

Social Presence in Human-AI Interaction: A Proposal for Non-Anthropocentric Social Presence

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## Abstract

With the use of machine learning, today's artificial intelligence (AI) is no longer merely passive appliance executing programmers' instructions and following predetermined rules. Instead, AI can be autonomous in terms of making its own decisions and learning rules from data with little human interference. The shift in agency locus from human experts or programmers to machine itself merits AI to be perceived as an independent, alternative form of intelligence, blurring the line between the actual and virtual, the direct and mediated. Against this backdrop, this paper aims to evaluate the adequacy of existing conceptualizations of social presence in characterizing individuals' psychological experience with AI during interaction. An explication of social presence reveals that existing conceptualizations of social presence are anthropocentric in nature, and therefore, are only suitable for explaining the anthropomorphizing process. However, AI with its own goals, rules, and capacities not necessarily humanlike need not be perceived via anthropomorphizing. To fully characterize the experience with intelligence of a different form, social presence in human-AI interaction is better considered in a larger framework of mind attribution and conceptualized non-anthropocentrically. A tentative non-anthropocentric definition is social presence as awareness of the goals, rules, and capacities of the AI system, and the perception of mutuality with the system on cognitive and affective levels. Implications of this definition and potential improvements on measurement are also discussed.

*Keywords:* artificial intelligence, social presence, mind attribution, concept evaluation

### Social Presence in Human-AI Interaction: A Proposal for Non-Anthropocentric Social Presence

When interacting with interactive media technologies, we often mindlessly apply social rules and social scripts derived from human-human interaction (HHI). Although many deny they would ever treat computers as social actors, they did in experiments by responding more positively to computers that compliment and being polite to the computer asking for evaluation for itself, as found in a series of studies under the paradigm of Computers Are Social Actors (CASA, Reeves & Nass, 1996). In fact, our tendency of treating technological artifacts as social actors is so strong that we even develop meaningful relationships with them, which is dystopian for many scholars since they are merely deceiving us by performing human attributes (e.g., care, love) that they do not really possess (e.g., Sparrow, 2016; Turkle, 2011).

Perception of social presence accounts for users' social responses to media technology. Humanlike cues carried by media technology such as human roles, visual anthropomorphic features, voice, and language could all trigger the sense of social presence, which further leads individuals to apply social rules derived from HHI to their interaction with inanimate agents (Isbister & Nass, 2000; Lee & Nass, 2003; Nass & Moon, 2000).

In early stage of artificial intelligence (AI), the role of human input is very important in its decision-making such that rules it follows are often composed by human experts and written in by programmers (Hernández-Orallo, 2017). In this case, the locus of intelligence is human beings who generate the rules, rather than the system itself, as Searle (1984) would argue with his Chinese room thought experiment. When interacting with such a non-autonomous high-tech puppet, it is not all unreasonable to ascribe human attributes to machines in that they follow rules that are designed by human. However, with machine learning, AI has become more autonomous in terms of making up its own mind, rather than merely following rules designed by experts and

programmers. It learns rules from large amount of data without much human interference.

Recently, AlphaGo Zero, an AI system, even bypassed the step of learning from human knowledge, but learned from its own experience, and achieved superhuman performance in the Go game (Silver et al., 2017).

As the agency locus shifts from human to machine, rules directing an AI system may or may not be similar to how human mind works (Yampolskiy & Fox, 2012). Therefore, our experience with an intelligent being need not develop from anthropomorphizing, i.e., ascribing human mental state to non-human entities, and probably should not (Sparrow, 2016). Instead, AI with self-determination and sophistication in its rules might have the potential to be experienced as what it *actually* is in terms of its goals, rules and capacity. As research has found, machine agency can be perceived directly from system's action without being attributed to humanlike intelligence (e.g., Levillain & Zibetti, 2017).

