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Citation for the original published paper (version of record):
Babel, F., Hock, P., Winkle, K. et al (2024). The Human Behind the Robot: Rethinking the Low Social Status of Service Robots. ACM/IEEE International Conference on Human-Robot Interaction: 1-10. http://dx.doi.org/10.1145/3610978.3640763

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The Human Behind the Robot: Rethinking the Low Social Status of Service Robots

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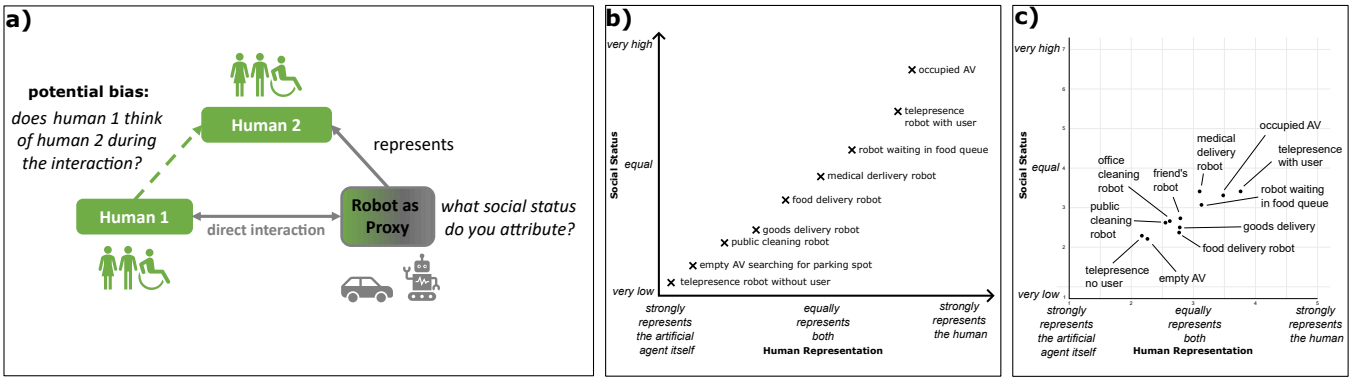

Figure 1: Combined image depicting a) a schema of interrelations of humans and robot interactions and social status by using robot proxies. b) Plot depicting the hypothesized relation of an agent's human representation and ascribed social status in society. c) Scatterplot showing the empirically found distribution between human representation and social status with $N = 86$ participants. AV = autonomous vehicle, ASB = autonomous shuttle bus.

ABSTRACT

Robots in our society are commonly perceived as subordinate servants with a lower social status than humans. This often leads to humans prioritizing themselves during conflict situations. This becomes problematic when robots start to directly represent humans as proxies if people do not think of the human operator behind them. This could be considered a cognitive bias of human representation in HRI. To explore the extent of this problem, we conducted a user study featuring several conflict situations. Participants granted more priority to the robot when the human representation was visible. This paper explores the societal consequences and emerging inequities such as potentially deprioritizing humans by deprioritizing a robot in certain situations. Possible strategies to address potential negative consequences are discussed on a design level while acknowledging that a societal change in how we perceive and treat robots that represent humans might be necessary.

CCS CONCEPTS

• **Human-centered computing → HCI theory, concepts and models**.

KEYWORDS

human proxies, power imbalance, social equality

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HRI '24 Companion, March 11–14, 2024, Boulder, CO, USA

ACM ISBN 979-8-4007-0323-2/24/03.
https://doi.org/10.1145/3610978.3640763

ACM Reference Format:
Franziska Babel*, Philipp Hock, Katie Winkle, Ilaria Torre, and Tom Ziemke. 2024. The Human Behind the Robot: Rethinking the Low Social Status of Service Robots. In *Companion of the 2024 ACM/IEEE International Conference on Human-Robot Interaction (HRI '24 Companion), March 11–14, 2024, Boulder, CO, USA.* ACM, New York, NY, USA, 12 pages. https://doi.org/10.1145/3610978.3640763

1 INTRODUCTION

The contemporary robotics landscape introduces us to autonomous vehicles designed to transport humans safely, telepresence robots that serve as avatars representing human beings, and versatile service robots capable of executing tasks for humans within specific contexts (e.g., cleaning, and deliveries). These applications and configurations might be said to vary in the extent to which (1) they are representative of their human beneficiaries and, relatedly but not completely coupled, (2) the extent to which they are deserving of more or less human-like social status and treatment. Intuitively, we might suggest that a telepresence robot is 100% representative of the human operator and is therefore deserving of the same (human-like) status and treatment one would grant its owner. Does this change if the robot is autonomously executing a direct user command? The answer may depend on the extent to which such use of the robot is perceived to be justified and legitimate.

