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Rage against robots: Emotional and motivational dimensions of anti-robot attacks, robot sabotage, and robot bullying

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ABSTRACT

An assortment of kinds of attacks and aggressive behaviors toward artificial intelligence (AI)-enhanced robots has recently emerged. This paper explores questions of how the human emotions and motivations involved in attacks of robots are being framed as well as how the incidents are presented in social media and traditional broadcast channels. The paper analyzes how robots are construed as the "other" in many contexts, often akin to the perspectives of "machine wreckers" of past centuries. It argues that focuses on the emotions and motivations of robot attackers can be useful in mitigating anti-robot activities. "Hate crime" or "hate incident" characterizations of some anti-robot efforts should be utilized in discourse as well as some future legislative efforts. Hate crime framings can aid in identifying generalized antagonism and antipathy toward robots as autonomous and intelligent entities in the context of antirobot attacks. Human self-defense may become a critical issue in some anti-robot attacks, especially when apparently malfunctioning robots are involved. Attacks of robots present individuals with vicarious opportunities to participate in anti-robot activity and also potentially elicit other aggressive, copycat actions as videos and narrative accounts are shared *via* social media as well as personal networks.

1. Introduction

Instances of anti-robot attacks are emerging in industrial, community, and service sectors. These attacks often endanger the robots and humans near them despite the efforts of robot developers and robot managers to make robots appealing to humans (Bankins and Formosa, 2020; Black, 2019; Krumins, 2017; Luria et al., 2020b; Sherman, 2018, Torrez, 2019; Winfield et al., 2020). This paper focuses on the impact of "emotions" on the problematic relationships between humans and autonomous technologies and on direct human–robot interactions. The paper analyzes the framings of the emerging varieties of robot sabotage, bullying, and manipulation in terms of human emotions and motivations, considering the differences in attacks with autonomous entities as objects from attacks on non-autonomous entities. The paper also addresses the prospects for granting "rights" to robots to ascertain how robots would be construed in the contexts of robot sabotage, bullying, and manipulation by humans. It also explores whether "hate crime" or "hate incident" characterizations of certain anti-robot activities would be possible. Hate crime approaches can foster discourses on the motivations of the attackers and social settings of the attacks. In hate crimes and incidents, the perpetrator is motivated by the hostility or prejudice of the attackers toward the protected characteristics of the victim (Bacon et al., 2021). The term "hate incident" is used when the attack does not meet the standards of specific crimes.

The stakeholders involved in anti-robot attacks extend beyond robot owners and the economic and resource losses of these attacks can be heavy. Attacks on robots by humans can often have devastating and immediate impacts and cascading effects on other connected entities, disabling other systems or instigating them to act in unpredictable ways. For example, the incidents can produce collateral damages to humans if the damaged robots hit the bystanders or jeopardize the safety of individuals. As described in the sections that follow, some types of anti-robot attacks would consider the robot as a personage, while other types would consider the robot as a property. These other types of attacks consider robots as being responsible for the loss of jobs and social reputation. Video and narrative portrayals of anti-robot attacks can also have a significant influence on their audiences because such attacks direct the audiences to focus on certain situations in society or the impacts of automation (Küster et al., 2021; Mrug et al., 2008). With increasing attention received by social media and other forms of digital

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platforms, the methods of attacking robots can be crowdsourced. Mattoni and Teune (2014) present from an historical perspective how images disseminated through social media have played influential roles in the generation of negative human sentiments and social disruptions, often in ways not directly intended or foreseen by those whose actions are portrayed in the images.