In light of the implication of this technological advancement on human-technology interaction, we wonder whether the concept social presence that used to explain our social responses to low-intelligence technological artifacts is still adequate as a conceptual tool in accounting for psychological experience with AI. This paper aims to answer this question through an explication of the concept social presence and provides recommendations on both its conceptualization and operationalization for empirical research on human-AI interaction.

### **Explicating Social Presence**

Social presence has been studied as a psychological state occurring in various contexts such as technology mediated HHI (e.g., video conferencing), technology-mediated interaction between human and avatar/character (parasocial relationship), and human's interaction with technological artifacts such as robots, computers, etc. Accordingly, social presence has been

conceptualized in multiple ways. Lee (2004) synthesizes definitions of social presence in various contexts and provides a summary definition -- “a psychological state in which virtual social actors (para-authentic or artificial) are experienced as actual social actors in either sensory or nonsensory ways” (p. 37) with social actors meaning “humans and human-like intelligences” (p. 39).

As the experience with *actual* social actors is multifaceted, social presence in interaction with the virtual is also multidimensional correspondingly. In non-mediated interaction, presence is a binary variable -- either physically present within the perceptual range or not (Coan, Schaefer, & Davidson, 2006; Schnall, Harber, Stefanucci, & Proffitt, 2008). However, research has found even thoughts of friends can cause perceptual and behavioral changes (Dashiell, 1935; Schnall et al., 2008; Wapner & Alper, 1952). Therefore, most social presence researchers, in spite of differences in their foci, agree on seeing social presence as a phenomenological state that varies on a continuum.

Experience of the physical presence of others does not characterize the “social” aspect or the uniqueness of a social actor. In a non-mediated context, Goffman (1959, 1963) emphasizes the importance of mutuality in the experience with others with the concept “copresence,” defined as a person’s sense of the salience and accessibility of the other with the sensory channel as the medium for experiencing social presence. A higher level of social presence is mutual awareness, the interactive and mutual aspect of copresence. “Copresence renders persons uniquely accessible, available, and subject to one another” (Goffman, 1959, p. 22).

Biocca, Harms, and Burgoon (2003) suggested that social presence is beyond the mere awareness level but requires sense of access to intelligence and one’s model of the other intelligence. According to Biocca (1997), to experience social presence, one develops models of

others' intentional state (Dennett, 1987, 1996). The representation of other, either virtual or physical, "is conceptualized as a medium that provides cues to the intentional states of another" (Biocca et al., 2003, p. 463). As simulating other's mind does not require the other to really have intelligence, this conceptualization has been applied to interaction with both artificial agents and avatars (e.g., Kim, Park, & Sundar, 2013; Lee, Park, & Song, 2005; Lee, Peng, Jin, & Yan, 2006; Nowak & Rauh, 2005).

Experience with actual social actors also involves affective and relational aspects. Rooted in research on interpersonal non-verbal communication (e.g., Argyle, 1969, 1975; Argyle & Dearn, 1965), perceived intimacy, i.e., relational closeness (Argyle, 1969) and immediacy, i.e., "directness and intensity of interaction" (Mehrabian, 1967, p.325) or psychological distance (Weiner & Mehrabian, 1968) are regarded as components of the experience of social presence (Palmer, 1995; Rice, 1993). Social presence has also been defined as mutual understanding (Savicki & Kelley, 2000) and perceived homophily, i.e., perceived similarity in emotions and attitudes (Nowak, 2000).

In the context of virtual reality research (e.g., Palmer, 1995) and human-agent interaction (e.g., Huang, 1999), researchers suggest include behavioral engagement such as eye contact, nonverbal mirroring, turn taking, etc., as one dimension of social presence. However, interactive behaviors are arguably outcomes of the psychological state of social presence, rather than social presence *per se*.

