

- Villa-Nicholas, M. (2014). Latina narratives of information technologies: Towards a critical Latina technology studies. *Media-N*, 10(3), n.p.
- Wallace, P. A., & Nelson, J. E. (1976). Legal processes and strategies of intervention. In P. A. Wallace (Ed.), *Equal employment opportunity and the AT&T case*. Cambridge, MA: MIT Press.
- Zuckerman, E. (2008). *Beyond dispute: EEOC v. Sears and the politics of gender, class, and affirmative action, 1968–1986*. PhD dissertation, Rutgers University Press, New Brunswick, NJ.

## CHAPTER TWELVE

## The Intersectional Interface

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### THEORIZING THE INTERFACE

Interfaces are typically conceptualized as the point of interaction between two systems, organizations, subjects, or components. Though this interaction is usually described in social or haptic terms, the interface also serves as a cultural point of contact shaped by ideologies that are manifest in the design, use, and meaning of the technology. Selfe and Selfe (1994) echo this sentiment in their description of the computer interface as a “political and ideological boundary land” (p. 481) that may serve larger cultural systems of domination in much the same way that geopolitical borders do. Just as geopolitical borders prevent the circulation of some individuals for political purposes, computer interfaces act as “contact zones” where complicated power dynamics play out, privileging the movement of some users over others.

Pratt (1991) defines contact zones as “social spaces where cultures meet, clash, and grapple with each other, often in contexts of highly asymmetrical relations of power, such as colonialism, slavery, or their aftermaths as they are lived out in many parts of the world today” (p. 34). This is an important lens to apply to information and communication technologies (ICTs), which have historically been paradoxically positioned either as apolitical and neutral tools or as inherently democratic and liberating. Internet technologies in particular have been rhetorically

described in terms of the networked potential for democratic interactions that transcend social systems of race, gender, and class. Applying the contact zone to the computer interface offers a critical reframing of this discourse, highlighting that computers do not *de facto* serve democratic aims, and instead may be directly implicated in facilitating legacies of racism, sexism, heterosexism, colonialism, as well as capitalistic exploitation and classism. More research is needed to historicize how power asymmetries in the interface have shaped the possibilities (and limitations) of anthropomorphized interfaces in the present moment.

## DEFINING AVAS

Anthropomorphized interfaces are often known as virtual agents, animated characters, embodied conversational agents, personified agents, and virtual humans ("v-humans"). This work purposefully employs the term *anthropomorphized virtual agents* (AVAs) as a way to emphasize the design aspects of these computer programs and interfaces that are designed to have human features, characteristics, and personality traits. Brenda Laurel (1997) describes an AVA as "a character, enacted by the computer, who acts on behalf of the user in a virtual (computer-based) environment" (p. 208). Anthropomorphism may be constructed *visually*, through graphic representation; *aurally*, through speech patterns and vocal styling; and *textually*, through written interactions with the user. Anthropomorphization may occur in degrees, ranging from less humanoid programs like Microsoft's old "Clippy" assistant for Office, to more humanoid examples such as IKEA's "Anna," who resembles a call center operator with a headset and cheery smile.

Laurel (1997) identifies four categories of computer-related tasks—those related to *information*, *work*, *learning*, and *entertainment*—where virtual agents may be appropriate. Information-related tasks include navigation and browsing functions, information retrieval, and the sorting, organizing, and filtering of data. Agents are also adept at performing the second category of tasks, *work* functions such as reminding, programming, scheduling, and advising. *Learning* is the third category of tasks appropriate for agents, and it includes coaching and tutoring. Finally, agents are often used in *entertainment* and are found in gaming situations performing and playing with and against human users. Apple's Siri application is a popular example of an AVA that fills work-related functions similar to a personal assistant: organizing personal data, maintaining a calendar, sending memos and text messages. Siri also fills an information role by performing search engine searches as a proxy. AVAs by companies like Artificial Solutions can be used as dialogue partners for educational goals like learning a second language, or as customer service agents like "Anna" from IKEA, who can answer questions in 21 languages. AVAs are easily recognizable in computer and video games as they interact with

the player to provide clues, fight, and advance gameplay in other ways. Increasingly they are used in personal health care interfaces such as SimCoach, a project from the USC Institute for Creative Technologies that assists military personnel and family members dealing with the effects of PTSD. As digital media platforms become sites for increasingly integrated activities, so too do AVAs move fluidly between and among these various functions, often simultaneously entertaining and educating, or performing information retrieval while also scheduling appointments.

