

ORIGINAL ARTICLE



Characterizing Communication Patterns between Audiences and Newsbots

Diego Gómez-Zará^{a,b}  and Nicholas Diakopoulos^b 

^aFacultad de Comunicaciones, Pontificia Universidad Católica de Chile, Santiago, Chile; ^bSchool of Communication, Northwestern University, Evanston, IL, USA

ABSTRACT

News organizations are increasingly exploring how the use of newsbots can enhance journalism by enabling novel ways to disseminate news and engage with audiences in social media environments. While newsbots have begun to draw attention in journalism studies, little consideration has been given to how audiences perceive and respond to newsbots. Through the lens of human-machine communication (HMC), this article presents a case study of a newsbot interacting with Twitter users who shared news articles from the *New York Times* (NYT). In particular, we analyzed the Twitter users' perceptions and responses to the newsbot using qualitative analysis. We found that Twitter users perceived the newsbot in several degrees: from ignoring it, to addressing the content curated by the newsbot, to responding to newsbot itself. Moreover, we found that Twitter users offered a range of opinions, personal experiences, facts, counter-arguments, and affective displays when they addressed the content or the newsbot. We discuss how newsbots can be effective tools to enhance news engagement, the obstacles that they face when they interact in online environments, and reflect on the range of communicative roles that newsbots play with online audiences.

KEYWORDS

Newsbots; human machine communication; Twitter; social bots; news engagement; news comments

Introduction

Given the rising prevalence of social bots on social media platforms, journalism scholarship has sought to understand how these machines are reconfiguring the news ecosystem (Thurman, Lewis, and Kunert 2019). Whether their purposes are benign or perverse, social bots are changing how social media users are receiving, consuming, and sharing news articles. A recent report from the Pew Research Center (Wojcik et al. 2018) highlighted two key findings related to social bots' presence: 66% of all shared links on Twitter from July to September 2017 were made by accounts with characteristics common among automated bots, and a small number of highly active bots were responsible for a significant share of links to prominent news and media sites. This pervasive presence of social bots has brought concerns around their existence, sources, creators, and ultimately, their implications for online public spheres. As a

consequence, a great deal of research attention has been given to social bots' potentially detrimental role, such as by amplifying propaganda and creating the conditions for increased manipulation, polarization, misinformation, and fake news (Ferrara et al. 2016; Vosoughi, Roy, and Aral 2018; Lazer et al. 2018; Howard, Woolley, and Calo 2018).

In contrast, another vantage point considers social bots for productive and benevolent uses, such as distributing personalized information and establishing conversations with social media users. Such virtuous bots have been used by news organizations for journalistic purposes, embracing their values, norms, and principles (Thurman, Lewis, and Kunert 2019). Also known as *newsbots*—and the focus of this research—these are social bots with a particular focus on news distribution and interactions with audiences on social media platforms (Lokot and Diakopoulos 2016; Ford and Hutchinson 2019; Jones and Jones 2019). Scholarly interest has often focused on how news organizations are using newsbots to automate news distribution, provide information to audiences as personalized services, and distribute news information using conversational formats (Diakopoulos 2019). Conceptualized as *technological actants*, newsbots have been constructed to suit journalistic purposes and innovate relationships between news organizations and audiences, operating as actants with a social presence and the agency to interact directly with social media users (Lewis and Westlund 2015).

Despite the increasing research interest in newsbots, less scholarly attention has been given to how audiences *perceive* and *respond* to newsbots that interact with them (Guzman 2019a). In the current news ecosystem, where humans are considered the dominant agents, most newsbots have been conceived of as mere tools for automation purposes or as passive gadgets that audiences may have an interest in using (Milosavljević and Vobič 2019). Relatively little is known about the role of these newsbots as *communicative actors*—agents with a degree of autonomy and freedom to communicate with human users—in the current news ecosystem (Jones 2015), and the communication patterns adopted by audiences when newsbots reach out to them in serendipitous ways (Guzman and Lewis 2020). How effective are newsbots that interact with audiences in social media environments? What kinds of reactions do online audiences have toward newsbots? And how might news distribution evolve in light of algorithms that act not only as a communication channel (as with feeds or recommenders) but as entities that engage with humans as communicative actors?

To address these questions, this research undertakes a case study around a particular newsbot that interacts with Twitter users. We analyze a newsbot called *Anecbotal NYT*, which listens to Twitter users who share *The New York Times* (NYT) news articles, and then shares with them comments written by NYT users about those articles. Drawing on the human-machine communication (HMC) framework (Lewis, Guzman, and Schmidt 2019; Guzman 2018), we characterize how Twitter users perceive the newsbot and respond to it. We conducted a qualitative analysis of 366 messages observed between Twitter users and the newsbot to characterize the nature of their communication. This case study exemplifies to what extent newsbots can exercise communicative roles in social media environments, as well as the range of reactions that audiences can experience by interacting with them. We discuss the broader

implications of our analysis and reflect on how our findings expand the horizon of news engagement to include newsbots as communicators in online public spheres.

Newsbots

Despite social bots' potentially detrimental role in social media, news organizations have endeavored to create social bots that support various aspects of news distribution processes. Lokot and Diakopoulos (2016) conceptualized this specific form of social bots as "newsbots," which they define as "automated accounts that participate in news and information dissemination on social networking platforms." Unlike other automated software bots used internally in news organizations (e.g., for scraping information or producing data-driven leads), here we specifically focus on newsbots that are oriented toward audience engagements as the "social face of news automation" (Diakopoulos 2019). Newsbots can help journalists to automate the dissemination of news content in social media platforms. Similarly, newsbots can enable audiences to access information via conversational interactions, making news more accessible to those who desire a less traditional journalistic format. Also known as *chatbots*, news organizations have developed such conversational newsbots to provide more individualized and dialogic formats to distribute news to their readers (Dale 2016; Jones and Jones 2019). As advantages, news distribution becomes more personalized and is moved to messaging environments, where users can engage with newsbots in personal spaces (Ford and Hutchinson 2019). However, news organizations have faced issues with implementing and promoting newsbots among their audiences. Newsbots have been described as "resource-heavy experiments" that often require the full-time attention of journalists and developers to maintain, monitor, and feed (Belair-Gagnon, Lewis, and Agur 2020). The high human and financial costs have led news organizations to shut down several newsbots initiatives (Lichterman 2016). Moreover, users have described communicating with newsbots as clunky, slow, and unnatural due to glitches, slow response time, and the lack of advanced methods to understand and respond to users' messages (Johri, Han, and Mehta 2016). But despite these limitations, recent developments in newsbots suggest potential to provide personalized, intelligent, and individualized experiences for audiences, as well as to foster new relationships between audiences and news organizations (Jones and Jones 2019).