As discussed above, regardless of the levels of experience (perceptual, cognitive, affective, relational, and behavioral), and the contexts (interaction with para-authentic actors, technological artifacts, other human beings mediated by technology), existing conceptualizations of social presence entail a mental representation of a human or humanlike entity, which further

induces social responses to other interactants. However, with the method of machine learning, AI can be actually autonomous by developing its own rules from learning with little human interference. The emergence of AI technology questions the necessity of experiencing humanness to respond socially to non-human entities and the necessity of drawing the line between the actual vs. virtual and the direct vs. mediated, as discussed in the following section.

### **Relevance of Social Presence in Interaction with AI**

Lombard and Ditton (1997) brought up a more context-based typology of presence, which has *medium-as-social-actor* presence as one type of social presence experienced when interacting *with* technological artifacts (Xu & Lombard, 2016, 2017). Reeves and Nass (1996) discussed the phenomenon of media equation such that individuals treating inanimate technological artifacts (e.g., computers), as if they are human social actors. By testing social rules derived from interpersonal interaction on human-computer interaction, they found human users responded to computers in the same fashion as they would to other men (e.g., Brave, Nass, & Hutchinson, 2005; Reeves & Nass, 1996). Similar patterns were also observed in interaction with other forms of technologies such as robots (e.g., Lee et al., 2006; Shin & Choo, 2011).

According to Lombard and Ditton (1997), medium-as-social-actor presence is characterized by ignoring “the mediated nature of a communication experience” (Section: Presence as medium as social actor), which results in human’s social responses towards inanimate technological artifacts. However, it is unclear what is the medium and what is the entity being mediated in the case of human’s interaction with autonomous technology artifacts that make up its own “mind.”

To resolve this ambiguity, it seems necessary to invite the dualistic view seeing technological artifacts as composed of two parts, one being what they *actually* are, and the other

being what *represents* them, so that cues as property of medium can be considered as the medium, mediating the interaction between human users and what the technological artifacts actually are. Thus far, the term “AI” is used casually, referring to both the software and the tangible machines powered by the software as a whole. With this dualistic view adopted, from now on, AI is regarded as the intangible software, or what those technological artifacts *actually* are; and the representation of it, either embodied or virtual, is considered as the *medium*. As put by Biocca et al. (2003), the body should be seen “as set of cues for an intelligence that animates it” and “social presence hinges more on one’s model of the other intelligence, with the word intelligence suggesting broadly the notion of intentionality and intelligent behavior relative to the environment and the self” (p. 463).

### **Cognitive Experience with AI: As Artificial Intelligence or as Human Intelligence?**

Cognitive representation of the other is one important dimension of social presence. Biocca and colleagues define social presence as “the sense of being together with another and mental models of other intelligences (i.e., people, animals, agents, gods, etc.) that help us simulate other minds” (Biocca, Burgoon, Harms, & Stoner, 2001, p. 2), or “the moment-to-moment awareness of co-presence of a mediated body and the sense of accessibility of the other being’s psychological, emotional, and intentional states” (Biocca & Harms, 2002, p.10).

In different contexts, social presence is equivalent to one of the following two perceptions. The first is the illusion of non-mediation (Lombard & Ditton, 1997). From the early media richness tradition in CMC research, low-bandwidth media have fewer cues available to foster perceived salience of the interactant and social presence was seen as the subjective experience of the media feature (Short, Williams, & Christie, 1976). The second is the perception of realism. A further distinction is made between perpetual and social realism (Lombard &



Ditton, 1997). Perceptual realism is about experiencing the virtual or artificial objects as actual, which is related to the illusion of non-mediation (Lee, 2004). Social realism is “the extent to which a media portrayal is plausible or true to life in that it reflects event that do or could occur in the nonmediated world” (Lombard & Ditton, 1997, Presence as realism).

Both of these two types of social presence are applicable to interaction with AI but describe two different types of experience. Specifically, illusion of non-mediation in human-AI interaction means AI is experienced as itself, *artificial* intelligence; whereas perception of social realism in human-AI interaction means AI is experienced as a social actor. Depending on how AI is represented (e.g., with humanlike cues vs. with machine-like cues), users may experience AI differently (Sundar, 2008).