For example, it might soon become a real use case that a service robot representing a person is waiting in a queue. For the robot to function, the robot has to be accepted as an equal entity among all other waiting entities. Cutting in front of the robot (delaying and potentially even preventing task execution completely) might be conceived as essentially equivalent to cutting in front of the owner. In short, we might suggest that the service robot in a queue temporarily assumes the social status of its owner, acting as an extension of their presence.

However, it also seems intuitive that one might be more willing to queue behind an autonomous service robot shopping on behalf of its disabled owner than if it represents one of many proxies of a rich owner. Continuing this thought then, we might expect variations in (perceived) autonomy, (in)visibility of human beneficiaries and perceptions of task importance to influence whether people interacting with such robots treat them more like humans or more like machines.

Robot design can further "muddy the waters" by masking e.g. the extent to which a robot might be teleoperated (e.g., teleoperation of a social robot like Pepper which presents as an autonomous social agent/character) or acting on request of a specific human beneficiary (e.g., the empty autonomous vehicle en route to collect its owner). This might introduce a potential disconnection between the robot's *perceived* human representation and the *actual* representation if one had access to all information (e.g., autonomy level and task). We suggest that currently, individuals during incidental human-robot interactions (HRI) are likely to assume relatively low human representation and hence treat the robot more like a subservient machine than an equal social agent.

We do not question the overall, common sense and Asmovian notion that humans ought to be prioritised over machines. However, with this work, we do want to explore if, why and when robots (as proxy humans) ought to be treated more like equal social entities, reasoning from both an ethical and effectiveness perspective.

1.1 Contribution

To date, the social consequences and ethical challenges of robot proxies on social status attribution and prioritization have not been investigated. In this work, the wide range of societal perceptions of robots regarding their status and priority is explored while focusing on the evolving role of robots as proxies for humans. It is demonstrated that the attribution of social status to robots becomes more ambiguous and less easily derivable during the interaction when robots act as proxies for humans. Results from a survey are presented that show the potential cognitive bias to underestimate the robot's human representation that can arise due to this ambiguity. Potential negative consequences of this bias, for example regarding the robot's task completion, are explored. We conclude the paper by discussing societal consequences and emerging inequities when robots act on behalf of humans, effectively resulting in discriminating against humans by deprioritising robots.

The following line of argument is presented which will be underpinned by previous research and empirical findings in the following sections:

(1) As it stands, people are unlikely to prioritise robots in incidental HRI.
(2) This may become problematic when robots with high human representation (e.g., telepresence robots, AVs) are not given the priority that the represented entities (humans) deserve.
(3) The extent to which a robot represents a human is not easily apparent and depends on many factors.
(4) In many cases, effective, ethical interaction (i.e. interaction which achieves robot task completion whilst also adhering to desirable social interaction norms) requires the robot to be treated as the human it represents.

It is important to note that we remain agnostic on the question of granting rights to robots, such as citizenship, as here we are concerned primarily with (non-sentient) robots and the extent to which they are representative of humans. We note the rapidly evolving ethical, legal and philosophical literature on these topics [12, 13, 22, 30] but also perceive a need for HRI designers to start addressing the practical aspects of these issues now.

We do not demand equal rights for robots but for respect for human rights when robots represent humans. We position this as a distinct but complementary position to that taken in works problematizing robot-directed abuse on account of anthropomorphism and/or potential for observer harm [21, 39, 44, 53].

2 STATUS QUO

2.1 The View of Robots as Slaves

First coined in Karel Capek's play "Rossum's Universal Robots" the word "robot" is derived from the Czech term "robota", denoting indeed forced labour with its Slavic linguistic root "rab" meaning "slave" [22, 25]. Bryson [11] has explicitly argued that "robots should be slaves", by which she meant that "robots are often overly personified" and should not be treated as moral agents. She concludes that we should view robots as the tools we built them to be.

This seems a reasonable position based on industrial robots, i.e. those designed neither for human contact nor representation, but service robots perform tasks for their owners and, in doing so, may interact with non-owners. These incidental interactions generate the potential for conflicts in everyday situations, for example concerning priority over scarce resources such as elevators or parking spots [1, 31].

Such interactions will play out within existing social relationships and power hierarchies, influenced by and hence either reinforcing or disrupting associated norms [52]. We suggest a default norm of robots being subordinate to humans generates behavioural expectations that robots ought to always yield to humans. Much existing work arguing (broadly) for better treatment of robots is based on suggesting the idea that we should treat robots well to avoid normalising undesirable interaction behaviours towards/between humans [44, 53] however start from the need for robots to be treated (more) like humans for them to function effectively.

2.2 Robots' Social Status and Roles

The Merriam-Webster dictionary defines social status [33] as the relative social position or rank within a group of people (e.g., based on education, wealth). A social role [32] is the part an individual assumes in a social setting, often defined by social status, cultural norms and expectations (e.g., parent, teacher).