This paper is largely rooted in the narratives of the United States and United Kingdom and on research conducted in those countries; cultural and national differences can complicate the analyses of anti-robot attacks (Gorgan, 2019; Lloyd and Payne, 2019; Xu and Yu, 2019). For example, Payne characterizes the attacks on robots in the United Kingdom as causing damage but not overly aggressive. "*We heard stories of workers standing in the way of robots, and minor acts of sabotage – and not playing along with them*" (quoted in Bernal, 2019, para. 4). By contrast, Rodell (2020) from a South African context asserts, "We burn our robots in Africa; they keep trying to steal our jobs" (para. 1). In Japan, numerous anti-robot bullying cases involving children that were widely publicized triggered concerns (Nomura et al., 2016). The vicarious and voyeuristic appreciation of attacks upon robots and autonomous entities has transcended national borders because the coverage of robot attacks by popular and social media is on the increase and various copycat incidents or incident clusters are occurring (Liberatore, 2016). The attitudinal responses to robots revealed by recent surveys are apparently mixed with both positive (Carradore, 2022) and negative (Gnambs and Appel, 2019) directions. This paper has a limitation because quantitative accounts of the extent of anti-robot attacks are apparently still unavailable. Efforts to analyze anti-robot attacks and related emotions have become complicated due to time-related factors; technologies in the field of robotics advance quickly along with the shifts in robot capabilities and subsequent emotional responses of the humans.

2. Evolving characterization of robots

Robotics has developed into a field because advances made in artificial intelligence (AI), such as machine learning, have increased the autonomy with which robots can learn about their environments and deliberate on them (Ingrand and Ghallab, 2017; Oravec, 2018). The International Federation of Robotics defined a manufacturing robot as an automatically controlled and reprogrammable multipurpose manipulator that can be used in industrial automation applications (IFR, 2019) with the automation concepts stemming from the work of John Diebold (1952). The word "robot" is rooted in the 1920 Czech play (*Rossum's Universal Robots*) by Karel Čapek (Abnet, 2020). The term stems from the Slavic word "robota," used to indicate a forced-labor worker, a name that signals the social roles that robots can play in many settings. The answers to the question, "What is considered a robot?" have changed because automation has become sophisticated. Burdick (1992) related, "Once a certain level of automation becomes widespread, we no longer call it robotic. For example, 200 years ago, a dishwasher would have been considered a robot" (p. 2). Sometimes, the anthropomorphic features of robots, such as their humanlike faces, correspond to the explicit aspects of their designs, while at other times, they are features provided by their users for entertainment purposes (Corkery, 2020). In some future scenarios, humans themselves would conjoin with robots to form "cyborg" configurations; in other scenarios, humans would be able to upload themselves to robotic entities to achieve a type of forms often interpreted as "artificial immortality" (Cave, 2020; DiCarlo, 2016; Ferrando, 2019; Oravec, 1996). Varieties of human–machine hybrids are emerging as the availability of cybernetic implants for use in prostheses expands (Egan, 2020). Some of the antagonism toward robots described in this paper may unfortunately extend to cyborgs as well, and thus steps to identify and mitigate anti-robot attacks may also be of value.

Robots are being increasingly interpreted as autonomous and intelligent entities operating with various degrees of self-sufficiency and self-awareness (Abnet, 2020; Hurlburt, 2017). Ingrand and Ghallab (2017) found that autonomous robots have deliberative capacity and the independence to access the environment although the levels of both would substantially depend on the settings of the robots. As robots take roles tightly intertwined with human activities in both public and domestic spaces, the characterizations of socially focused robots are becoming increasingly common (Lafontaine, 2020; Vanman and Kappas, 2019). For example, research on how robots can express dominance in human–robot interactions has shown that various robot signals and positionings may increase the extent of compliance by humans with the directions given by the robots (Peters et al., 2019). Social considerations, such as ethics and morality, have often been factors influencing the way robotic applications have been construed in popular discourses and public policy venues (Gunkel, 2018), with the "Three Laws of Robotics" by Isaac Asimov (1950) being an early attempt to provide some degree of direction (Clarke, 1993; Dennett, 1997). Such social conditions as robophobia have emerged (McClure, 2018; Paerregaard, 2019; Vanman and Kappas, 2019) with some of the social conditions linked to the uncanny valley phenomenon. Uncanny valley notions stem when empirical research shows that many individuals recoil or feel uneasy or creepy in the presence of robots as they become increasingly similar to humans in appearance but not exact duplicates of them (MacDorman, 2005; Mori, 2012).