**AI experienced as humanlike mind.** As suggested by CASA, technological artifacts powered by AI could be experienced as a human actor during interaction. With creating both perceptual and social realism as the goal, designers of technology should aim to resemble its “real-life” counterpart both perceptually and socially. In fact, the field of AI started with the goal of imitation – building a machine that is as intelligent as human (Hernández-Orallo, 2017; Turing, 1950). For example, many technological artifacts are built in a humanlike fashion by using natural language in the interaction, humanlike body (e.g., humanoid robots), non-verbal cues similar to human’s (e.g., eye gaze, body gesture, etc.), and providing interactive and contingent responses, etc. Some technologies are invented to perform certain human roles serving as natural counterparts for technology to simulate and emulate, such as virtual nurse, caregiver, office assistant, therapist, etc. All these elements added to the medium contribute to both perceptual and social realism and lead AI to be perceived as human.

Even though new technologies are emerging constantly to the extent that we do not necessarily have a real-life counterpart (Kaplan, 2016), with the tendency to anthropomorphize (Wegner & Gray, 2016), human users might still experience AI as human actor by projecting their own mental state onto it.

**AI experienced as artificial mind.** Many media researchers and designers want to improve the technologies in the direction of increasing social presence to facilitate communication and relationship formation (Biocca et al., 2003). To elicit the illusion of non-mediation, ideally, media technology should be designed to provide authentic representation of each party (Pavlou, Liang, & Xue, 2007). With this goal in mind, to increase social presence in interacting with technology that is powered by AI is about increasing the authentic representation of AI by the medium. For example, during online chatting with a chatbot, which is analogous to computer-mediated interpersonal communication, in order to elicit perception of non-mediation, all the aspects of the chatbot should be delivered authentically in terms of its working mechanism, its goal, its nature, etc. Despite the bot might not be embodied to be able to interact with anyone face-to-face, medium/interface between human users and technological artifacts should be designed in a way that the features, rules, “intentional state” of AI are well communicated to human users to enhance social presence as a perception of non-mediation. However, this notion of social presence is largely neglected in research on human-technology interaction.

### **Affective, Behavioral, and Relational Aspects**

As discussed above, both ways of conceptualizing social presence, as illusion of non-mediation and as perception of realism, are relevant and applicable to human’s interaction with AI and describe different possibilities of how AI might be experienced cognitively. As some

researchers suggest, social presence also has affective and relational components (e.g., Gunawardena, 1995). Despite whether AI is perceived as an artificial mind or a human mind, human users might still experience it as a relational other. For example, as found in the ethnographic work by Turkle (2011), some users develop close and meaningful relationships with technological artifacts such that they talk to them, get concerned when they get “sick,” and believe and feel the technology artifacts love them back. Therefore, experience of intimacy (Argyle, 1969), immediacy (Mehrabian, 1967, p.325), and homophily (Nowak, 2000) is also applicable to interaction with AI and the technological artifacts powered by it, especially in a longer term.

### **Evaluation of Social Presence as a Conceptual Tool in Human-AI Interaction**

Although social presence characterizes the psychological processes of human interaction with and through technology in various contexts, there are two shortcomings in current conceptualizations of social presence in human-AI interaction. First, it seems that the current conceptualizations of social presence are biased towards the anthropocentric aspect of the experience -- interpreting AI in terms of human values and experiences as if humankind is the only species with such capacities. As medium-as-social-actor presence is characterized by ignorance of mediation perceptually and cognitively, and responding socially to media (Lombard & Ditton, 1997), experiencing technological artifacts as human or social actors seems to be given, which may or may not reflect the actual experience with technological artifacts. Even with other more entity-neutral, context-neutral definitions, such as “the sense of accessibility of the other being’s psychological, emotional, and intentional states” (Biocca & Harms, 2002, p.10), the anthropocentric nature of social presence is still obvious as reflected in the use of terms “psychological” “emotional” and “intentional.” It seems that to experience social presence

during interaction with machines is synonymous with anthropomorphizing, i.e., seeing machine as with human mental state. Empirical research testing how certain media cues influence interaction with technologies also seems to bias towards testing cues of humanness (e.g., Jung, Waddell, & Sundar, 2016).