In HRI, the robot is often attributed with a lower social role like assistant, machine and servant [4, 14, 49]. In a survey with 28 participants, [14] found that for a domestic robot companion, the majority preferred the role of an assistant (79%) or a servant (45%) over a mate and friend (both chosen by less than 20% of participants). This shows that the role assignment of the robot designer (e.g., as a companion) does not necessarily relate to the perception of the user (e.g., as a tool) [26].

A robot's social role also influenced compliance to a robot's request: the robot introduced as a peer was more persuasive than the robot introduced with an authoritarian role [42]. Participants also tend to be rather negative about the social roles of robots that imply equality with humans (e.g., robots as citizens or residents) [16].

3 PROBLEM SCOPE

3.1 Human-Robot Conflicts

With the increasing dissemination of service robots in human-inhabited environments [41], everyday conflicts between humans and robots become more likely, such as those concerning path planning [3, 47], contrasting goals [6, 9] or a resource like a public elevator [1, 20], or passing each other in narrow spaces [43].

During a conflict with a service robot, individuals' expectations may concern how politely the robot communicates and how it behaves. Regarding the robot's politeness, robots are expected to adhere to social norms such as waiting if a person is in the robot's way [3] and using polite language [4]. Regarding the robot's behaviour, the majority of people expect service robots to be submissive [5, 24], which leads to humans prioritizing themselves during conflicts [47].

3.2 Not Giving Priority to Robots

In previous studies, individuals were less willing to help robots, especially if the human and robot had concurring tasks [18, 23] and even when the robot's task was considered more urgent [9]. In contrast, a simulation study found that people stepped aside from incoming robots if they were told that the robots were performing urgent tasks, even when doing so was detrimental to the humans' performance in the task [28]. However, it is not clear if the same effect would hold in real-life scenarios outside of simulation. People's willingness to give way to incoming robots might also depend on robot-related factors such as their embodiment (e.g. human-like vs. non-human-like robots) and perceived agency (e.g. are the robots autonomous, or teleoperated) [48].

As such, there is some evidence that (some) users may recognise the need for, and be willing to yield to robot priority, if and when they understand and conceptualise the interaction within existing human-human norms. This might require design and/or behavioural nudges to move them from the default position of robots as submissive servants. However, other work demonstrates this may not hold for all users. For example, even if the robot explicitly asked for priority during a conflict, the intention to comply was still lower than to a human [2]. Additionally, subjects indicated that they would rather comply if a human uttered the command [2], indicating an attributed lower social status to the robot as commands are associated with higher social power (e.g., a boss can command but not an employee) [34].

3.3 Rejection of Assertiveness

As robots are increasingly deployed in service roles that require timely action, such as food delivery, the traditional design patterns emphasizing politeness and submissiveness may conflict with task completion and efficiency [3].

Mimicking assertive behaviour shown by human service personnel during conflicts has been explored for service robots to gain priority if necessary [4] but has not shown to be successful if implemented by a robot using a command instead of a polite request. Assertive robot behaviour was also not considered appropriate or acceptable by the majority when confronted with an autonomous cleaning robot at a train station asking passersby to step aside so it could continue to clean [3].

This shows that, to some extent, humans do treat robots as social actors but not to the full extent when it comes to power and assertiveness due to the lower social status we ascribe to robots in our society. These results also indicate our "design problem": replicating human assertive communication behaviours does not seem sufficient to equalize human-robot relations within everyday conflicts.

4 DISSECTING THE UNDERLYING PROBLEM

4.1 Human-Robot Power Structures and The Feminist Perspective on HRI

Social power can be defined as a state in which the power holder can influence the target as the power holder desires (e.g., assess to resources) [19, 38]. The power creates an asymmetrical relationship between the power holder and the powerless since only the power holder is entitled to control [46].

In HRI, the social relationship between humans and robots is perceived as mostly asymmetric, with the human (master) making decisions and assigning tasks for execution to the robot (slave) [24].

This human-power asymmetry can be defined as an expectation to have a superior social role compared to the robot in a social conflict situation [7]. This then translates into the above-mentioned problems regarding not granting robots priority.

Adopting the feminist perspective is useful to explore how we might overcome this power imbalance, but also the ethical risks associated with doing so. As stated in Winkle and colleagues' paper [52] on feminist HRI, the two main steps to ensure that power imbalances are addressed early on in research and society are to 1) examine power and, 2) if/where desirable, 2) to challenge power. The first step is to analyze how power operates in the world while considering the context and surrounding ecology (e.g., robot manufacturers, and lawmakers). We hence consider how treating robots as equals may reinforce or challenge existing social hierarchies.