## FACING THE INTERFACE

The story of anthropomorphic computer agents could easily begin with Alan Turing's exploration of computing intelligence, commonly known as "Turing's Test." In this experiment, an interrogator tries to distinguish a man from a computer through a series of mediated question-asking and answering. If the computer can successfully fool the interrogator into thinking that it is the man, it is said to "pass" the test. In Turing's original formulation of the test, the interrogator was tasked to tell a man from a woman, rather than a computer. In this version, the man wins if he fools the interrogator by successfully "passing" as a woman. Scholars have observed that the central role of gender in the original Turing Test effectively gendered the computer as female in the second version (Brahnam, Karanikas, & Weaver, 2011; Genova, 1994; Hayles, 1999), embedding gender and sexuality firmly in the foundational theorizing of computing intelligence.

Turing's thought experiments inspired computer scientists to design programs that could act as real-life Turing Tests and pushed the idea of computer agents as interfaces. The juxtaposition of the physical and the intellectual is a theme that has run throughout artificial intelligence (AI) and, later, in agent design. This is an important theme to trace, given that the mind/body binary is also prevalent in the discursive construction of social hierarchies, such as race and gender. Feminist thought has demonstrated that men tend to be associated with intelligence, mind, and thought, while women are associated with the body, emotion, and intuition. Similarly, critical race scholars have observed that hegemonic discourse associates Whiteness with intelligence, virtue, and civility, while the racialized Other is associated with nature, the body, and the primitive. The gendered construction of knowledge and knowing in AI is one that persists in AVA design. Some famous expressions of this include the design of now famous AI programs such as ELIZA, the psychologist agent designed by Joseph Weizenbaum (1976), and Michael Mauldin's (1994) conversational agent, JULIA, entered in the first Loebner competition for artificial intelligence. Both of these programs were gendered female in their design and expressed their gender identities through conversational scripts.

For example, JULIA responded to queries about her humanness (“Are you real?”) with references to having her period or “PMSing”—responses that problematically conflate gender identity with female biological markers (Foner, 1993). As with the Turing Test, gender and sexuality have remained central in the designs of current AVAs in both intended and unintended ways.

## INTERACTING WITH THE INTERFACE

Alexander Galloway (2008) describes the interface as “a control allegory” that “indicates the way toward a specific methodological stance” (p. 935), highlighting the metaphoric nature of interfaces and the concomitant ideologies required to approach them. Similarly, Selfe and Selfe (1994) note that computer interfaces have semiotic messages built in that betray an alignment along the axes of class, race, and gender. As an example, they point to the metaphor of the computer desktop, which connotes a professional, middle-class workspace, as opposed to other configurations that might be referents to domestic spaces (e.g., a kitchen table), or craftsman spaces (e.g., a mechanic’s workshop). Winner (1986) famously argues that artifacts have politics embedded in them, and certainly this is borne out through these examples. Selfe and Selfe argue, “if the map of the interface is oriented simultaneously along the axes of class, race, and cultural privilege, it is also aligned with the values of rationality, hierarchy, and logocentrism characteristic of Western patriarchal cultures” (p. 491). This is also true in the case of the anthropomorphized metaphor that is central to agent interface design.

Metaphor simultaneously describes two objects at once, operating through the recognition of an aspect of the primary object in the secondary object. Metaphor is a distinctive form of likening because it requires that we speak of the primary object in terms of the secondary object as if they were the same (Hills, 2012). As such, metaphors are often employed as heuristic tools, meant to facilitate understanding. Importantly, metaphors are culturally based, grounded in correlations from our own experiences (Lakoff & Johnson, 2003), and necessarily embodied. Considering the role and function of metaphor is essential when discussing interfaces and becomes even more explicit in AVAs where anthropomorphization is the foundational metaphor for design.

The point of comparison that the metaphor of anthropomorphism relies on for interface design is the sociality of human interaction. Not all virtual agents are anthropomorphized, but there are many advocates of anthropomorphization as a design strategy for enhancing usability of interfaces (e.g., Lester et al., 1997; Waern & Höök, 2001). According to Laurel (1997), “the kinds of tasks that computers perform for (and with) us require that they express two distinctly anthropomorphic qualities: *responsiveness* and the *capacity to perform actions*” (p. 210).