However, machine is not necessarily experienced as human being to be perceived as understanding and interactive. According to Biocca's (1997) definition, social presence is having access to another intelligence, which does not entail the perception of humanness in AI. AI can actually be something else that does not conform to the commonly held assumptions about human's "psychological, emotional and intentional states" (Biocca & Harms, 2002, p.10). More importantly, they could be just perceived as it is, depending on the availability of certain cues. For example, cues suggesting the "machine nature" of the technological artifacts could elicit "machine heuristic" such that machine is random, or that machine is objective, which further influences how they experience and judge the technology (Sundar, 2008; Sundar & Nass, 2001). Although a simple machine heuristic is not sufficient enough to constitute an entire mental model of AI, these findings suggests a machine's "mind" can be experienced quite differently than what is currently depicted in social presence research through the anthropocentric lens, yet still be influential on human users' perceptions and judgements.

The second shortcoming is related to but different from the first one. Social presence focuses more on the salience or accessibility of the other, but not enough on *what* the other is actually construed as during the interaction. In the definition of medium-as-social-actor presence, concepts of "human" and "social actors" are treated as primitive. What is meant by real human is under explicated, and the process underlying social presence is not articulated, either. For example, it is not clear whether the image of human or mental constructs related to human need

to be cognitively available for individuals to experience social presence and which dimensions of human are perceived (e.g., agency dimension or experience dimension, see Gray, Gray, & Wenger, 2007). Besides the perception of having *access* to other intelligence, perceptions of how other intelligence is like, should also be taken into consideration to fully understand human-AI interaction.

### **Suggestions**

To remedy these issues, social presence during interaction with AI should be considered in a larger framework of mind attribution or theory of mind, which can encompass both social presence as social realism and social presence as illusion of non-mediation, and does not entail anthropomorphism. Theory of mind is the ability to attribute mental states to oneself and others, including beliefs, goals, desires, pretending, knowledge, perspectives etc., and to understand the difference between oneself and others in those respects (ToM; Premack & Woodruff, 1978). How other minds are known is a long-existing philosophical and psychological question (Carruthers & Smith, 1996; Dennett, 1987, 1996; Rosenthal, 1991; Stueber, 2006; Wegner & Gray, 2016). Although anthropomorphism has been identified as an important mechanism for mind attribution to machine (e.g., Gray & Wegner, 2012; Wegner & Gray, 2016), research suggested it might not be a necessary condition or mechanism for perceiving machine agency (e.g., Levillain & Zibetti, 2017). For AI, many concepts such as desire, belief, are not directly applicable. However, that does not mean machine has no functionally equivalent elements. An AI system reads in and process external input, and generate responses directed by ultimate and instrumental goals (Dillard, 1997) and following certain if-then rules (Levillain & Zibetti, 2017). The key point is that the access to those goals and rules, or the access of the “mental state” of an intelligent other (Biocca, 1997), might not be mediated by anthropomorphism at all. By

extending the conceptual scope of “intelligent other” in the definition of social presence by Biocca (1997) to non-anthropocentric intelligence, and by considering how machines’ “minds” are perceived and identifying dimensions of machine’s “mind” in terms of its goals and rules, the psychological processes involved in interaction with AI might be understood more comprehensively.