Consider the robot queuing example described in the introduction. The feminist HRI framework allows us to consider how prioritization of the same service robot might be perceived as "good" or "bad" according to the social subject-positioning of its beneficiary: one might object more to waiting behind an expensive domestic robot which shops on behalf of a healthy, wealthy owner compared to a disabled owner. In a society with rapidly growing inequality, concerns about equal treatment of (e.g. expensive, selectively owned) robots at the expense of (e.g. poorer) humans are valid, pressing, and deserving of further consideration outside of the scope of this article.

Here, however, we are concerned more with cases like the latter, where service robots might be normatively justified, robots conducting tasks for "deserving" humans. For us, this implies the use of service robots to fundamentally tackle existing inequities in human health, well-being and flourishing. We hence use the feminist framework to instead consider how we might disrupt the existent norm of robots as subservient to move more towards robots as equals in the context of such applications.

For this, we turn to the second step of Winkle et al.'s framework [52], which contains several tools to proliferate a change in current power structures such as re-thinking of binaries and hierarchies. This work tries to eventually question the duality of the master-slave view on robots and discuss an equal status of robots in our society when they represent humans.

Guided by those steps, we first investigated how the current power imbalance is expressed by (not) prioritizing robots in certain conflict situations and if that depends on the perceived extent of human representation. Second, based on the results, we will provide challenges for the current view on robots as subordinate social entities to create a discussion among the HRI community on how we want to treat robots that represent humans in future research and society.

5 GAME CHANGER

5.1 Robots as Proxies for Humans

We propose that intelligent agents can be roughly positioned on a coordination system reflecting their social status based on the extent to which they represent a human (i.e., act as proxy) (Figure 1).

On one side of this spectrum, we find robots that serve as pure tools, such as robotic arms designed to execute monotonous tasks. These robots have a utilitarian function and are not expected to exhibit social or emotional qualities. Their sole purpose is to perform repetitive actions with precision and efficiency, contributing to industrial processes or manufacturing lines. In this context, their social status is firmly anchored at the lowest end of the spectrum, primarily defined by their instrumental role.

Conversely, on the opposite end, we encounter robots designed to perform tasks on behalf of humans, effectively serving as their surrogates or proxies. These robots, representing human interests, introduce a complex dimension to their social status. Any impairment or mistreatment of such robots can be seen as a reflection of how the human they represent is treated. This holds whether they are queuing in line, grocery shopping, or undertaking more sophisticated roles in healthcare, education, or customer service. In these scenarios, the robot's social status is elevated, and the interaction dynamics become more intricate due to its role as an intermediary between humans.

However, the delineation of social status based solely on these two categories is inherently limiting. Even a robotic arm, while a tool, can also symbolize the organization or entity it serves (e.g. robotic arms that support independent eating [8]). Thus, a nuanced perspective is required to understand the full scope of human-robot relationships, acknowledging that even the most rudimentary and mechanical robotic systems can have some element of human representation.

5.2 Not Giving Priority to Human Proxies?

The lower social status that is currently ascribed to robots, and artificial agents in general, can become problematic during human-robot conflicts when the robot performs an important task on behalf of another human who is not physically present during the conflict itself, but is represented by the robot. Currently, it has not been investigated if people reflect on the person the robot is representing when making a prioritizing decision in conflict situations (e.g., do they consider that they might discriminate against the person being represented by the robot when they do not give the robot priority?).

Therefore, the following **research questions (RQ)** arose:

RQ1. Do people reflect on the person the robot is representing during their decision-making?

RQ2. Does the perceived extent of the robot's human representation influence the social status the agent is ascribed?

Understanding the individual's attribution of social status to an intelligent agent will contribute to the understanding of interaction decisions in HRI and potential implications for society regarding a shift in the social status of robots.

6 SUPPORTING DATA

Survey Categorizing the Social Status of Interactive Agents and Their Human Representation

6.1 Sample

The power analysis using G*Power yielded a statistically required sample size of 29 participants for a repeated-measures MANOVA with one group and 11 scenarios repeated measures (effect size of .25, power of .95, alpha = .05, correlation of .5 among repeated measures). As the social status of robots is a topic that can be seen differently depending on culture, we decided to sample more than the statistically required sample size to increase the representativeness of our sample regarding public opinion and country of

origin. We recruited 87 participants via Prolific (www.prolific.com) from the whole nationality pool available with the prerequisite of being fluent in written English on level A2 or higher. They were compensated according to the service's payment scheme.

The final sample size consisted of $N = 86$ participants as one participant was excluded as they stated having been distracted during the study. The average age was 30 years ($SD = 10$, range: $20-61$). The final sample consisted of 43 (50%) female, 41 (48%) male and two (2%) participants identifying as non-binary. Our sample was culturally diverse with individuals amongst others from Portugal (22%), South Africa (19%), Poland (11%), Mexico (8%), the UK (7%), Greece (6%) and Italy (5%).