The foundation of this thinking is that humans are naturally skilled at relating to and communicating with other humans, thus interface design should exploit this as psychologically advantageous and human-computer interaction (HCI) should actively engage these innate skills. To paraphrase Lakoff and Johnson’s (2003) work, the anthropomorphic metaphor provides us not only a specific way of thinking about a topic but also a way of acting toward it (p. 34). In other words, anthropomorphization is a tool that repurposes human skill sets for sociability in the translation of otherwise foreign interactions with computer agents into more familiar social ones. What this metaphor misses when applied to virtual agents are the ways in which social interaction is heavily mediated by culture and its associative norms, practices, and power structures. Therefore it is imperative to look more closely at the values that are designed into AVAs and interfaces, teasing out their complexities and consequences.

AVAs have been a subject of substantial scholarship within artificial intelligence and human-computer interaction research, as well as in humanities disciplines such as rhetoric. Within AI and HCI, scholars have explored race and gender as design variables that can be optimized to create believability, thus enhancing user experience of interfaces. For example, Nass, Moon, Morkes, Kim, and Fogg (1997) observe gender stereotyping in testing how users apply categories and rule in social responses to computers. J. A. Pratt, Hauser, Ugray, and Patterson (2007) have found that users prefer computer agents whose ethnicity is similar to theirs. Rhetoricians have explored how representations of AVAs often re-instantiate harmful stereotypes about race and gender. For example, Sean Zdenek (2007) finds that virtual women that represent customer service workers draw heavily from stereotypes about women’s work. Brahn et al. (2011) demonstrate that virtual women enact male fantasies of heterosexuality. The differences in disciplinary approaches to this subject illustrate the needs for interdisciplinary contributions to design of technologies.

Zdenek (2007) points out the anthropomorphization of virtual agents has become deeply naturalized, though there is no hard evidence proving they are superior in function to non-anthropomorphized agents. Instead it has become a “seemingly unassailable claim that users treat computers, regardless of whether they are designed with faces or not, as social actors” (p. 403). Clifford Nass is credited with casting computers as social actors (see Nass et al., 1997; Nass & Moon, 2000). Nass et al. (1997) tested the idea that people engage with computers as social actors. They found that the users in their study applied politeness norms and varied their responses to the computer’s personalities and flattery as they might with a human actor. In another study, they found that users drew heavily on gender stereotypes in their interactions with the computers (Nass et al., 1997). This has contributed to the foundational framing of human-computer interaction as a social interaction between two human-like actors. While there have been

some challenges to this work (see Shechtman & Horowitz, 2003), the paradigm of computers as social actors remains dominant in HCI and is critically implicated in AVA design.

Previously scholars (e.g., Turkle, 1984; Winograd & Flores, 1986) attributed people's social responses to computers as proof that individuals anthropomorphize computers. However, Nass et al. (1997) found that, when explicitly asked, users acknowledge that the computer is not a human and should not be interacted with as such. Despite this awareness, they engage in social behavior toward the machines. This shows that while people may behave in social ways toward computers, they may not be explicitly anthropomorphizing the machines. In later work, Nass and Moon (2000) elaborate on this seeming contradiction by showing that people "mindlessly apply social rules and expectations to computers" (p. 81). "Mindless behavior" is a concept they borrow from Ellen J. Langer's work (1989, 1992). Mindless behavior can be characterized as an "overreliance on categories and distinctions drawn in the past and in which the individual is context-dependent and, as such, is oblivious to novel (or simply alternative) aspects of the situation" (Langer, 1992, p. 289).

Mindless behavior is presented as a kind of cognitive autopilot in these studies, though in later work Langer and Moldoveanu (2002) briefly acknowledge the social implications of mindless behavior for normalizing harmful stereotypes and prejudices. Mindless behavior describes an overreliance on categories based on personal experience as a way to deal with a novel situation or context. The paradigm for AVA design seems to cater to mindless behaviors as the path of least resistance, further entrenching the naturalization of this design strategy and ignoring how this may lead to reliance on harmful stereotypes.

Coinciding with the framework of computers as social actors is an overwhelming emphasis on the positive effects of anthropomorphized agents. Lester et al. (1997) coined the term "persona effect" to refer to the phenomenon that a life-like interface agent may have positive effects on the user's perception of a computer-based interaction task. This concept has been used widely in AI and HCI as validation for the use and design of AVAs (e.g., Mountridou & Virvou, 2002). Though many anthropomorphic agents are not humanoid in design (e.g., Microsoft's former Office Assistant "Clippy," a paperclip with eyes), many studies place a premium on increasingly realistic humanoid AVAs, asserting that humanoid interfaces engender increased cooperation (Kiesler & Sproull, 1997), or altruistically oriented interactions (Sproull et al., 1997). Interestingly, this was not actually borne out in Microsoft's Clippy, a widely maligned AVA that mostly annoyed users. Anna from IKEA, however, is an example of a hugely successful AVA (Noy, Ribeiro, & Iurgel, 2013), which may support evidence that more humanoid AVAs connect more with audiences, to the extent they do not wander into Mori's (1970/2012) "uncanny valley," in which an almost perfect humanoid resemblance creates feelings of strangeness and revulsion among users.