In light of existing multifaceted definitions of social presence, a tentative non-anthropocentric definition of social presence is *individual’s awareness of the goals, rules, and capacities of the system, and the perception of mutuality with the system on cognitive and affective levels.*

To be noted, this non-anthropocentric definition of social presence does not negate the possibility of perceiving AI as human or humanlike actors. Instead, it is just more comprehensive – including both anthropocentric and non-anthropocentric experience – without making such a distinction by focusing more on the content of the mental representation of AI’s “mental status,” regardless of whether it is humanlike or not. The comprehensiveness of this conceptualization might also be conducive to building a more parsimonious social presence theory.

### **Implications of the New Definition in Empirical Research**

Although it is possible that people lack the language to account for their experience with AI in a non-anthropocentric way (Kahn Jr., Freier, Friedman, Severson, & Feldman, 2004) and that our mental model for AI turns out to be solely developed through anthropomorphizing, it is an empirical question subject to future examination and cannot be answered with social presence conceptualized and operationalized anthropocentrically.

When put in a larger theoretical framework, simulation or representation of AI’s mental state might also be triggered by certain cues of the form and behaviors of the technological other

(Yampolskiy & Fox, 2012), identifying which is considered as part of the ambition of building a social presence theory (Biocca et al., 2003). As found in social presence research, the form, behaviors, or sensory experience with others serve as cues triggering certain mental models of others, shaping perceptions of others and determining how much social presence is experienced (Biocca, 1999; Biocca et al., 2003). With the new conceptualization of social presence, cues might be conceptualized and categorized with a different typology (as opposite to humanlike cues vs. machine like cues) depending on the dimensions and degree of social presence they trigger.

Although the operationalization of social presence is not the focus of the current paper, the non-anthropocentric conceptualization suggested here is only useful when it can be operationalized non-anthropocentrically. Furthermore, developing measures of non-anthropocentric social presence can help identify dimensions of social presence in human-AI interaction.

Existing measures of social presence in human interaction with technological artifacts are anthropocentric and ambiguous about what human, social being, and intelligent being, actually mean. For example, social presence has been measured with items such as “When working with the robot, I felt like working with a real person,” “Sometimes it seemed as if the robot had real feelings” (Bailenson, Blascovich, Beall, & Loomis, 2001; Heerink, Kroese, Evers, & Wielinga, 2008; Shin & Choo, 2011; Shin & Kim, 2008), and “unsociable : sociable,” “machine-like : life-like” and “insensitive : sensitive” (Lee, Jung, Kim, & Kim, 2006). A commonly used item for social presence measure is “how much did you feel as if you were interacting with an intelligent being?” (e.g., Kim, Park, & Sundar, 2013; Lee, Park, & Song, 2005; Lee, Peng, Jin, & Yan,

2006). However, it is not clear what participants mean when saying they feel interacting with an “intelligent being.”

Using anthropocentric wordings to describe experience with an alternative form of intelligence can be problematic. To answer this empirical question, non-anthropocentric conceptualizations and measures are needed. One tentative method to generate non-anthropocentric measures is by substituting neutral, objective description of perceptions of AI’s goals, rules and capacities for anthropocentric wordings in existing measures of social presence and mind perception. For example, “sensitive” can be rephrased as “able to detect signals sent from me,” and “consciousness” can be rephrased as “having access to its internal state,” etc.

### **Conclusion**

In conclusion, existing conceptualizations of social presence, although are very rich in terms of encompassing the perceptual, cognitive, affective, relational and behavioral dimensions of human interaction with technology, bias towards the anthropocentric aspect of the experience -- experiencing AI as a humanlike actor (medium-as-social-actor presence) and neglecting the direct experience of an intelligence (experiencing AI as it actually is). To account for the experience with an autonomous intelligence that need not be humanlike and that need not be perceived via anthropomorphizing, non-anthropocentric conceptualization and operationalization of social presence without using human as a reference point are argued for. A tentative definition is social presence as awareness of the goals, rules, and capacities of the system, and the perception of mutuality with the system on cognitive and affective levels.



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