3. Machine wreckers of the past and anti-robot attackers of today

Attacks on technical entities are on the increase as pervasive features of many modern workplaces and community settings (Mars, 2019). Whitby (2008) presents a "call to action" against such attacks. In this paper, "attacks" constitute dysfunctional contacts with an entity in a particular system context, with emphasis on the sabotage, destruction, debilitation, or desecration of the entity. A taxonomy of anti-robot attacks is presented in the next section. Dysfunctional contacts with unaggressive robots that are rooted in their misinformed or inappropriate usage by humans are also widespread. This type of superstitious or irrational technological abuse is often characterized in a manner that facilitates subsequent education of the individuals involved (Parasuraman and Riley, 1997). Many robots in use today have fragile and brittle dimensions that can be exploited or damaged either through aggressive or non-aggressive contact with humans although efforts are underway to harden the robots to improve their resilience to attacks by humans (Alexis, 2020).

Attacks on technological entities can be targeted toward autonomous robots discussed in this paper and also on non-autonomous entities. The targeted and intentional destruction of workplace machinery has a long legacy that predates autonomous technologies. Decades ago, Stern (1937) characterized the resistances to the adoption of technological innovations and found that "machine wreckers" expressed dissatisfaction with automation by instituting strategically-planned damage. The machine wreckers of previous centuries had limited options for their attacks; however, many of them were quite strategic in their activities and planned and timed their attacks to cause maximum possible impact (Hodson, 1995; Linton, 1992; Pearson, 1979; Tierney, 2019). In the past (between 1815 and 1848), the aggressive activities of the Luddites drew the attention of political and social leaders to particular issues. The Luddites were skilled machinery workers who chose to counter certain technological shifts (Linton, 1992). The Luddites who were followers of Ned Ludd were associated with anti-automation themes with the term Luddite often used in reference to such perspectives (Dorson, 1965; Manuel, 1938; Jones, 2013). However, studies on machine wrecking often stop short of characterizing the types of attacks on autonomous entities. The destruction, manipulation, or sabotage of a thinking entity can be different from those of a machine that is merely performing a routine and predictable set of functions. For example, decision-making by autonomous machines can be maliciously and surreptitiously manipulated and reprogrammed through complex maneuvers that are generally not applicable to machines less capable than autonomous

machines.

Machine wreckers of past centuries effectively disseminated information about their attacks although they did not have access to social media at that time. Recent publicity given to attacks against robots *via* different media modalities has stimulated public discourses on the emerging societal roles of robots. An account of a widely discussed 2019 anti-robot attack is given below.

> Every day for 10 months, Knightscope K5 patrolled the parking garage across the street from the city hall in Hayward, California. An autonomous security robot, it rolled around by itself, taking video and reading license plates. Locals had complained [*sic*] the garage was dangerous, but K5 seemed to be doing a good job restoring safety. Until [*sic*] the night of August 3, when a stranger came up to K5, knocked it down, and kicked it repeatedly, inflicting serious damage.
>
> Harrison (2019, para. 1)

The travels of HitchBOT, an autonomous mobile robot, provide another example of a possible anti-robot fervor (Fraser et al., 2019). HitchBOT successfully navigated lengthy ventures in Canada without a human escort but was destroyed by individuals who encountered it in the United States only after being in transit for a short time. The widely publicized stories of K5 and HitchBOT are coupled with many other accounts on the manipulation and sabotage of robots resulting from human emotions and motivations, such as antipathy and vengeance, often adding to the narratives (Gibson, 2017; Harrison, 2019; Heath, 2016; Kolodny, 2018). Public attention to anti-robot attacks has also increased with reports on a sex robot that was heavily damaged at an electronics show where it was on display (Nichols, 2017).

4. Types of anti-robot attacks

Types of anti-robot attacks can include complex schemes that exploit the known weaknesses of the entities concerned and even primitive assaults (Meryem and Mazri, 2019) along with the dissemination of information on the exploits on social media. The type of attack involved in any particular incident can differ depending on the perspectives of those implementing and interpreting the attack with the analysis of the narration of the attack posted on social media by external audiences making it complicated. The level of knowledge possessed by the perpetrators of the attacks on robotic systems is also a contributory factor in some attacks. Emerging forms of anti-robot sabotage that are based on prior knowledge or assumptions about the operations of the entities concerned impede or disrupt the decision-making functions of the entities, for example, causing frustration in the entities with regard to the attainment of their objectives. Some recent attacks on robots and aggression toward robots are given below.