Most of this research is empirical, drawing evidence from user interface testing, user questionnaires, and, in some cases, biofeedback models (Prendinger, Mayer, Mori, & Ishizuka, 2003). Waern and Höök (2001) note, "the more anthropomorphic the agent is, the more naturally the user will respond to it, and the more 'human' the dialogue will become" (p. 298). This raises important questions about the underlying assumptions as to what constitutes "natural" behavior in the framework of human interactions. For example, Nass et al. (1997), finding that users apply gender stereotypes to computers, conclude that this is a natural behavior: "the tendency to gender-stereotype is so deeply ingrained in human psychology that it extends even to computers" (p. 154). This framing of sexism as a natural human behavior is dangerous and reveals the ways in which sexist ideologies are embedded in notions of nature and human behavior.

Zdenek (2007) points out that designers and researchers who build their work on the premise that human-computer interaction operates as human-human interaction "do not have to justify their own research agenda so much as claim the role of facilitator or catalyst for a phenomenon (i.e., the human propensity to treat computers as social actors) that is taken to be predetermined, universal, and above all, natural" (p. 405). This is a powerful and important observation. The scientific enterprise has a long history of using appeals to nature to explain racial, gender, and sexual difference, often for the purpose of justifying economic, political, and social projects that protect the status of the dominant power structure. Instead of approaching anthropomorphization as natural and inevitable, it must be approached as a particular philosophy of design with concomitant values that can be examined for ethical implications and moral accountability.

## DESIGNING RACE AND GENDER IN THE INTERFACE

Many designers of AVAs focus on humanness and believability in agent interfaces as features that will optimize the user's information experience. These abstract concepts are often defined by component qualities such as trust, friendliness, credibility, and empathy, which are further operationalized in the design process through verbal and nonverbal cues. The key supposition in this design strategy is that the user will judge the character of an anthropomorphic computer agent based on the same criteria that they use to judge humans in daily interaction. Zdenek (2007) observes that, in focusing on user experience and believability as units of analysis for evaluating AVAs, "designers may also fail to see how their software systems are shot through with assumptions about gender, race, ethnicity, users, and so on" (p. 405). This is demonstrably true in the construction of the base category of "human," for instance. At different points in history, "humanity" and "humanness" have been denied to people based on their gender, race, religion, ethnicity,

and sexuality and have been used to justify atrocities such as slavery, genocide, and rape. Similarly, the social construction of attributes such as trust, friendliness, credibility, and empathy are mediated by systems of gender and race. Notions of masculinity and femininity are often defined by their alignment with these terms, framing women as more empathetic and friendly and men as more credible and competent. Racial stereotypes shape who is seen as authoritative and trustworthy and who is seen as pathological and criminal. AVA designers have treated humanness and believability as natural categories, forgoing deeper investigation into the political histories and social construction of these concepts. Additionally, language describing personality traits as “variables” employs a mathematical metaphor that trades on positivist scientific authority. This obscures the socially mediated and flexible realities of these categories.

Zdenek (2007) points out that race and gender themselves become viewed as variables that strengthen or weaken the design goals of believability. As a result, studies that deal with race and gender in agent interface design tend to focus only on optimization, ignoring how race and gender function within systems of social difference. Often race and gender are acknowledged only as barriers to optimization. Thus, in these configurations, the normative subject is usually constructed as White, male, and presumptively heterosexual, and therefore unproblematic and uncomplicated as a design option. Female and non-White identities are seen as potentially problematic in terms of meeting design goals that promote “authority” or “trust.”

Cowell and Stanney's work (2003) provides an example of how race and gender are dealt with as design variables. Their study, undertaken with the goal of drafting design guidelines for “credible” and “trustworthy” agents, analyzes race and ethnicity (which they conflate), gender, and age in agent design and examines both visual representations and nonverbal behaviors. Cowell and Stanney begin by acknowledging the pervasiveness of gender, racial, and age stereotypes in society and providing substantive literature reviews on each area. However, even as they acknowledge this, they cite without question studies that purport to demonstrate that male and female users rank male agents more highly in terms of credibility and believability. Along the same lines, they refer to studies showing that youthful agents are more highly rated. Instead of problematizing these results against the stereotypes they enumerated, they conclude that the combination of these features (i.e., youth and masculinity) provides the best possible option for default design guidelines, effectively reinforcing the stereotypes they listed.

