any issues of stereotyping and possible discrimination through the erasure of any and all gender markers. The computer pioneer Alan Turing envisioned a machine which would overcome the boundaries between the binary and combine both, male and female, in a “universal machine” – a super-brain in the form of a wholesome concept of mind [34]. Yet, societal discourses are always gendered and split in a binary manner which relates the male and the female [34]. Technology or robots are not

excluded from this, because they are not excluded from societal discourse. Studies show that even if the robot does not have an obvious assigned gender, users tend to identify it as male, which reveals their binary mind-set [10]. Furthermore, we do not know and understand all gender cues, yet (and arguably never will). Gender is not static but rather a fluid construction that changes over time and place. To create a gender-neutral robot, it would be necessary to be aware of all cues to avoid their placement in the robot.

A third potential option could be the *queering* of the robot. This would constitute a middle ground between explanation and neutralization. Queering acknowledges the existence of gender attributions and the fact that they cannot be neutralized. Instead, it suggests a way to move beyond the binary of gender attributions and proposes a certain level of gender fluidity which adapts to the individual needs of the user. The idea of queering robots takes some inspiration from what has been called a cyborg, a cybernetic organism, a hybrid of machine and organism, which is part of a post-gender world beyond a binary gender order as a norm [35]. Taking up these considerations in the context of eldercare and thus “graying the cyborg” [36], one could imagine a ‘dragbot’, a care robot which is queered in the sense that it challenges previous notions of robots but also of aged care, the cared-for person, and the carer. The ‘dragbot’ resembles Haraway’s cyborg in that it could not be understood in binary terms of gender. It would not be human but rather posthuman [37]. It would be neither female nor male but could adapt its gender to the needs of the users. As such it would not rise above gender, but permit fluidity that incorporates male and female, and everything in between. Furthermore, the ‘dragbot’ could not only be fluid in the context of gender but also with regard to other social categories, for example, age and ethnicity/race. Nevertheless, the notion of moving beyond gender boundaries and creating a robot which acknowledges a world beyond the binary, the post-gender might be an illusion, because the construction of gender is a cultural condition [33]. Demanding a fluid, post-gender robot which adapts to all needs seems to presuppose that the users actually live in a post-gender world. However, they do not. They are very much formed by a binary society and to confront them with a post-gender robot might even mean to limit their autonomy rather than extending it.

## 5. Conclusions and Outlook

Gender is a relevant category in human-robot interaction and must be considered as a serious and complex issue in robotics. Especially the ethical and social consequences of gender stereotypes in the development and design of social robots emerged as a mostly neglected aspect of current research. With our explorative ethical analysis, we have offered a potential step forward.

The heuristic use of the principlist framework revealed a whole variety of potential ethical problems and conflicts regarding stereotypes in social robots for eldercare. Of course, further ethical perspectives should be considered in future analyses, for example eudemonistic questions of a good life. Furthermore, it makes an important ethical difference as to how exactly these stereotypes find their way into the robot. We will need to have to distinguish between bigotry as an inconsiderate infiltration with common stereotypes and stereotyping as the intentional and strategical use of stereotypical notions in social robotics. Further social research on the meaning and functioning of stereotypes in the context of social robotics is necessary in order to refine this distinction, also with regard to other social categories such as age and race [38].

Finally, we discussed three possible solutions for the issue of stereotyping in robotic care: explanation, neutralization, and queering. Explanation and neutralization ultimately represent a technological point of view. However, they have significant problems regarding their theoretical premises and social adaption. By only considering technological possibilities to create a 'transparent' or gender-neutral robot, these considerations fail to take into account important insights from social research, gender studies and cultural studies regarding the fundamental mechanisms of the cultural construction of meaning and its entanglement with social power structures. By contrast, the queering of robotics and the idea of a gender-fluid 'dragbot' represents a new, innovative perspective that deserves closer examination and elaboration.

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