4.1. Destruction or impairment of critical physical or environmental factors contributing to robot operations

These can be the physical damage, rooted in the deficiencies or shortcomings of specific materials and systems required for the operation of the robots, caused to robots (Ranabhat et al., 2019) and attacks on the machinery associated with the robots. For example, if the required amount of cooling or heating is not provided, the robot can cease functioning. Such attacks can be designed to produce significant economic and resource losses.

4.2. Destruction or impairment of decision-making capabilities of the robots

The type of attacks on a robot, including the attacks on AI-enhanced sensors and software of the robot, can vary if the destruction of the robot is focused on its aspects that are seen as "autonomous" or "intelligent." Attacks affecting the environmental awareness and decision-making features of a robot can cause less visible damage than physical attacks do although those attacks can be as devastating as physical attacks with regard to the operations of the entity under attack (Bartneck and Keijsers, 2020). Robotic controls can be fragile (for example, the use of delicate sensors), and seemingly minor tampering can have substantial impacts on the operational capacity of the entity.

4.3. Visual indignities

Various visual indignities may affect the social status of a robot, and thereby its effectiveness in various social situations. Some robots have been abused in ways—for example, by defacing the robots— that would indicate to humans that some type of desecration or humiliation of the robot has occurred (as in Fraser et al., 2019 and Harrison, 2019), (Gibson, 2017; Terbrack, 2021).This type of aggression may be considered a "personal" attack upon the robot rather than an attack on the property of the individuals or the organization concerned as a whole as far as the intelligence and personage of the robot are concerned.

4.4. Verbal attacks

Humans demonstrating their aggression toward robots in the form of verbal attacks have become commonly observed in the past decade (Neff and Nagy, 2016). Some robot developers incorporate methods for dealing with sustained verbal attacks on the robots into their protocols (Chin and Yi, 2019). Most of the abuse has gender- or racially-related overtones (Ramos et al., 2018; Strait et al., 2018), raising issues concerning the anthropomorphism of robots.

4.5. Strategic or intentional neglect

Robots in dangerous or sensitive settings that do not receive the required level of attention by humans or other robots could cause significant damage to humans and their environments although the consideration of this type of negligence as an "attack" or "abuse" can be problematic without having adequate knowledge of the situation. This type of intentional neglect is often difficult to detect until it causes considerable damage to the robot because the entities involved have been assumed to be autonomous (Bernal, 2019).

4.6. Manipulation and gaming

Attacks on robots in ways that attempt to confuse them or thwart their efforts, such as tricking a mobile food delivery robot to engage in dangerous traffic maneuvers, has become a matter of concern for developers and implementers of robots (Kiss, 2019; Liu et al., 2020; Moore et al., 2020). Salvini et al. (2010) describe how a service robot in a community setting was bullied in ways "aimed at forcing the robot to do or not to do something" (p. 371). Some of the manipulation strategies related to robots are being exchanged online and shared through crowdsourcing.

4.7. Security breaches

Security breaches are another form of attacks on robots, which may not be clearly visible immediately after the attacks but may cause dramatic consequences affecting the operations of the robots and the safety of humans (Oravec, 2017; Perales Gómez et al., 2021). A security breach can allow for the reprogramming of a robot in the future in ways that would produce unexpected or rogue behavior on the part of the robot (Maggi et al., 2017). The hacking of presumably autonomous entities causes concerns because their monitoring may not be as direct as that of non-autonomous entities (Greenberg, 2017; Willison and Warkentin, 2013). If the successful exploits on robots are shared online, there could be potential escalations of hacking efforts.