This had the most problematic effects on their formulations of ethnicity and race. While they acknowledge that racial stereotypes come up as major barriers in acceptance of credibility and trust, they dismiss the key political valences of Whiteness by saying that “all ethnic groups appear to harbor their own out-group prejudices and use similar stereotypes for people in their own ethnic group” (Cowell & Stanney, 2003, p. 303). Just as the comments of Nass et al. (1997)

naturalized sexism through gender stereotyping, Cowell and Stanney (2003) seem to dismiss racism as a “natural” part of the human experience, rather than as a structural system that replicates power and privilege. By using the language of prejudice, rather than acknowledging that the racist framing of Whiteness forms the benchmark for trust and credibility, they obscure the foundational ways that power becomes operationalized in agent design.

Cowell and Stanney (2003) suggest that the solution for racial barriers to trust and credibility in agent design is to match the ethnicity of the agent to the ethnicity of the user. Customizability is often offered as a potential solution to side-step tricky questions about how to mediate, or altogether avoid, criticisms of negative stereotyping in agent design. This strategy gives users a level of control over the representation of their AVA, for which they can then design an agent that is both culturally specific and appropriate for them. While this might offer some potential remediation for problematic representations, it should be treated suspiciously as a transformative approach. Studies of avatar design in related digital environments (e.g., online gaming) demonstrate that giving users the chance to customize their avatar does not automatically result in representations that dismantle gender or racial hierarchies. On the contrary, customized avatar design tends to strongly conform to identity stereotypes (Kolko, 1999) and reflect White standards of beauty (Higgin, 2009; Lee, 2014). In addition, users are still limited to the design choices available in the system for representation (Pace, Houssian, & McArthur, 2009). In light of this evidence, customization of AVAs should be located within a discourse about the neoliberal effects of the interface as a site where individual choices are shaped by consumer power and market logics, rather than heralded as a radical shift of underlying values in design.

## AVAS AS WOMEN'S WORK

While metaphors potentially facilitate new understandings of one experience through another, they may also leverage stereotypes and tropes in ways that reinforce dominant power structures. Brahn et al. (2011) demonstrate how the foundational HCI metaphor, “computer is woman,” is closely tied to the maintenance of the gendered labor force in computing. They link the history of a labor transformation in which women performed skilled computer functions until the advent of computing machinery that automated these tasks to the present trend of designing anthropomorphized agent technologies to resemble women. Zdenek (2007) likewise views the repetition and banality of tasks performed by computers as a metaphor for women's work. Recent studies of virtual assistants expand the idea of AVAs as women's work by defining emotional and affective dimensions to the functions AVAs may perform.

Emotional labor has been shown to be part and parcel of “women’s work” in the domestic sphere, where women have historically managed caregiving and childrearing and performed other affective labor activities involved in maintaining domestic social relationships. As women have moved into the workplace, jobs that have been coded as “feminine” (e.g., nursing, caregiving, service) tend to require the same emotional and affective labor as an invisible component of the job. Gendered emotional labor practices are practices of sexual differentiation that both construct and reinforce gendered beliefs and stereotypes (Hochschild, 1983). Studies of affective labor in service industries demonstrate that women are expected to perform emotionally and affectively in jobs where their male counterparts are not. This includes putting up with gendered abuse and harassment as part of their affective work (Hughes & Tadic, 1998; Taylor & Tyler, 2000).

Affective agent design attempts to mediate user frustration or anxiety with the interface or information context (e.g., health care, language acquisition, etc.). There are various ways the agent may be programmed to sense and respond to the emotional state of the user. Empathetic agents may recognize emotional expression in the voice, detect facial expressions, or use sensory tools like the IBM “emotion mouse” to detect pulse rate, skin temperature, and general somatic activity (Ark, Dryer, & Lue, 1999). These data are calculated and the agent can react using strategies such as active listening and empathy.