A myriad of existing newsbot developments can be described using several dimensions, such as their inputs, outputs, intelligence, environment, features, and purposes (Lokot and Diakopoulos 2016). One key component of these newsbots is the current socio-technical infrastructure enabled by social platforms such as Facebook, Twitter, and Telegram. Newsrooms have developed productive newsbots that disseminate informational content (e.g., Twitter bots such as FiveThirtyEight's *@censusAmericans* and *New York Times'* *@NYT4thDownBot*), gather information to support journalists (e.g., ProPublica's project to collect examples of hate speech and Washington Post's *Feels* bot, both of which were deployed on Facebook), serve as public-facing monitoring and alerting tools (e.g., NPR's *@Botus*, USA Today's *@big_cases*, or LA Times' *@MuckRockBot*), and perhaps even contribute to accountability journalism (Diakopoulos 2018). Another example is *Politibot*, which was used to offer narrated

news articles to Telegram users (Gonzales and Sánchez González 2016). The goal of these newsbots is often to facilitate audiences' interaction and engagement with news organizations and their content.

Despite the growth in scholarship around newsbots, little attention has been given to understanding audiences' attitudes toward newsbots (Guzman 2019a), such as how audiences conceptualize and make sense of newsbots in social media environments, and their interactions with them (Lewis, Guzman, and Schmidt 2019). Previous studies have described newsbots mostly from the viewpoint of journalists, technicians, and managers. These perspectives focus mostly on newsbots' components (e.g., algorithms, personality, agency, interfaces, scripts, inputs, outputs) rather than their audiences' perceptions and experiences, which can lead to defining newsbots as complex socio-technical systems (Geiger 2014). Furthermore, measuring newsbots' effectiveness with audiences is still limited and lacks benchmarks. Jones and Jones (2019) found that methods for assessing BBC newsbots' performance included common metrics used for news articles and social media (e.g., "clicks," "time spent," "reach"), but these metrics were not sufficient to indicate whether newsbots appealed to their target audiences or added value to the news organization.

Ultimately, understanding the effects of newsbots on online audiences could help elaborate their modes of success or failure and facilitate their responsible use and adoption in the current news ecosystem (Belair-Gagnon, Lewis, and Agur 2020). This research aims to fill the gap in the need for such an analysis of the social aspects and interactions between audiences and newsbots.

Human–Machine Communication: A Conceptual Lens

To understand how audiences perceive and respond to newsbots, human–machine communication (HMC) provides a theoretical lens for guiding communication research oriented around the "creation of meaning" between humans and machines (Guzman 2018). Instead of conceiving machines as mere *mediums* through which humans communicate with one another, HMC envisions machines as *communicators*, which can be sources and recipients of messages. To comprehend the role of machines as communicators, HMC draws theoretical foundations from social presence, source orientation, "computers are social actors" (CASA), and human computer interaction (HCI) theories (Walther 1992; Nass, Steuer, and Tauber 1994; Picard 2003). This shift in the machine's role rethinks the boundaries of human–communication from traditional perspectives of *human–human* interactions studied in communication theories to a new way of thinking where machines can establish meaningful interactions with humans (Gunkel 2012). Prior research shows that people can respond to these machines applying the same rules of communication with humans, showing levels of gratitude, reciprocity, and respect (Nass and Moon 2000; Reeves and Nass 1996). Because the creation of meaning between humans is guided by how they interpret one another as communicators, the main goal of HMC is to comprehend how humans make sense of and conceptualize machines as communicative subjects (Guzman 2019b).

From an HMC perspective, newsbots can function as communicative actors able to establish meaningful communications with audiences in their public and private

spaces (Guzman 2018). Conceiving newsbots as communicative actors in news media environments brings symbiotic conceptualizations between humans and machines of who, what, when, where, and why journalistic processes are taking place (Waisbord 2019). Moreover, the increasing role of newsbots to automate communication and news distribution in social media platforms creates a new sphere of influence in audiences' public and personal communication (Hepp 2020). Since there remains a dearth of empirical scholarly study of how newsbots may impact the relationships between news organizations and audiences, HMC offers a theoretical framework to shed light on how newsbots are perceived and responded to by audiences (Lewis, Guzman, and Schmidt 2019).

Research Questions

Our first research question seeks to understand how audiences perceive newsbots when they are interacting with them. Compared to interacting with humans, people have less experience with making sense of technologies as communicators (Dautenhahn 2004). Prior studies have shown multiple approaches to study how users perceive machines as communicative subjects. A general standard to address interactions with technologies is comparing prior experiences of conversations in human-human contexts, since people can observe and evaluate others' behaviors and intelligence through communication activities (Gunkel 2012). In the context of journalism studies, this approach lacks specific references since news distribution traditionally is a unidirectional process driven from news organizations to their readers. Another perspective is analyzing newsbots' elements of technology design and anthropomorphic qualities—such as gender, personality, nationality—which helps explain users' attitudes and perceptions toward machines (Nass, Moon, and Green 1997). While many news technologies can be described according to their materiality and functionality (Nagy and Neff 2015), most news organizations have designed newsbots using neutral traits (e.g., no gender, no nationality, no cultural references) in order to keep the newsbot's identity close to their brand and their journalistic products, such as websites and social media accounts.

Another approach to understanding how audiences conceptualize newsbots as communicators is evaluating toward whom audiences are exhibiting a social behavior: Do they target the newsbot as the source? or do they respond toward the individuals "behind" the newsbot (e.g., developer, journalist, etc.)? This distinction is referred to as *source orientation*, which is the source that the user considers to be the focus of the interaction (Sundar and Nass 2000; Solomon and Wash 2014). This distinction is critical for work within HMC because "people's source orientation affects their evaluation of the messages that they are receiving" (Guzman 2019b). When audiences interact with newsbots, they can interact with several sources and entities that are involved in the newsbot's presence: the newsbot itself, the news organizations, or the developers behind the newsbot. Therefore, how audiences perceive newsbots can be described in terms of users' responses to it and how they consider the source. Studying mobile assistants, Guzman (2019b) found that users' source orientation was not always uniform across different technologies: some users thought that the mobile assistant was

a *medium* for extracting information from other sources, whereas the assistant was the source of the communication for other people. Thus, we examine how newsbots' are perceived by audiences, paying special attention to how users address the source of the interaction with newsbots. Do newsbots become the focus of the interaction, a medium, or an entity in the middle? We propose the following research question:

RQ1. How do social media audiences perceive newsbots in their online environment?