4.8. Staging of robot attacks for online dissemination

Intentional and conscientious staging of attacks may be used to elicit anti-robot sentiments; deepfakes and other forms of editing and video reconstruction could also be used in planning the attacks. For example, videos of humans kicking a Boston Dynamics canine-style robot have produced an assortment of copycat videos and a substantive discourse on the treatment of robots (Meinecke and Voss, 2018).

Distinguishing "hate crimes" from less-severe "hate incidents" often involves determining the outcomes and contexts of particular attacks that can be problematic when the attacks have subsequent or even cascading impacts. For example, mobile food delivery robots or other service robots are often kicked by passersby, sometimes with an attempt to ripflags from the antennas of the robots (Cox, 2020; Hamilton, 2018; Lynn, 2020). Whether flag ripping can be considered a severe attack on the robot can depend on whether the flag was necessary to alert vehicular traffic about the robot's travels along busy streets. Some forms of violence against robots may be considered self-defense on the part of the humans involved, especially if the robots have been maliciously tampered with or manipulated.

5. Hate-related emotions and motivations associated with anti-robot attacks

This paper argues that hate crime framings can assist in distinguishing and contrasting generalized antagonism toward robots considered autonomous and intelligent entities in the context of human self-defense, especially when apparently malfunctioning robots have been involved. Framings of anti-robot attacks that consider the emotions and motivations of the human attackers, such as hate crime discourses, may enable concerned organizational and community participants to obtain a clear understanding of the attacks to help in their mitigation irrespective of whether specific hate crime legislation or administrative rules have been breached. Focusing on the negative emotions rather than on a large spectrum of emotions toward the robots may constrain the discussions on robots somewhat (which is a limitation of this paper); future research must incorporate the potential counterbalancing impacts of positive emotions. Hate crimes are designed to damage a particular entity and even other similar entities or the systems that are supportive of and connected to them (Lawrence, 2009). In hate crimes, a melding of various complex negative emotions of humans with their motivations can be involved: Brogaard (2020) characterizes hate as "a complex emotion, built out of the negative emotions: resentment, condemnation, and reprehension" (p. 2), which are often linked to violent expressions (Hart, 2017). What constitutes hate-propelled attacks can often be difficult to ascertain: smearing feces on a robot may be associated with a hate incident (as in Gibson, 2017) unlike attaching a sticker to a robot (as in Terbrack, 2021) although the message on the sticker would have to be considered along with the use of special insignia or imageries. Subsequent postings of videos of anti-robot violence or other instantiations or proofs of attacks on social media sites along with related antagonistic messages or imageries can often signal that strong anti-robot sentiments have led to the attacks.

Attacks on entities considered as "others" (whether human or technological) often are based on the social and moral status of the entities (Miller, 1983; Coeckelbergh, 2013). The consideration of a robot as an "other" has been a common theme of science fiction and various creative works (Mayor, 2020) and can include substantial cultural insights and assumptions about robots (Higbie, 2013; Paerregaard, 2019; Teo, 2021). Coeckelbergh (2011) describes how the linguistic construction of artificial others (such as addressing them by name) affects the way individuals interpret them as entities. Anti-robot attacks can differ depending on whether the robot concerned is primarily considered an object owned by a particular individual, organization, or community; considered in some ways as having human-style personage; or understood as the source of certain economic woes or other perils. The following characterizations describe these framings of attacks, which sometimes overlap, on robots considered as others.

5.1. Robot-as-property

Negative emotions relating to the consideration of a robot as the property of a particular individual or organization can lead to anti-robot attacks. The robot is framed as an "other" because of its associations and interactions with objectionable entities. For example, the robot's association with an undesirable organization could elicit negative and hateful aggression toward it as with humans or mascots associated with the organization. Destructive activities in some workplaces involving organization-owned robots are consuming considerable economic resources and can jeopardize the lives of employees and bystanders (Singh, 2020; Yeşiltaş and Gürlek, 2020).