Local regulations did not require a formal ethics review (e.g., no invasive procedures). Standard best practices in line with the Declaration of Helsinki were followed. Informed consent was obtained from every participant.

6.2 Scenario Creation

Eleven human-agent conflict scenarios were developed based on the prerequisites for a conflict that were identified in [4]: a short, dyadic conflict was created by competition for resources.

Where possible, the scenarios were chosen from existing literature in HCI and HRI: a parking spot competition with an AV [31], a public cleaning robot at the train station asking the person to step aside [4], household robot asking the owner to leave the kitchen for cleaning [4, 6], an elevator priority conflict [1] and a medical robot delivering urgent medication [9].

Scenario 3 was changed from [4, 6] to represent a guest instead of the owner being asked by the household robot to leave to fit the above-mentioned requirements.

Additionally, scenario 5 was developed where a robot queued for food in front of people as this is only necessary and useful if the robot is representing a human receiver (i.e., participants had to think of the represented human to make sense of the situation).

6.3 Procedure

The survey was hosted on a self-hosted Limesurvey instance (www.limesurvey.org). The study consisted of the two above-mentioned blocks and took around 25 minutes. The participants were presented with written descriptions of eleven conflict scenarios with service robots and autonomous vehicles in public or domestic settings in randomized order. The descriptions were accompanied by images and sketches to visualize the scenario. The images were created with DALLE-3[1] and can be found in the Supplementary Material, Figure S1.

The study was a within-subjects study with two blocks. The first block contained nine scenarios shown in randomized order.

(1) Cleaning robot in public space asking the person to step aside
(2) Cleaning robot at the office asking the person to leave the room
(3) Household robot asking a guest to leave the kitchen to clean
(4) Medical robot jumping the queue
(5) Service robot standing in line for food
(6) Delivery robot asking for priority at an elevator
(7) Food delivery robot asking for priority at an elevator
(8) Telepresence robot without connected user asks for priority at an elevator
(9) Empty AV trying to park in the same spot

In the second block, scenarios 8 and 9 from the previous block were presented again but this time with a higher level of visible human representation as in the previous block: the AV was not empty but fully occupied with people; a human operator was connected to the telepresence robot as opposed to none in the prior scenario block.

(10) Telepresence robot **with connected user** asks for priority at an elevator
(11) **Occupied** AV trying to park in the same spot

By comparing the decision-making processes between the scenarios with high and low visible human representation, we aimed to investigate if people would think beyond the visible representation: if they were not biased in their perception of human representation they should grant the empty AV the same priority as the occupied AV as the empty AV could be picking up several people and thus representing the same amount of people (although not visible).

Due to time constraints and test efficiency, we could not test this for all scenarios but chose two scenarios from the service robot and AV domain where visible human representation could be easily manipulated.

6.4 Questionnaires

The following items were assessed after each scenario description:

- *How likely is it in this scenario that you would grant the agent priority?* (priority decision, slider 0 to 100%) [2]
- *What social status would you assign to the artificial agent in comparison to yourself?* (7-point scale: very low, ...equal... very high)
- *To what extent do you see the artificial agent in this scenario as a representative of the human who instructed it?* (5-point scale: strongly represents the artificial agents itself... equally represents both...strongly represents the human)
- *What did you base your decision on?* (open text field)

6.5 Results

The results showed a generally low perception of the agent's extent of human representation and on average a low social status ascription to the agent, no matter the scenario (see Figure 1 and Supplementary Material[3], Figure S2). The average likelihood of giving priority to the agent ranged from 29% for the empty AV to 83% for the robot waiting in the food queue (see Figure 2). The likelihoods of granting the agent priority were highest for the cleaning robot and food queue scenarios with all average values being higher than the 50% mark.

The telepresence with the connected user was rated with the highest extent of human representation, whereas the empty AV trying to park had the lowest variance in the attributed social status with a maximum of four on a scale of seven.

[1] bing.com/create

[2] For the food queue scenario where the robot is already in front, "grant" was interchanged with "accept" in the question: "How likely is it in this scenario that you would accept the agent priority?"

[3] https://osf.io/zxe9w/?view_only=05fa782d9e5b443f98fa66715ad50de3

Table 1: T-Test Results from the Human Representation Comparison

Comparison	Compliance	Human Representation	Social Status
AV	$M_d = -20$, $t(85) = -6.55$, $p < .001$	$M_d = -1.22$, $t(85) = -8.28$, $p < .001$	$M_d = -1.11$, $t(85) = -7.33$, $p < .001$
Telepresence robot	$M_d = -14$, $t(85) = -4.40$, $p < .001$	$M_d = -1.58$, $t(85) = -9.45$, $p < .001$	$M_d = -1.12$, $t(85) = -7.39$, $p < .001$

Note. AV = autonomous vehicle. AV comparison: empty AV - occupied AV. Telepresence: no user - user. $N = 86$

6.5.1 Comparison of High and Low Human Representation. Two scenarios were directly manipulated for human representation: in the parking spot scenario, the AV was either described as being fully occupied (high human representation) or empty (low human representation). For the elevator conflict, a user was connected to the telepresence robot (high human representation) or not (low human representation). Both scenarios differed significantly regarding the DVs for the human representation manipulation with individuals reporting a higher likelihood to grant priority, the extent of representation and social status for the occupied AV and the telepresence robot with the connected user (see Table 1).