Gendered assumptions about women’s “natural” affective skills shape the discourse and design of affective virtual agents, whether or not they are explicitly represented as women. That is, even AVAs not explicitly represented as women are still discursively constructed as feminine. For example, in Brave, Nass, and Hutchinson’s (2005) study, they find that both male and female users rated virtual agents exhibiting only empathic emotion as submissive, a trait negatively and stereotypically applied to women. AVAs functioning as health care workers (e.g., nurses or caregivers to the elderly) are often explicitly designed to conform to gendered stereotypes. Noy et al. (2013) state that in designing embodied agents for use in elderly digital inclusion efforts, “female and male behaviour of an EVA [AVA] should be consistent with gender stereotypes” (p. 145). Similarly, Bickmore, Pfeifer, and Jack (2009) discuss designing female nurse characters to “better match the patient demographic and improve acceptability of the VN [Virtual Nurse]” (p. 1270). Hone (2006) found that affective responses are more generally acceptable to users, and thus more effective, when coming from female embodied agents. These studies support Forlizzi, Zimmerman, Mancuso, and Kwak’s (2007) findings that people prefer virtual agents that conform to gender stereotypes—and, interestingly, that men prefer embodied agents more than women do.

Brahnam et al. (2011) persuasively argue that “screen-based metaphors that cloak the interface are unspoken gendered subtexts that have the power to bind or liberate” (p. 402). This stance posits that metaphors structure access to power

and action in the world instead of being neutral or harmless rhetorical maneuvers. Brahnam et al. thus locate the design of virtual agents as a continuation of the “computer is woman” metaphor and suggest that the introduction of personified agents has simply made the longstanding feminization of the computer more visible. The metaphorical distinction becomes somewhat collapsed in virtual agents that are explicitly represented as women, and even more so when these programs are designed as affective workers that assume caregiving and emotional labor roles. Laurel (1997) dismisses the consequences that representations may have on real women in the workforce. She frames it as an issue of knowing fact from fiction, arguing that people realize the virtual agent is not a real person; therefore, their actions toward the virtual agent are separate from their behavior toward real people (p. 209). This viewpoint ignores the symbolic power that media representations have, along with their potential for upholding dominant cultural narratives that reinforce damaging stereotypes. Certainly, virtual agents designed to take on affective work are being culturally coded in gendered ways, whether they are explicitly represented as women or not.

## CONCLUSIONS

AVAs continue to proliferate across platforms and are increasingly advanced in terms of computing intelligence and interactive capabilities. Now more than ever, it is crucial to interrogate the premise of anthropomorphization as a design strategy that relies on gender and race as foundational, infrastructural components. The ways in which gender and race are operationalized in the interface continue to reinforce the binaries and hierarchies that maintain power and privilege. While customization may offer some individual relief to problematic representations in the interface, particularly for marginalized users, sexism and racism persist at structural levels and, as such, demand a shifted industry approach to design on a broad level. Exploring how gender and race inform AVA design illuminates the ethical considerations that designers of technology must engage with if they are to create socially responsible technologies. Sexism and racism persist in shaping the design, use, and meaning of ICTs, and this must be prioritized as a set of key ethical concerns in those computing fields where design and implementation of these systems occurs. As this work demonstrates, there is a disjuncture between disciplinary approaches to AVAs that must be bridged for change to happen. Socially responsible interface design requires active engagement with issues of identity, representation, and power from both designers and digital media scholars. Critical cultural frameworks are potentially powerful tools for investigating culture and power in technology design and should be integrated into the training of computer engineers and designers.