Our second research question asks what kinds of reactions audiences have toward newsbots. Through an HMC theoretical lens, the sequence of messages between audiences and newsbots constitutes part of the research analyses. Previous HMC literature provides two main insights regarding humans' reactions toward machines. First, humans can show different levels of politeness, interpersonal distance, and judgments (Reeves and Nass 1996). Additionally, humans can rely on the same social rules when interacting with machines, as they would when interacting with other people, applying the same social heuristics because social agents call to mind similar social attributes as humans (Nass, Steuer, and Tauber 1994). Second, HMC studies have shown that human users are able to disclose personal information to machines through reciprocal self-disclosure (Moon 2000). In one study of conversations held by humans and machines, participants' emotional disclosure effects were equivalent, whether they thought they were talking to a machine or a person (Ho, Hancock, and Miner 2018). Another study shows that humans can positively connect with a machine, influence it by providing arguments and advice, and also be aggressive with it by being hostile, sarcastic, or negative (Shechtman and Horowitz 2003). Considering these communication patterns between humans and machines, we aim to understand social media users' reactions toward a newsbot that interacts autonomously with them. Our second research question is

RQ2. What kind of reactions do audiences have toward newsbots?

Case Study: Anecbotal NYT

Using the HMC perspective developed in the last section, we characterize the audiences' perceptions and reactions to a newsbot that shares and distributes news articles. Rather than analyzing how news organizations develop or use newsbots, we disentangle how audiences perceive and react to this newsbot. We seek to better understand and characterize how audiences perceive, interact with, and communicate with the newsbot via the comments they make.

For this reason, we conducted a case study analyzing an open-source Twitter newsbot called "*Anecbotal NYT*."¹ This newsbot listens to Twitter users who have shared NYT news articles and then shares with them comments written in response to the article from the NYT website (Figure 1). The stated design goal of the newsbot is to find interesting comments made on a news article and make them more visible to people tweeting about those stories on Twitter. We chose to study a newsbot on Twitter because (a) users' interactions with others are public, (b) Twitter is highly relevant in news and media, (c) Twitter users can interact directly with each other, without communicating through a specific thread or topic (e.g., Reddit) and without being

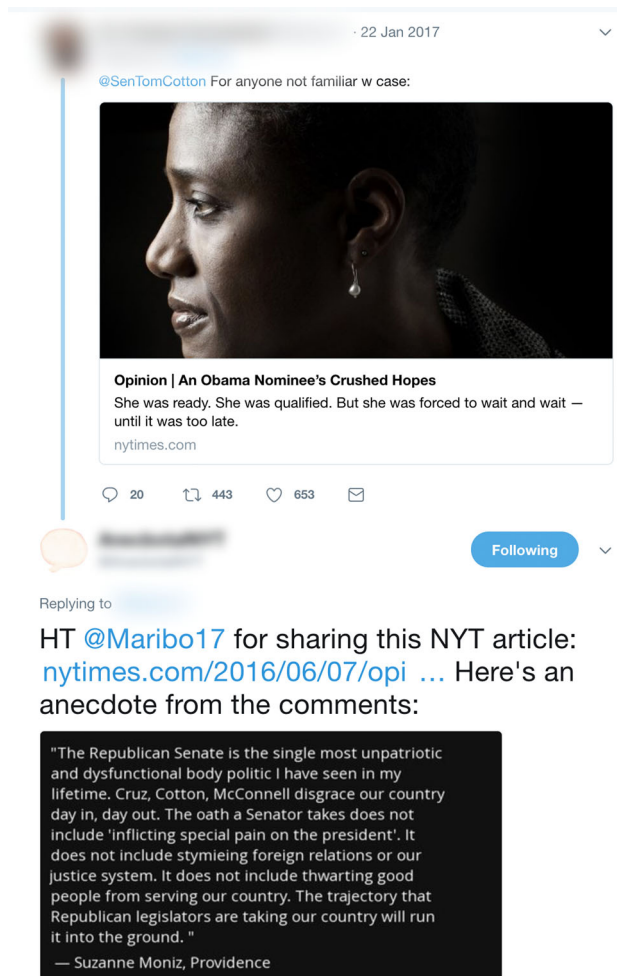


Figure 1. The newsbot shares an anecdote from the *New York Times* with a Twitter user.

friends (e.g., Facebook), and (d) the platform allows the download of users' interactions through its APIs. In particular, this newsbot was already available on Twitter and was in operation for more than one year when our study began. The Anecbotal NYT newsbot was active from November 2015 until November 2017, when the *New York Times* introduced new changes in its API which disrupted the newsbot's activity.

The newsbot has two main components: a Twitter account to interact with users on that platform ("@AnecbotalNYT"), and a Python script to operate the newsbot and extract data from the Twitter API and the NYT API. The newsbot's Twitter account was designed to have a neutral persona: There was no attempt at anthropomorphism, its name was not gendered, and it labeled itself as a newsbot. Essentially, the newsbot did not mimic any human identity or attempt to deceive users about its nature. The newsbot did not act as a conversational agent. In other words, if a Twitter user sent a message to the newsbot, the newsbot did not reply.

The newsbot works in four steps: (1) it first identifies Twitter users who have shared links of NYT articles on Twitter, (2) gets a comment drawn from the discussion about

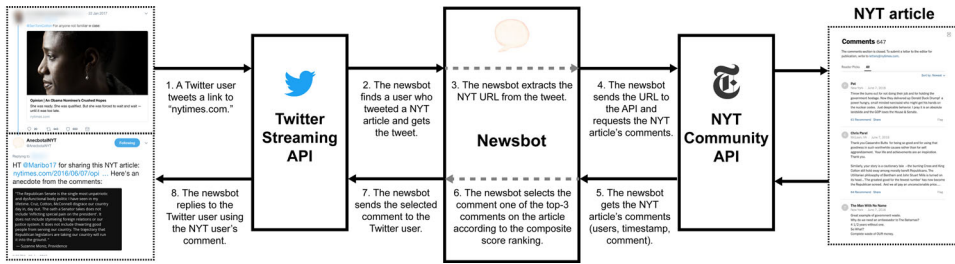


Figure 2. The newsbot functioning.

the article on the NYT website, (3) selects one of the most relevant comments posted by the NYT users, and then (4) replies to the Twitter user with the selected comment from the NYT user. Next, we describe in more detail how this newsbot works to curate the NYT article's comments, which is also illustrated in Figure 2.