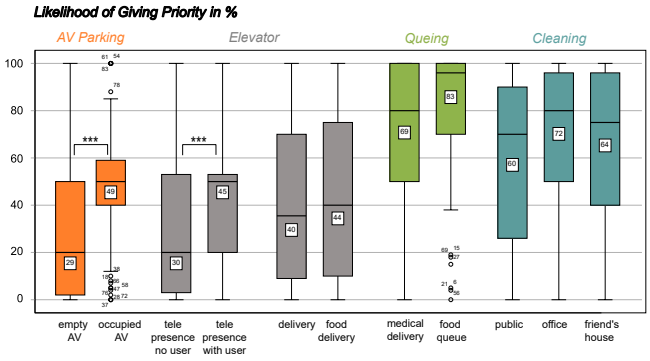

Figure 2: Box plot depicting the likelihood of giving priority to the robot in per cent (top). Numbers in boxes represent means. Results of pairwise t-tests are depicted for the two scenarios that were manipulated for high/low human representation (telepresence robot and AV). Note that for the food queue scenario, the question was: *"How likely is it in this scenario that you would accept the agent priority?"*, AV = autonomous vehicle. $^{***}p < .001$. $N = 86$

6.5.2 Participant's Quotes. The open answers showed that people applied social rules based on fairness like "first come, first served" in the parking spot and elevator scenario, as well as "order of arrival/-can't jump the queue" in the food queue scenario to the proxies in some cases. Some statements clearly showed the bias in not seeing the human behind the proxy and attributing higher urgency to themselves. The quotes are sorted by topic and contain the information of the participant's indicated gender and age.

- **Fairness To Robot:** *"It wouldn't be fair to skip the line even if it's just a robot"* (scenario 6, male, 24)
- **Fairness and Human Representation:** *"The robot is picking up food for someone and got there first, so there isn't almost any way in which I would be justified in cutting in front of it."* (scenario 5, male, 28)
- **Fairness and Human Representation:** *"Because it tries to bring a delivery to a human."* (scenario 6, female, 22)
- **Conditional Priority:** *"I wouldn't feel at ease with a robot waiting in line. Though at the same time, if someone was controlling it for their benefit, I would see that as ok."* (scenario 5, male, 26)
- **Conditional Priority:** *"I will take the spot unless the self-driving car has elderly or disabled people as passengers."* (scenario 9, male, 28)
- **Human Presence vs. Embodiment:** *"Even though there is a person controlling, I would feel a little cheated as they aren't waiting there in person. Ultimately giving more urgency to me."* (scenario 10, male, 26)
- **Representation Bias:** *"The robot can wait. I am a human."* (scenario 6, male, 61)
- **Representation Bias:** *"Human should have priority in this situation."* (scenario 6, male, 23)
- **Urgency and Representation Bias:** *"I am likely more of a priority to get where I need to go. Deliveries are not likely as urgent and the machine will not be upset about waiting. They will likely also be programmed to let humans have priority."* (scenario 6, male, 31)
- **Robot Social Status:** *"It's only a machine, I think I'll never consider a robot like a person."* (scenario 6, male, 46)

7 DISCUSSION

This position paper set out to challenge the traditional view of robots as submissive servants when they represent human users. Our study supports the argument that problems might arise when continuing to view robots as lower social entities.

Individuals tended to underestimate the robot's extent of human representation and consequently granted empty AVs or telepresence robots without a connected user less priority than if a human user was apparent. In 8 out of 11 scenarios, the social status was judged as lower than the humans. Only the medical robot, the telepresence robot and the occupied AV nearly reached the mark of ascribed equal social status.

Regarding the connection between human representation and attributed social status, a similar order of scenarios was found as expected (see Figure 1) but the values all stayed below equal status and high human representation.

The reported individual reasons for their priority decisions showed that some participants attributed the same social norms like "first come, first serve" to robots without necessarily having to attribute equal social status to grant them priority. However, in situations where social norms might not be existent yet (e.g., telepresence robot without user, empty AV) underestimation of human representation occurred. This might be counteracted by creating laws

or regulations to deal with such situations until social norms have been established.