5.2. Robot-as-personage

Anti-robot attacks on an entity by humans may involve negative emotions and motivations relating to specific anthropomorphic features of the entity, such as those related to hair, or toward general features, such as intelligence. An attack on an entity by humans, widely construed as "intelligent", could be owing to complex factors associated with trust and their personal and social identities (Kim et al., 2020; Oravec, 2022). Attempts to devalue robotic intelligence or desecrate robots can be considered efforts to transform the robotic entity being attacked to one that would not be fully comparable to a human, and thus would not deserve the same degree of non-aggressive treatment as a human does. The cleverness with which anti-robot attacks are planned and the suddenness of the attacks often place the humans involved in the attacks in positions more dominant than those of the robots (Küster et al., 2021; Luria et al., 2020b).

Dehumanization of robots involves the framing of robots as subhuman and having less personage than humans, which allows people to disregard the (negative) consequences of their behaviors, thereby reducing the empathy expressed toward the robots (Keijsers and Bartneck, 2018). Haslam (2006) in his pioneering analysis states that "traits that determine humanness include 'human nature' and 'uniquely human' characteristics, and denying uniquely human attributes to others represents them as animal-like, and denying human nature to others represents them as objects or automata" (p. 252). Keijsers and Bartneck (2018) contend, "dehumanization of robots is often linked to aggressive and bullying behavior much like the dehumanization of certain human individuals" (p. 205); the simple addition of certain anthropomorphic characteristics to robots may not be sufficient to reverse such dehumanization (Złotowski et al., 2017). Dehumanization efforts, which can include types of defacing as stated by Gibson (2017), are often an integral part of anti-robot attacks and can be used to signal hate crimes and hate incidents.

5.3. Other dimensions of robot attacks

Anti-robot attacks can be associated with framings other than those involving property or personage and may be geared to destroy the robot's position and dignity in terms of various themes (Hamilton and Mitchell, 2017). For example, a robot can be construed as a catalyst of jobs and social and reputational damage, irrespective of whether economic and social analyses support these claims. As new functional relationships and social standings are imposed on a particular robot setting, such as workplaces, humans can be placed in perceived social positions that can engender negative emotions and potential anti-robot attacks (Akst, 2013). The identification of some of these anti-robot attacks as "hate crimes" or "hate incidents" would involve attempts to understand the thematic underpinnings of the attacks, if any, which in some cases could be quite transparent because attackers present their motivations through statements or social media postings.

Framings of robot attacks by their perpetrators and observers can include heroic themes. Scenarios in which individuals will ultimately need to engage in epic battles with AI-enhanced robot "overlords" have been projected by luminaries, such as Elon Musk and Stephen Hawking (Leitao, 2019; Oravec, 2023; Thompson, 2018). Heroic motivations could be major considerations in anti-robot attacks as humans take on some of the imagined roles of the defenders of humanity scripted in movies, literature, and lore, along with the heroic emotions of triumph, elevation, and sacrifice (Kutschke, 2020). Numerous science fiction accounts include the demise of robots, often in activities with medieval themes of jousting and direct confrontation and as modern configurations (Bigliardi, 2019; Luria et al., 2020a). Many students have participated in intentionally arranged robot destructions (Black, 2019) with a number of robot-to-robot battles placed on YouTube, which according to reports are sometimes deleted by YouTube administrators because of resemblance of those battles to animal battles. Lewnard (2020) describes such a setting in an educational context: "The Prospect High School Fieldhouse looked like a scaled-down scene out of a 'Mad Max' movie, with marauding robots designed for one task – destruction" (para. 1).

6. Initiatives on robot rights and anti-robot violence mitigation

It can be argued that hate crime and hate incident determinations can underscore the seriousness of some types of anti-robot attacks in the context of overall security concerns, injuries to humans, and even their death. Hate crime framings can aid in characterizing generalized antagonism and antipathy toward robots considered autonomous and intelligent entities in anti-robot attacks. However, other proposed mitigation approaches for anti-robot attacks can be used including the following:

6.1. Robot "rights" initiatives

Efforts to draft and enforce some form of robot rights may provide ways of stemming or at least mitigating the attacks directed at robots by humans (Bennett and Daly, 2020; Coeckelbergh, 2010; Darling, 2016; Lemley and Casey, 2019; Mosakas, 2021). Declarations of rights are often used to resolve difficult practical and moral conflicts with the individuals involved by making various assertions (Dupras et al., 2020). As of today, robots have not made such assertions except in the case of few demonstrations staged by humans; however, robot development pioneer Rodney Brooks declares that robots would at some point rise up and demand their rights (Brooks, 2000). Coeckelbergh (2010) attempts to provide "intelligent social robots" with "some degree of moral consideration," and develops an "argument for moral consideration based on social relations" (p. 209). In the approach used by Coeckelbergh, "moral consideration is granted within a dynamic relation between humans and the entity under consideration" (p. 220), which is in synch with some of the ways in which animals are granted rights in certain societies. Another approach toward preparing robot rights considered that some robots could be accorded an ethical status accorded to many artworks given their deep meanings to some members of their societies (as described in Nomura et al., 2019) to shield them from anti-robot attacks.

6.2. Elicitation of human empathy through robotic design

Research that may help mitigate anti-robot attacks through changes in robotic designs and system modifications has considerably increased in the past decade. Robots that are specially designed to elicit human emotions, such as empathy, could serve to alleviate some forms of anti-robot aggression (Connolly, 2020; Shao et al., 2020; Vinanzi et al., 2019). For example, Briggs and Scheutz (2014) explored the effects of various robotic displays of protest and distress on the humans near whom the robots were placed. Robotic exterior appearances have been shown in some cases to "solicit compassion and attachment in humans, and [their] cognitive resources may be powerful enough to establish enduring and relatively rich relationships with their users" (Cappuccio et al., 2019, p. 10). Researchers are raising questions, such as "Do a robot's social skills and its objection discourage interactants from switching the robot off?" (Horstmann et al., 2018, p. 1), in their attempts to mitigate potential attacks on robots and their sabotage.

6.3. Bystander intervention strategies

Encouraging human bystanders to intervene when a robot attack occurs is another mitigation approach (Tan et al., 2018) just as in human–to–human bullying where human bystanders can be an improving factor. Strategically organized bystander activities by other robots have also been proposed (Connolly et al., 2020). Murrer (2020) describes how some mobile delivery robots have been equipped with buzzers to attract the attention of bystanders and ward off potentially abusive human contacts.

6.4. Robots simulating expressions of pain and suffering

Punishing robots in some way has been proposed as a way to diminish the incentives for anti-robot attacks. Strategies in which autonomous entities can be programmed to feel and express a simulated response of pain can be a part of anti-robot violence mitigation approach (Keijsers et al., 2019; Richardson et al., 2020; Sandberg, 2015).These strategies present potential means for individuals to express their negative emotions toward robots without physically damaging them or the human bystanders. Strategies for programming pleasure and related motivating factors have also been proposed (Lewis and Canamero, 2016) giving individuals the means of applying forms of perceived behavioral modification rather than making destructive attacks when they interact with robots.

6.5. Participatory design

Efforts made to develop a participatory design that would involve individuals in developing the robots they would use may also help contain certain anti-robot attacks (Compagna and Kohlbacher, 2015). Participatory design activities can help individuals to familiarize themselves with the robots, softening some of their potential antagonistic attitudes. However, a participatory design can also empower antipathetic individuals with detailed information about robot operations, making the manipulation and sabotage of the robots effective.

6.6. Acceptance and channeling of aggression toward robots

If the above-mentioned ethical and design strategies fail to mitigate anti-robot aggression, organizations may be compelled to eventually accept a certain level of anti-robot activity with robot designers increasing the capacity of the robots to make them endure focused human-inflicted attacks on them. Directing some amount of abuse to robots may steer individuals from engaging in anti-robot attacks that could even cause collateral damage in humans, thereby deflecting and channeling certain negative emotions and aggressions on their part. The strategic use of anti-robot violence for cathartic and expressive purposes in various social contexts has some potential just as video game interactions with humans fighting robotic figures can apparently provide catharsis to some individuals (Bastian et al., 2012). For example, organizations could arrange forums in which individuals can openly express their antagonism to robots. Approaches that can be used to design robots that are impervious to abuse or that can be easily reconstructed have been proposed (Cohen, 2019; Luria et al., 2020b). Lucas et al. (2016) show that robot size may be a factor that determines the type and quality of attacks on robots and that some robots may be interpreted as being "too big to abuse." Monitored and contained expressions of aggression toward robots could indeed identify and expose individuals who have overall problems with anti-robot aggression in an organizational context