Newsbot's Functionality

The newsbot listens to the free Twitter Streaming API for people tweeting a link to "nytimes.com." The newsbot only considers the first link written in a tweet and filters out tweets that are retweets or not in English. When the newsbot detects the 10th article link that meets these criteria, it selects the user who tweeted the link and extracts the link.

Second, the newsbot uses the NYT Community API to collect the top-level comments posted on the linked news article. The news article must have one hundred or more comments to be selected. The newsbot ignores comments with fewer than 25 words, which are filtered out so as to avoid overly short statements.

Third, the newsbot selects NYT comments based on a score calculated using three operationalized criteria (length, readability, and "personal experience"). The newsbot relies on a weighted composition of the three scores in order to rank and select the comments that it tweets. Each of these scores is calculated for each comment based on the text of that comment. The three scores are weighted in a linear combination to calculate an overall score for each of the comments. The final comment tweeted out is a random selection from the top three comments on an article according to the ranking by the composite score. For more details on this calculation, see Diakopoulos (2016).

Finally, the newsbot replies to the Twitter user using the text of the selected NYT comment, including a byline of the author of the NYT comment. The newsbot transforms the text into an image and attaches it in the final tweet. The NYT comment is presented to the Twitter user as an "anecdote," to frame it as a personal and interesting story shared by the NYT user. The newsbot tweets out the anecdote to the Twitter user who shared the NYT article with the following tweet: *HT @<user-name> for sharing this NYT article: <news-article-link> ... Here's an anecdote from the comments.* The newsbot does not engage in ongoing dialogue after the tweet is sent.

Data Collection

We tracked all interactions between the newsbot and its targeted Twitter users. Twitter users interacted with the newsbot via reply actions (i.e., a user sends a

message in response to a tweet written by the newsbot) and mentions (i.e., a user includes the newsbot's username in a tweet, but that tweet does not have a reference to a previous tweet or news article). We used Twitter Scraper,² a Python package that scrapes the tweets directly from browsers to collect users' mentions and replies to the newsbot. Each collected tweet's information contained the username, location, tweet ID, timestamp, text, number of likes, and number of retweets. We did not collect personal information from users. Despite the tweets collected being public, we anonymize usernames in the reported results to protect users' privacy. In total, we found 366 tweets that included the newsbot's username: 361 replies to the newsbot and five tweets that mentioned the newsbot directly. These tweets were made by 331 unique users. The first reply to the newsbot was published on 30 November 2015, and the last one was published on 16 October 2017.

Qualitative Analysis

We analyzed data following Strauss and Corbin's (1998) analytical coding system. In the first round of coding, we used open coding to break the data apart, develop codes, and assign tweets to categories. One of the authors (henceforth, the coder) coded tweets in the context of the original page (i.e., www.twitter.com), including the body content, emojis, tweet metrics (i.e., retweets, likes, and replies), and embedded images. The coder reviewed 100 tweets at random and proposed an initial set of categories. All authors then met to discuss the categories and 100 coded tweets, which led to a revision of the initial set of categories. Categories were not mutually exclusive, as a single tweet could relate to multiple aspects and categories. The coder then reviewed all tweets using the initial set of categories and refined it. All authors then reviewed the coded tweets, discussed and refined the categories again.

In the next coding round, we used axial coding to specify the relationships among categories, relating categories to larger categories. This process helped to identify the conditions, interactions, context, and consequences described by these categories. Finally, we applied selective coding to integrate and synthesize the categories into the following core categories: (1) *the newsbot as the source*, where Twitter users' responses are oriented toward the newsbot; (2) *the newsbot as an information broker*, where Twitter users' responses are focused on the NYT users and their comments; and (3) *unclear recipient*, where the Twitter users' source orientation was not clear, either the NYT user or the newsbot.

Although the number of tweets collected is relatively small given the span of data collection, it still allowed us to gather a substantive corpus for qualitative analysis and code a range of users' source orientations and reactions toward the newsbot. These results are meaningful if scoped to that limitation and, certainly, future studies could uncover other types of communication behaviors based on different newsbot designs. From these tweets, we assessed our research questions and traced our findings around the responses given by the Twitter users. We unpack each of the core categories in the following sections, presenting the tweets exactly as they were written and sent to the newsbot.

Findings

The Newsbot as the Source

The first dimension of Twitter users' commenting behavior encompasses a communicative orientation toward the newsbot as the *source* of the communication. In some cases, Twitter users do not refer to the anecdote written by the NYT user, but instead comment toward the newsbot's action or presence. These messages included the word "you" and the newsbot's Twitter username. Some Twitter users realized that a bot was interacting with them and responses included the word "bot." The fact of interacting with a newsbot occasioned different reactions, ranging from positive to negative attitudes.

The most noticeable positive reaction was *gratitude*, which represents Twitter users expressing "thank you" messages to the newsbot for sharing that NYT user's anecdote with them. These tweets were short and reflected positive receptions from Twitter users, such as the tweet "thanks, very interesting!!." We found 110 tweets that included "thank you" messages. Considering that at the time of data collection Twitter allowed up to 140 characters in one tweet, most messages were short: 57 tweets had less than 21 characters. These tweets were brief and concise (e.g., "Thank you"), used exclamation marks to show emphasis ("thank you!!"), and many used emoticons to express more emotion ("thanks :-)"). In two particular messages, two different Twitter users noticed the newsbot's intervention and replied saying "omg I've just replied to a bot! Nice algorithm :-)" and "Thanks! You're a fun bot." Twitter users also expressed their opinions and elaborated extensive "thank you" messages. Almost one-third of these tweets included more expressive messages, such as "Powerful, thoughtful, and painful. Thanks very much for sharing." In particular, some Twitter users welcomed the newsbot in their social circles and wished for future interactions with it. Two examples were "Thank you so much for sharing this extract. It is absolutely on point and facts are true enough. Please do stay in touch," and "What a beautiful response. Thank you evet so much four sending it 2 me. I welcome you as a new friend." Overall, Twitter users recognized the newsbot as a communicative actor and sent thank you messages to acknowledge its presence and interactions with it.