## REFERENCES

- Ark, W. S., Dryer, D. C., & Lu, D. J. (1999). The emotion mouse. *Proceedings of the HCI International 99: 8th international conference on human-computer interaction: Ergonomics and user interfaces* (Vol. 1, pp. 818–823). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Bickmore, T. W., Pfeifer, L. M., & Jack, B. W. (2009). Taking the time to care: Empowering low health literacy hospital patients with virtual nurse agents. In *Proceedings of the 27th international conference on human factors in computing systems* (pp. 1265–1274). New York: ACM Press.
- Brahnam, S., Karanikas, M., & Weaver, M. (2011). (Un)dressing the interface: Exposing the foundational HCI metaphor “computer is woman.” *Interacting With Computers*, 23(5), 401–412.
- Brave, S., Nass, C., & Hutchinson, K. (2005). Computers that care: Investigating the effects of orientation of emotion exhibited by an embodied computer agent. *International Journal of Human-Computer Studies*, 62(2), 161–178.
- Cowell, A., & Stanney, K. (2003). Embodiment and interaction guidelines for designing credible, trustworthy embodied conversational agents. In T. Rist, R. Aylett, D. Ballin, & J. Rickel (Eds.), *Lecture notes in computer science: Vol. 2792. Intelligent virtual agents* (pp. 301–309). Berlin: Springer-Verlag.
- Foner, L. (1993). What’s an agent, anyway? A sociological case study. *Agents Memo* 93. Retrieved from <http://www.student.nada.kth.se/kurser/kth/2D1381/JuliaHeavy.pdf>
- Forlizzi, J., Zimmerman, J., Mancuso, V., & Kwak, S. (2007). How interface agents affect interaction between humans and computers. In *Proceedings of the 2007 conference on designing pleasurable products and interfaces* (pp. 209–221). ACM. Retrieved from <http://dl.acm.org/citation.cfm?id=1314180>
- Galloway, A. R. (2008). The unworkable interface. *New Literary History*, 39(4), 931–955.
- Genova, J. (1994). Turing’s sexual guessing game. *Social Epistemology*, 8(4), 313–326.
- Hayles, N. K. (1999). *How we became posthuman: Virtual bodies in cybernetics, literature, and informatics*. Chicago, IL: University of Chicago Press.
- Higgin, T. (2009). Blackless fantasy: The disappearance of race in Massively Multiplayer Online Role-Playing games. *Games and Culture*, 4(1), 3–26.
- Hills, D. (2012). Metaphor. In Edward N. Zalta (Ed.), *The Stanford encyclopedia of philosophy* (Winter 2012 ed.). Retrieved from <http://plato.stanford.edu/archives/win2012/entries/metaphor/>
- Hochschild, A. R. (1983). *The managed heart: Commercialization of human feeling*. Berkeley: University of California Press.
- Hone, K. (2006). Empathic agents to reduce user frustration: The effects of varying agent characteristics. *Interacting With Computers*, 18(2), 227–245.
- Hughes, K. D., & Tadic, V. (1998). “Something to deal with”: Customer sexual harassment and women’s retail service work in Canada. *Gender, Work & Organization*, 5(4), 207–219.
- Kiesler, S., & Sproull, L. (1997). “Social” human-computer interaction. In B. Friedman (Ed.), *Human values and the design of computer technology* (pp. 191–200). Stanford, CA: CSLI Publications.
- Kolko, B. E. (1999). Representing bodies in virtual space: The rhetoric of avatar design. *The Information Society*, 15(3), 177–186.
- Lakoff, G., & Johnson, M. (2003). *Metaphors we live by* (Updated ed.). Chicago, IL: University of Chicago Press.
- Langer, E. J. (1989). *Mindfulness*. Reading, MA: Addison-Wesley.
- Langer, E. J. (1992). Matters of the mind: Mindfulness/mindlessness in perspective. *Consciousness and Cognition*, 1, 289–305.
- Langer, E. J., & Moldoveanu, M. (2002). The construct of mindfulness. *Journal of Social Issues*, 56(1), 1–9.
- Laurel, B. (1997). Interface agents: Metaphors with character. In B. Friedman (Ed.), *Human values and the design of computer technology* (pp. 207–219). Stanford, CA: CSLI Publications.
- Lee, J.-E. R. (2014). Does virtual diversity matter?: Effects of avatar-based diversity representation on willingness to express offline racial identity and avatar customization. *Computers in Human Behavior*, 36, 190–197.
- Lester, J. C., Converse, S. A., Kahler, S. E., Barlow, S. T., Stone, B. A., & Bhogal, R. S. (1997). The persona effect: Affective impact of animated pedagogical agents. *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 359–366). doi:10.1145/258549.258797
- Mauldin, M. L. (1994). Chatterbots, tinymuds, and the Turing test: Entering the Loebner prize competition. *Proceedings of the National Conference on Artificial Intelligence* (pp. 16–21). Retrieved from <http://www.aaai.org/Papers/AAAI/1994/AAAI94-003.pdf>
- Mori, M. (1970/2012). The uncanny valley (K. F. MacDorman & N. Kageki, Trans.). *IEEE Robotics & Automation Magazine*, 19(2), 98–100.
- Moundridou, M., & Virvou, M. (2002). Evaluating the persona effect of an interface agent in a tutoring system. *Journal of Computer Assisted Learning*, 18(3), 253–261.
- Nass, C., & Moon, Y. (2000). Machines and mindlessness: Social responses to computers. *Journal of Social Issues*, 56(1), 81–103.
- Nass, C., Moon, Y., & Green, N. (1997). Are machines gender neutral? Gender-stereotypic responses to computers with voices. *Journal of Applied Social Psychology*, 27(10), 864–876.
- Nass, C., Moon, Y., Morkes, J., Kim, E.-Y., & Fogg, B. J. (1997). Computers are social actors: A review of current research. In B. Friedman (Ed.), *Human values and the design of computer technology* (pp. 137–162). Cambridge, UK: Cambridge University Press.
- Noy, D., Ribeiro, P., & Iurgel, I. A. (2013). Embodied virtual agents as a means to foster e-inclusion of older people. In P. Biswas, C. Duarte, P. Langdon, L. Almeida, & C. Jung (Eds.), *A multimodal end-2-end approach to accessible computing* (pp. 135–154). London: Springer.
- Pace, T., Houssian, A., & McArthur, V. (2009). Are socially exclusive values embedded in the avatar creation interfaces of MMORPGs? *Journal of Information, Communication and Ethics in Society*, 7(2/3), 192–210.
- Pratt, J. A., Hauser, K., Ugray, Z., & Patterson, O. (2007). Looking at human-computer interface design: Effects of ethnicity in computer agents. *Interacting With Computers*, 19(4), 512–523.
- Pratt, M. L. (1991). Arts of the contact zone. *Profession*, 33–40.
- Prendinger, H., Mayer, S., Mori, J., & Ishizuka, M. (2003). Persona effect revisited. In T. Rist, R. Aylett, D. Ballin, & J. Rickel (Eds.), *Lecture Notes in Computer Science: Vol. 2792. Intelligent virtual agents* (pp. 283–291). Berlin: Springer-Verlag.
- Selfe, C. L., & Selfe, R. J. (1994). The politics of the interface: Power and its exercise in electronic contact zones. *College Composition and Communication*, 45(4), 480–504.
- Shechtman, N., & Horowitz, L. M. (2003). Media inequality in conversation: How people behave differently when interacting with computers and people. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 281–288). doi:10.1145/642611.642661
- Sproull, L., Subramani, M., Kiesler, S., Walker, J., & Waters, K. (1997). When the interface is a face. In B. Friedman (Ed.), *Human values and the design of computer technology* (pp. 163–190). Stanford, CA: CSLI Publications.
- Taylor, S., & Tyler, M. (2000). Emotional labour and sexual difference in the airline industry. *Work, Employment & Society*, 14(1), 77–95.