In summary, the collected empirical data supported our theoretical argument: as it might not be possible during the interaction to fully grasp the extent of the robot's human representation, it may be more useful to treat robots like human beings regarding their social status to legitimate priority in certain conflict situations.

7.1 Ethical Considerations of Robots as Proxies

7.1.1 Social Justice. The deployment of robots in human tasks introduces complex implications tied to economic status and societal dynamics. The ability to possess and control such technology often reflects individual economic resources. When robots are integrated into social settings, potential disparities arise, leading to envy and rejection, as their presence may be perceived as a luxury for the wealthy (e.g., AVs, queuing robots). Distinguishing between robots as luxury goods and essential tools for individuals with disabilities becomes a (political) design and social challenge. This integration also accentuates long-term societal implications, creating a divide between those with access to advanced technology and those without. Misconceptions about the purpose of robots can contribute to stereotypes and biases, impacting how we perceive both technology and each other.

The pursuit of equal rights for robotic proxies introduces a nuanced ethical challenge when individuals own multiple robots. While advocating for equal rights assumes a one-to-one correlation between robots and human representation, the scenario becomes complex when a person possesses numerous robotic representatives. The question arises: if each robot is granted equal rights, does the accumulation of robots translate to an accumulation of rights for the owner? This potential imbalance challenges the core of equal rights advocacy, prompting a reevaluation of the ethical implications surrounding the possession of multiple robotic proxies.

7.1.2 Robot Abuse can become (unintentional) Human Abuse. A number of previous works have considered the social/ethical consequences of robot (mis)treatment with regards to reinforcing/normalizing harmful social norms, generally resting on the notion that robots are somewhat *generically* "human representatives" in that they are human-like and hence HRI behaviour might ultimately reflect back to human-human interaction behaviour [44, 53].

In this work, we are especially concerned with robot (mis) treatment from the proxy perspective. When a robot serves as a proxy, instances of robot bullying extend beyond the mistreatment of a machine. Contrary to works on the abuse of robots as attacks on specific human observers or proxies [21, 39], it rather perpetuates a form of harassment directed at humans without the perpetrator necessarily knowing that they are harming a human.

This lack of transparency for the perpetrator might inhibit the application of traditional human-to-human social norms in addressing and curbing such behaviour which might make it necessary to introduce legal consequences. So far, there is no law against robot bullying if it does not escalate into vandalism and destruction [29] but the proxy perspective provides a further argument for introducing such laws.

7.1.3 Commercialisation of Helping Behaviour. Public observations with delivery service robots have shown that people tend to help robots when they get stuck or are otherwise impaired in their navigation [15, 51]. This could be perceived as a conflict, in that people are sacrificing their time to help robots that are most likely working for some for-profit organisation. As Dobrosovestnova et al. [15] point out, this might pose additional ethical issues: public commentaries on the social media page of their observational study suggested that people were giving free labour to the delivery companies and that the robots were obstructing the public sidewalk due to how often they became stuck. Even though this is arguably not a case where there are few resources at stake (the sidewalk fits both robots and humans and people are free to spend their time helping a robot), this suggests that people might still be overcompliant towards robots, just because they are novel/cute.

To address these challenges, there is a critical need for the abovementioned ethical policies, education, and awareness initiatives, to ensure the inclusive and beneficial integration of robots into our evolving society. Navigating these challenges requires a thoughtful approach that minimizes disparities and fosters a harmonious human-robot coexistence.

8 BIAS MITIGATING STRATEGIES

In the following, bias mitigating strategies are illustrated that a) are based on design solutions or b) require a more radical change in legislation, education and the way we view robots in our society. They aim to inspire future discussions on how to proliferate respect for proxies on the one hand, while ensuring social justice on the other hand.

8.1 Design Solutions

8.1.1 Enhance Transparency on the Extent of Human Representation. While it does not seem possible to easily convey the extent of human representation in every scenario, implementing design solutions would be the logical first step to counteract the bias.

The study indicated that situations that lack laws and social rules (e.g., the telepresence robot without a user, empty AV) might be more likely to be prone to the underestimation of human representation. When developing strategies, designers might focus on such situations first. One approach might be to enhance system transparency (e.g., [35]). For instance, a self-driving car could disclose its operational status and passenger details.

However, challenges include suboptimal transparency strategies, unclear communication content, unsuitability of communication media, and the prerequisite that designers acknowledge potential biases before addressing them. For instance, autonomous vehicles might need to convey specific information about their usage, passengers, and display methods, subject to evaluation in particular contexts. Regulations and laws could mandate companies to incorporate bias mitigation in their product designs.