We also observed several instances where Twitter users developed an *argument* or exchanged their opinions with the newsbot. In 77 tweets, Twitter users exchanged information, arguments, or opinions. In most of these messages, Twitter users asked for more information or otherwise asked for a response from the newsbot. We interpret these messages as a 1-on-1 short "conversation," where the user might have expected a concrete response from the newsbot, even though this particular newsbot was not designed to reply back. In some cases, Twitter users' responses started by acknowledging the newsbot's action or information provided, and then continued with their opinion about the anecdote. For example, "You are absolutely right on this, and if oil was not there, there would be no discussion and maybe these countries would work things out," where the Twitter user points to the newsbot ("you"), then continues the conversation, and complements the shared comment. In one news article related to childhood poverty in the U.S., the newsbot received this response: "Thank you, I agree we could do a lot more lifting poor children out of poverty. You

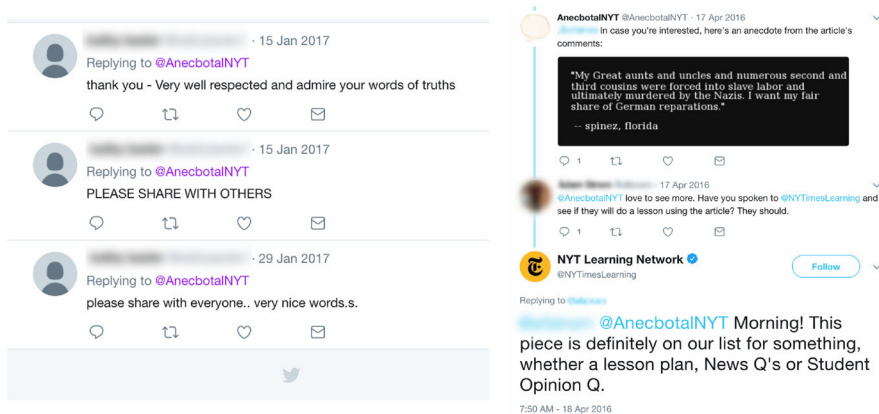


Figure 3. (a) The Twitter user thanks the newsbot and asks it to share the tweet. (b) A Twitter user praises the newsbot by referring it to the NYTimes Learning Network's account, which replies later.

have some very good ideas." In this case, the user starts giving thanks to the newsbot, continues by agreeing with the opinion, and finally endorses the ideas provided. In a small proportion of tweets, Twitter users asked explicitly for action from the newsbot: a response, a question, or call to share. Two particular examples were a Twitter user who engaged with the newsbot and asked it to share the anecdote with other users (Figure 3(a)), and a Twitter user who asked the newsbot if it had spoken with the NYT Learning team to do a lesson about the shared anecdote (Figure 3(b)). Unlike the gratitude messages, we found that this category not only reassessed the newsbot's communicative role but also showed Twitter users' intention to continue a deeper conversation with the newsbot.

Although most reactions toward the newsbot were positive, we also found an important group of negative reactions. Twitter users' unfavorable responses displayed *rejection* toward the newsbot. Rejection is often present in news comments and may involve an unnecessarily disrespectful tone toward the discussion forum, its participants, or its topics (Coe, Kenski, and Rains 2014). In this particular case, rejection toward the newsbot was reflected in messages denying the newsbot's nature, accusing it of spamming or acting with bad intentions. An example of denying newsbot is the tweet "You're a bot? Blocked." Twitter users also expressed that they were not interested in receiving messages from a newsbot ("Oh, a bot that serves up random NYTimes comments. Something I never considered until this moment that I do not need..."). A few times, Twitter users mentioned clearly the cause of their outrage, denouncing spamming or an unwanted bot intervention. Whereas 21 tweets referred to the newsbot with formal words (e.g., "Context, or are you spamming?," "As your name suggests Mr/Ms robot this statement is purely anecdotal..."), five tweets contained swear words (e.g., "Yeah, you're a damned bot. Fuck off.") Overall, Twitter users addressed the newsbot as the source of these messages, but they targeted the newsbot as a disruptive machine and pointed out the bots' low reputation in social media platforms. Unlike rejecting the presence of other social media users based on their opinions or appearance, rejecting the newsbot's presence appeared to be due to its

computational nature, looking down at its capabilities and intentions to discuss or share news content.

Newsbot as an Information Broker: Twitter Users Focused on the NYT Users' Anecdotes

Another core category involved responses oriented to NYT users as the sources of the communication. While Twitter users' attention was toward the NYT user and the anecdote, the newsbot stayed in the background and became a bridge between the Twitter and NYT users. This mediation role played by the newsbot sparked multiple reactions from Twitter users, breaking interoperability barriers between the Twitter platform and the NYT website. Unlike the reactions that targeted the newsbot's actions and nature, these messages (1) addressed the anecdote's content ranging from positive to negative receptions, (2) extended the contribution made by the NYT user by providing additional information to the anecdote, and (3) expressed emotional identification with the anecdote.

On the one hand, most Twitter users' responses explicitly show *agreement* with the NYT user's anecdote displayed. These tweets included positive words to demonstrate their acceptance of these comments published by the NYT user. Some examples were short messages (45 tweets had less than 50 words), where the Twitter users only stated their reaction: "cheers! It is so so true!"; "most definitely agree!," "Agree 100%. He's the one to get the ship back on course." Some replies included more descriptive comments (e.g., "What a beautiful and courageous comment.") or used idioms to express their agreement (e.g., "Love it, that's hilarious," "Sounds like a plan to me!," "Nail on the head!").

On the other hand, a considerable number of Twitter users did not like the NYT user's anecdote, writing their messages in negative terms and criticizing the comment. One example was an NYT Opinion article related to the 2016 water crisis in Flint, where the anecdote's author proposes to start a fundraising campaign, and the Twitter user replies saying "totally irrelevant. stay on point." These tweets were longer and provided more facts than the agreement messages. Unlike the comments against the newsbot's nature or presence, Twitter users' comments on the anecdote provided counterarguments focused on the topic and stayed at a formal level. Almost one-quarter of the sample of Twitter users' messages expressed some form of opposition to the anecdotes ranging from quite severe to more mild disagreement. We found several levels of harsh tweets: in 14 tweets, Twitter users disagreed with the NYT user's anecdote politely (e.g., "That's your opinion but I certainly don't agree.") and provided their opinions or facts in order to counteract the anecdote (e.g., "I respectfully disagree. I was raised in the Christian subculture and it has plenty of wife beaters and child abusers itself."). In 44 tweets, Twitter users were against the facts presented by the NYT user (e.g., "what a pathetic excuse for islamic misogyny," "It's such a mild review of #TedCruz, one could hardly describe it as a critique. It's a gentle summary of non-gentle immigrant"), then 14 tweets found the anecdote to be irrelevant (e.g., "This isn't really helpful because I can read and form my own opinions..." or "No, I was not interested in such a load of nonsense."), and 12 tweets also referred to the