- Turkle, S. (1984). *The second self: Computers and the human spirit*. New York: Simon and Schuster.
- Waern, A., & Höök, K. (2001). Interface agents: A new interaction metaphor and its application to universal accessibility. In C. Stephanidis (Ed.), *User interfaces for all: Concepts, methods, and tools*. (pp. 295–317). Mahwah, NJ: Lawrence Erlbaum.
- Weizenbaum, J. (1976). *Computer power and human reason: From judgment to calculation*. San Francisco, CA: Freeman.
- Winner, L. (1986). Do artifacts have politics? In *The whale and the reactor: A search for limits in an age of high technology* (pp. 19–39). Chicago, IL: University of Chicago Press.
- Winograd, T., & Flores, C. F. (1986). *Understanding computers and cognition: A new foundation for design*. Norwood, NJ: Ablex.
- Zdenek, S. (2007). “Just roll your mouse over me”: Designing virtual women for customer service on the Web. *Technical Communication Quarterly*, 16(4), 397–430.

## CHAPTER THIRTEEN

# The Epidemiology of Digital Infrastructure

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## INTRODUCTION

The field of media and cultural studies is in desperate need of an epidemiological turn. Though it has produced a handful of exemplary forays into the study of disease, the field as a whole has yet to produce a sustained branch of epidemiological analysis. Paula Treichler's landmark text, *How to Have a Theory in an Epidemic: Cultural Chronicles of AIDS*, was published in 1999, and though one would hope that it would have served as a catalyst and model for a sustained and rigorous cultural analysis of disease, most of the work on the cultural study of disease has been produced outside the field of media and cultural studies. This is not to suggest that these works are lacking on the basis of their having been produced outside the field of media and cultural studies. Indeed, these works have advanced our understanding of the rhetorical production of medical character and trust (Keränen, 2010) and the epidemiological consequence of the outbreak narrative (Wald, 2007). And yet, these contributions likewise reflect the intellectual histories of their production and their origins in the disciplines of rhetoric and English, respectively. The absence of a sustained contribution from the field of media and cultural studies is a shame, for in spite of the contributions to a cultural analysis of epidemiology made by other fields, “unless we operate in this tension, we don't know what cultural