(Sparrow, 2020). These strategies could also diminish the impact of hate crime and hate incident approaches proposed in this paper although with possible side effects in terms of the confusions of the individuals regarding the acceptability of anti-robot violence.

7. Discussion and conclusions

An attack on a robot can reflect little more than a momentary and instinctive response. However, robot attacks can also involve an assortment of negative emotional reactions and motivations, including considerable personal prejudice and linkages to concerns and assumptions about automation and economic struggles (Joosse, 2021). Hate is a complex emotion comprising other negative emotions, such as resentment and reprehension (Brogaard, 2020). Efforts to diminish the damaging impacts of hate in societies have often included some form of hate crime or hate incident framed as a tool (Lawrence, 2009). It can be argued that forms of hate crime and hate incident designations can assist in identifying and segregating occurrences that cause accidental harm from those that are designed to damage a particular autonomous entity and even other similar entities or systems that support them. The dissemination of images and accounts of robot attacks through social media can amplify the impacts of anti-robot incidents, which often expand the related anti-robot social connections and discourses. Robot *versus* human narratives are pervasive in many societies as manifested in science fiction and in news and economic reports, and thus connections with anti-robot themes are readily made in various messages disseminated and information posted on social media. Many people learn about robots from science fiction portrayals and economic forecasts that may have been misguided in predicting a loss of a large number of jobs owing to automation (Abnet, 2020; Meinecke and Voss, 2018).

Supporting physically fragile entities that can be abused and manipulated by humans can be resource intensive for organizations and communities. The potentials for the intentional or planned attacks, such as the malicious reprogramming or systematic diversion of robots, present unsettling prospects for human safety, especially in an era when the use of robots in manufacturing and community security is expanding. Robot attacks as social practices have widened the range of expressions that individuals can make about their attitudes toward automation and other societal changes although the attacks have also caused unfortunate consequences concerning the safety of humans and security of organizational resources. For example, humans can attack robots to injure the robots directly and personally in ways comparable to delivering an attack upon another human, or in ways that are primarily aimed at causing damage to the organization as a whole by requiring it to make repairs to the robot or replace it.

Many issues emerge with regard to attacks against robots by humans, such as the potential consequences of the spread of aggressive behavior for the character of societies. Violence against robots can be seen as a new type of human violence, including domestic and military violence, and an increase in this violence against robots can create a hateful society as a whole in terms of its forms of expression. The aberrant imaginative variations that violent activities against robots and other autonomous entities generate may stimulate disturbing copycat behaviors in interactions among human beings, especially as the roles of humans and robots begin to intertwine in various settings. The overall influence of the attacks on robots on workplaces and communities and subsequent dissemination of images and narratives about the attacks on social media is still unclear, especially given the emerging changes in robotics, which include the previously mentioned cyborg-style implantations of robotic parts in human prostheses. Despite the growing uncertainties involved in robot operations and security, robots are increasingly portrayed by many of their administrators and developers as non-problematic companions and collaborators. The objective of framing robots to make them become friendly colleagues in confined settings may backfire because they could become unstable and untrustworthy through human-initiated sabotage and targeted attacks. Construing robots as supervisors and as being superior to humans can unsettle the situation even further (Sahota and Ashley, 2019). Such forms of perceived indignity against individuals may be countered with negative hateful emotions and subsequent human-generated attacks. Organizational and community participants can work with robot developers to understand the emotions and motivations behind anti-robot attacks and help counter and mitigate the attacks with the insights acquired.

Author statement

There is a sole author to the paper who is responsible for it in its entirety. Many thanks to the reviewers for their efforts.

Data availability

No data were used for the research described in the article.

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