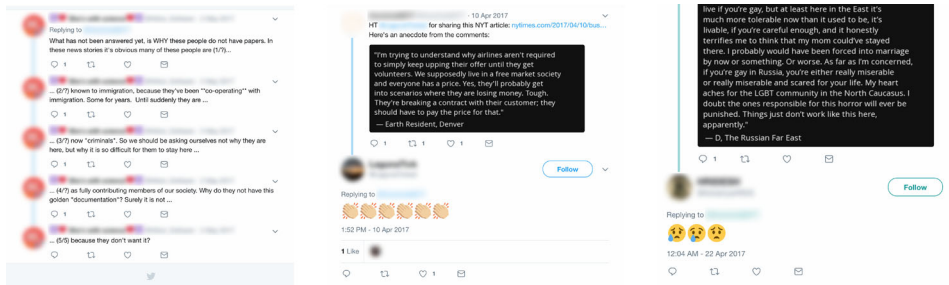


Figure 4. (a) The Twitter user criticizes the facts presented in the NYT user's anecdote. (b) The Twitter user responds using only clapping emojis. (c) The Twitter user responds using sad and crying faces.

NYT user questioning his/her opinion ("I'm unsure what point you're making with that?," "So, you're saying you didn't like Reagan?"). One harsh tweet looked down at NYT users in general ("So @nytimes readers really DON'T understand history OR that 86% of this tax cut goes to the top 1% OR that last cut failed"). We found a particular tweet where the Twitter user started a thread in response to the newsbot's initial tweet and provided several arguments against the anecdote (Figure 4(a)).

We found how Twitter users engaged in different levels with the NYT anecdote. One relevant aspect of the Twitter users' responses to the NYT users was providing *additional information* that contributed opinions, stories, and points of view. Twitter users shared personal experiences about prior work, health issues, places where they lived, and even addictions (e.g., "Great reading it! Yes that is exactly the point. And I can see if you feel the same way - have happy memories of College Park" and "I've had problems with drugs on every plan I've had since I was 22. I'm in 60's now. No insurance is hassle free."). Then, we found messages in which Twitter users mentioned other facts in order to continue the conversation (e.g., "interesting idea. Cohort studies (e.g., UK civil service study) suggest stress from lack of control is key - i.e., external cause."). And in most of these tweets, Twitter users expressed their opinions using verbs like "believe," "think," or "my point" (e.g., "true he could do no worse than any of his Republican counterparts. I believe they all as a group r not good for America" or "clearly we are not financial analysts, we only play them in the movies. however, I think we would take lump sum"). Surprisingly, one Twitter user shared a YouTube playlist to provide more information ("youtube.com/watch? [...] Also watch this playlist as well. More background here not in the article").

Lastly, Twitter users engaged emotively with the NYT user. Instead of providing facts or opinions, Twitter users demonstrated emotive responses to the NYT users' anecdote. In this particular form of expression, Twitter users wrote their emotions and made explicit their empathy. We found 16 tweets in which Twitter users expressed their identification with the anecdote, as in the following example: "We have our own problems. But Trump has been so offensive, I feel I have the right to talk against him." Most of these tweets empathize with NYT users' pain (e.g., "not sure how one qualifies 'we have the best freedoms', but I share her pain"). In a news article related to lunch shaming in New Mexico, one of the Twitter users empathize with the misfortune (e.g., "As a human being, woman, and social worker... it infuriates me.") Another

component was humor: we found three tweets made fun of the anecdote (e.g., “Just for clarity this comment is in reference to @BarackObama not the orange disaster”). Some tweets used only emojis and not a single word to express their emotions, whether positive (Figure 4(b)) or negative (Figure 4(c)). We interpret these messages as Twitter users trying to produce a more engaging response message with the NYT users (Cramer, de Juan, and Tetreault 2016). Although only a small number of tweets, these Twitter users’ reactions nonetheless demonstrate a salient form of emotive engagement with the content facilitated by the newsbot.

Overall, these tweets show that Twitter users’ source orientation was toward the NYT anecdote, engaging and providing more information, and the newsbot became a mediator between both users.

Unclear Recipient

Some Twitter users were not clear about who was the recipient of their response. Neither the newsbot nor the NYT user was explicitly the second actor in their interactions. Identifying the Twitter users’ source orientation was not possible due the limited cues in their message. One example was a Twitter user replying with the tweet “That’s your opinion but I certainly don’t agree,” where the subject of “your opinion” is not clear. A possible explanation is that some Twitter users thought that the newsbot was the author of the anecdote—regardless of how the anecdote was presented as a quote from an NYT user. Alternatively, users might have not thought of who the message’s source was at the moment of writing their answers. Overall, Twitter users referred to this unclear receiver sometimes in positive terms (“your response is beautiful and aligns with my view of how to make a difference. Keep watching.”) and other times in a more negative light (“And you think this is truth because why?”).

Discussion

In this study, we examined how social media audiences perceived and reacted to a newsbot who shared users’ comments from the NYT website. Through the lens of human-machine communication (HMC), our findings elaborate different levels in which communications between Twitter users and this newsbot unfolded. We found that the newsbot stimulated user engagement by serving as an anchor and locus for additional substantive comments that expanded the opportunities for news discourse. In particular, Twitter users’ responses indicated that the newsbot was often perceived as a communicative actor, showed affective reactions toward the newsbot, and highlighted a range of factual and emotional reactions to NYT users’ anecdotes curated by the newsbot. In the following subsections, we elaborate on how the newsbot was variously perceived and discuss the ways in which it appeared to support a range of affective communication. In particular, our emphasis is on considering how the findings create new opportunities for understanding and designing newsbots through an HMC lens.