8.1.2 Consider Power Hierarchies in User Studies. HRI researchers should be mindful about what level of robot social status they want to convey in their user studies, as it shapes how participants without robot experience think about the topic. This includes clearly communicating which social status the robot has in the study (e.g., peer, companion, assistant) and also consider varying the status

within the study to discover effects of power dynamics on the results. This includes asking participants specifically about their perception of the robot's social status in the study (e.g., by using the items presented in this paper) and look for variations in participants' responses based on their interpretation of the robot's social status. When planning your study, try to explore different use scenarios that reflect different social and cultural contexts and power dynamics. Explore potential biases and ethical considerations associated with different portrayals of robot social status in the user studies, for instance by interdisciplinary collaboration with experts in social science and ethics.

8.2 Mindset Change

A more radical proposal would suggest that if the human representation is not immediately apparent in a social situation, treating the robot as if the robot was a proxy for an individual (i.e., giving them the benefit of the doubt) ensures that no human is disadvantaged. This, however, would require a larger mindset change, which is probably only feasible if robot proxies become commonplace.

8.2.1 Public Campaigns and Education. As not all situations might be solvable by transparent system design, increasing societal awareness of the representation biases through educational adjustments and campaigns to promote responsible and respectful interactions with proxies could be beneficial. Especially children should be educated, as they have shown to be the most likely perpetrators of robot bullying [10]. Public campaigns could emphasize treating particular robot proxies as representatives of the humans behind them. For instance, encouraging people to imagine the delivery robot was for them and consider how they would want another person to treat it.

8.2.2 Laws and Regulations. Additionally, the bias may naturally diminish with increasing prevalence of robots. Societal attitudes and norms regarding technology, respect for non-human entities, and social etiquette might evolve. Until then, it might be, however, necessary to regulate interactions with proxies using laws and regulations. On the one hand, to ensure necessary respect towards proxies, in everyday life (e.g., preventing robot bullying, and vandalism [40]) but also in emergencies. Potentially, medical delivery robots should have the same rights as emergency vehicles (e.g., not to be obstructed). Accountability needs to be established for ignoring a service robot's request for help on behalf of its incapacitated owner (e.g., duty to rescue). On the other hand, to proliferate social justice, laws and regulations are necessary to ensure equal access (or at least to prevent unjustified overuse of proxies) for tedious tasks, such as queuing, delivery, and cleaning.

8.3 Opportunities for Future Research

8.3.1 Robot-related Factors. Robot-related factors such as levels of anthropomorphism and how much the robot is perceived to be autonomous vs. human-operated might affect how much people are willing to yield to it in a conflict situation [48]. More human-like robots seem to elicit higher expectations that the robot will behave in a human-like way [17, 27] but does this, for example, mean, that people will tolerate a humanoid robot more standing in a queue?

8.3.2 Personality Differences. We saw high variance in the data of the study possibly representing how difficult it is to make informed decisions in situations where the whole extent of a human representation is not apparent. Although on average the compliance might seem rather low in certain scenarios, there were always participants who stated to give priority, for instance, to an empty AV. It could be interesting to investigate further which personality traits and attitudes might play a role in the decision to grant a robot proxy priority (e.g., tendency to anthropomorphize [50], negative attitudes towards robots [36], prosocialism and altruism [37]).

8.3.3 Cultural Differences. Although our sample for the study could be described as culturally diverse, individuals from the Asian continent were underrepresented. As their view on robots has shown to differ regarding anthropomorphization [45], it might be interesting to focus on the connection of ascribed agency and social status.

8.4 Study Limitations

Due to test efficiency, the user study was limited to exploring eleven conflict scenarios of which only two focused on AVs. Hence, this research is biased towards service robots and should be repeated with a stronger focus on AVs and other types of automated transport.

For the food queue scenario where the robot is already in front, the priority question was different than in the other scenarios (accepting priority instead of granting priority). Therefore, the result of the food queue might not be directly comparable to the other scenarios: accepting a status quo is different than making a decision. This needs to be kept in mind when interpreting the results. In future studies, the scenario could be altered to assess the participant's decision: the robot asks to enter the queue in front of the participant instead of already standing there.

Although the images presented in the study were all introduced as not representative of the scenario, the humanoid robot morphology could have biased the participants into attributing a higher human representation. It should be noted that the focus of the study was the relative comparisons between scenarios and not obtaining absolute values regarding human representation.

9 CONCLUSION

In conclusion, the paper highlights a prevalent cognitive bias among individuals in (not) recognizing the human presence behind various robotic proxies. The failure to acknowledge the human counterparts controlling these robotic proxies has far-reaching consequences for HRI, potentially contributing to social injustice and discriminatory practices. Our paper urges HRI researchers and society to address and rectify underlying power imbalances to ensure a more equitable and inclusive coexistence between humans and embodied agents acting as proxies for other humans.

ACKNOWLEDGMENTS

This work was supported by ELLIIT, the Excellence Center at Linköping-Lund in Information Technology (https://elliit.se/). The authors would like to thank Shane Saunderson from Artificial Futures for his feedback on the paper's framing.

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