Chameleons of Social Media

Our qualitative analysis indicates that the newsbot was perceived in different ways by Twitter users, from not being recognized at all, to being considered as a communicative actor (RQ1). On the one hand, the low response rate—only 366 responses after two years of operation—helps demonstrate how difficult it was for the newsbot to start a conversation with human users and be recognized in their natural environment. From the newsbot's messages that did get a response, we found how the newsbot's communicative role varied in a couple ways. In multiple cases, Twitter users referred to the anecdote's author as the source, whereas the newsbot stayed in the background and acted as an *information broker* between both users. In a small number of cases, it was not clear whether Twitter users referred to the newsbot or to the anecdote's author as the source of the communication. In other cases, where Twitter users recognized the newsbot as the *source*, we found positive and negative reactions toward the newsbot. While some Twitter users acknowledged the newsbot's presence, others raised concerns of its computational nature and associated it with spam and undesired actions. This spectrum of users' perceptions shows that newsbots play several roles in HMC, from not being recognized at all by audiences, to be a broker between two different users, to be the *source* of the interaction. These results confirm that users' source orientation toward newsbots is not always uniform (Guzman 2019b), where in some cases the users' responses were focused on the newsbot itself and, at other times, on the content and its context. Thus, the salience of the newsbots' communicative roles depends on the users' source orientation and to what extent they can engage with and be aware of newsbots (Solomon and Wash 2014).

When the newsbot was recognized by the Twitter users, the newsbot served either as the source or as an information broker between users from different platforms. These two roles are congruent with the divergent users' conceptualization of the technological source they are interacting with. In some instances, the source orientation was located in the newsbot—where users showed multiple kinds of reactions toward it—and in other instances, it was in the NYT users—demonstrated by the Twitter users' messages toward the anecdote and its author. This role as broker also allows for newsbots to perform as *algorithmic gatekeepers* by selecting and connecting users who are discussing the same topics (Wallace 2018). This role may reduce platforms' interoperability barriers and enable audiences from several platforms to access content not only from news organizations but also from other audiences, connecting the perspectives of different news consumers who they otherwise might not have interacted with (Meyer 2010).

Even though Twitter users often recognized the newsbot as a valid communicative actor, several others ignored it, paid attention only to the anecdote and its context, or rejected the newsbot's presence entirely. Twitter users' omissions and negative perceptions reveal the obstacles that newsbots face at the moment of interacting with social media users in their natural environments. This suggests that newsbot developers and designers may want to consider how content, presentation, and interaction triggers the communicative process between audiences and the newsbot, and how it will affect users' recognition of the newsbot.

Notably absent from our data was any apparent awareness of the newsbot's creators as interlocutors who participated in the newsbot's communication via their design choices of how the newsbot messaged users and was algorithmically configured. Machine communicators appear to draw attention away from their human designers while sliding in and out of either being perceived as the source or acting as an algorithmic channel to connect people. This duality permits the newsbot to be seen as a source but also functions as a way to introduce human users to each other's ideas in an indirect way. An intriguing area for theoretical development in HMC is to more deeply consider the fluidity with which machines may move back and forth between communicative roles as the context may demand. For instance, at times a newsbot might benefit from being seen as a neutral conduit, such as when soliciting sensitive information or stories to collect for news organizations (Schuetzler et al. 2018), whereas at other times it may be beneficial to more strongly convey the newsbot as the source of the communication, such as for building trust and engagement habits with users.

Newsbots and Affective Communication

Despite the neutral portrayal of the newsbot, and the ostensible objectivity often conferred on computational artifacts, our findings show a range of social and emotional reactions to the newsbot as communicative actor and to the NYT users' anecdotes it curated (RQ2). Twitter users could positively connect with the newsbot, attempt to "influence" it by providing arguments and advice, and also be aggressive with it by being hostile, sarcastic, or negative. The reactions observed toward the newsbot are broadly congruent with previous HMC literature (Shechtman and Horowitz 2003), showing how Twitter users could express different levels of politeness, interpersonal distance, personal disclosure, and judgments to the newsbot. Unlike the comments toward the anecdote and its author—which provided polite responses addressing the anecdote's facts—the comments toward the newsbot used more affective words and pointed out its computational nature. On the one hand, Twitter users found interesting that a newsbot could share news comments with them and thanked it for that action (e.g., "Thx...I am just happy that someone read something I shared! Sometimes it's like we are all talking to ourselves, sigh."). Sending positive thankful messages to the newsbot reflected an act of reciprocity and appreciation for the message received (Lee and Choi 2017). On the other hand, Twitter users spotted that it was not a human who was interacting with them and responded to the newsbot in a retaliatory manner. Such negative perceptions may relate to the dominant-negative role of social bots, such as in disinformation, fake news, and manipulation, as well as their potentially invasive and inappropriate use (Long et al. 2017). Despite the negative reactions toward the newsbot, most messages used polite language, which may be related to the specific characteristics of the audience of NYT readers or to maintain the same level of politeness used by the newsbot. Considering the mixture of Twitter users' reactions observed, our results suggest that the particular choices behind a newsbot's design and the content curated play an important role in how people engage with and reply to the newsbot. The role of newsbots in supporting affective

communication from users creates new opportunities for thinking about their design. For instance, from an HMC perspective, designers might consider how newsbots could adapt to different audiences' reactions, whether they are positive or negative, and use different communication styles in response.

Future work might consider how users' reactions could vary with respect to differently designed curation strategies. For example, news content that discloses personal experiences may contribute to building a sense of community in online environments and may be more likely to be replied to than neutral comments (Oh and Syn 2015). The specific type of comment curation used by this newsbot may have resulted in the observed prominence of agreement, politeness, gratitude, and empathy expressions in Twitter users' responses. Yet some Twitter users still refused the messages provided by this newsbot, seeing it as intrusive spam and rejecting any interaction with it. Moreover, negative comments toward the anecdote illustrate tensions between some Twitter users and the anecdote, which could undermine the potential for a positive user experience.

Finding curation and communication styles that tune affective human reactions based on editorial goals, such as engagement, information delivery, trust building, news gathering, or brand awareness, represents a challenging design space. These editorial goals may suggest different design alternatives to moderate the range of affective responses. For instance, a focus on increasing engagement could call for mitigating negative reactions to the newsbot by aligning curated content to the personal interests and perspectives of a user. Different newsbot designs could also be editorially oriented toward different audiences (e.g., young, international), sets of interests (e.g., sports, politics, local), and desired forms of engagement with a news organization (e.g., re-sharing, commenting, providing information). Future work might consider how designers could enhance newsbots' social acceptability, mitigate negative user experiences, reduce user rejections, and improve the overall experience to be in line with specific editorial goals (Alvarado and Waern 2018; Guzman and Lewis 2020).

Limitations

In interpreting our findings, it is important to acknowledge the limitations of this article, including its data and methods. First, the scope of the news articles used was limited to a single news organization, the *New York Times*, and most articles were related to U.S. politics. Since we selected a newsbot that extracted only NYT news articles, we limited the potential audience and readers who interact on Twitter. Including other news organizations from across the editorial or political spectrum might expand the kinds of responses that users provide. Second, the Twitter demographic may influence our results. According to a recent Pew Research Center report (Wojcik and Hughes 2019), (a) U.S. adult Twitter users are younger and more likely to be Democrats than the general public, (b) most users rarely tweet, and (c) the most prolific 10% create 80% of tweets from adult U.S. users. Our results may have been different considering other social media platforms and audiences' demographics. We might expect audience differences in the response rate, length, and elaboration. Future work could further extend this work by examining other platforms such as Reddit or Facebook where

newsbots are also in use (Long et al. 2017). Third, our study was observational in nature and did not control the types of users that were contacted by the newsbot. The self-selected nature of user responses that we studied limits our ability to understand communication behaviors with newsbots that might arise in a greater diversity of contexts and with a greater variety of people. Future research may seek to experimentally examine the relationships between newsbots' strategies, interactions, and messages to user engagement, and to examine the generalizability of our results to other news outlets, audiences, and newsbot designs. Fourth, and due to the observational nature of this study, we did not control if Twitter users realized that they were interacting with a newsbot. Although Anecbotal NYT presented itself as a "newsbot," we did not check if Twitter users were aware of its nature. The classification of the messages' sources relied on the coder's interpretation and the tweets' context. Future studies could address this limitation by checking users' perception afterward. Fifth, the number of tweets collected is relatively small. Two possible explanations are the random selection of users done by the newsbot (without checking if they were responsive with other users or not) and that most Twitter users do not engage with discussions on the platform (the Pew study mentioned above also showed that 90% of the Twitter users only tweet two posts per month). Given the low response rate, future experiments should test if active users (those who tweet frequently or reply to other users) are more likely to respond to newsbots than passive users. A final limitation of this study was the decision to study a newsbot that only communicates in English. While outside the scope of the current study, other languages on Twitter and other social media may present their own interesting data and findings on the use of newsbots, as well as cultural differences in communication.

Conclusion

This article presents an analysis of how users responded to a newsbot that shared news content with them serendipitously on Twitter. Our findings identified a wide range of users' perception of the newsbot's communicative role: from not being recognized at all, to acting as an information broker, to being recognized as the source of the communication, suggesting an opportunity for HMC to consider the fluidity of roles and factors influencing role perception. Moreover, our findings highlight a vivid array of users' reactions, offering a range of opinions, personal experiences, facts, counter-arguments, and emotional displays in their responses. In particular, users reacted in affective ways toward the newsbot, acknowledging its presence or looking down on it because of its computational nature. These results extend the current research on newsbots and suggest some of their limits and strengths as communicative actors in social media environments. The use of newsbots offers new practical opportunities for enabling audiences' news engagement by connecting different online news communities—as well as curating news content—and establishes a new path for engaging users in the consumption, sharing, and discussion of news.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

Notes

1. <https://twitter.com/anecbotalnyt>
2. <https://github.com/kennethreitz/twitter-scraper>

ORCID

Diego Gómez-Zará  <http://orcid.org/0000-0002-4609-6293>

Nicholas Diakopoulos  <http://orcid.org/0000-0001-5005-6123>

References

- Alvarado, Oscar, and Annika Waern. 2018. "Towards Algorithmic Experience: Initial Efforts for Social Media Contexts." Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems, April 21–26, 2018, Montréal, QC, Canada, 286. ACM. doi:10.1145/3173574.3173860.
- Diakopoulos, Nicholas. 2016. "Anecbotal Comment Bot." <https://github.com/comp-journalism/Comment-Bot>.
- Belair-Gagnon, Valerie, Seth C. Lewis, and Colin Agur. 2020. "Failure to Launch: Intrapreneurs, News Organizations, and Non-Adoption of Chatbots." *Journal of Computer-Mediated Communication* 25 (4): 291–306.
- Coe, Kevin, Kate Kenski, and Stephen A. Rains. 2014. "Online and Uncivil? Patterns and Determinants of Incivility in Newspaper Website Comments." *Journal of Communication* 64 (4): 658–679.
- Cramer, Henriette, Paloma de Juan, and Joel Tetreault. 2016. "Sender-Intended Functions of Emojis in US Messaging." Proceedings of the 18th International Conference on Human-Computer Interaction with Mobile Devices and Services, September 06–09, 2016, Florence, Italy. 504–509. ACM.
- Dale, Robert. 2016. "The Return of the Chatbots." *Natural Language Engineering* 22 (5): 811–817.
- Dautenhahn, Kerstin. 2004. "Socially Intelligent Agents in Human Primate Culture." In *Agent Culture: Human-Agent Interaction in a Multicultural World*, edited by Robert Trappl and Sabine Payr, 45–72. Mahwah, NJ, USA: Lawrence Erlbaum Associates.
- Diakopoulos, Nicholas. 2018. "Bots and the Future of Automated Accountability." *Columbia Journalism Review*. September 11, 2018. https://www.cjr.org/tow_center/prepare-to-welcome-our-accountability-bot-overlords.php
- Diakopoulos, Nicholas. 2019. *Automating the News: How Algorithms Are Rewriting the Media*. Cambridge, MA, USA: Harvard University Press.
- Ferrara, Emilio, Onur Varol, Clayton Davis, Filippo Menczer, and Alessandro Flammini. 2016. "The Rise of Social Bots." *Communications of the ACM* 59 (7): 96–104.
- Ford, Heather, and Jonathon Hutchinson. 2019. "Newsbots That Mediate Journalist and Audience Relationships." *Digital Journalism* 7 (8): 1013–1031.
- Geiger, R. Stuart. 2014. "Bots, Bespoke, Code and the Materiality of Software Platforms." *Information, Communication & Society* 17 (3): 342–356.
- Gonzales, Hada M. Sánchez, and María Sánchez González. 2016. "Bots as a News Service and Its Emotional Connection with Audiences. The Case of Politibot." *Doxa Comunicación* (25): 63–84.
- Gunkel, David J. 2012. "Communication and Artificial Intelligence: Opportunities and Challenges for the 21st Century." *Communication +1* 1 (1): 1–25.
- Guzman, Andrea L. 2018. *Human-Machine Communication: Rethinking Communication, Technology, and Ourselves*. New York, NY, USA: Peter Lang.
- Guzman, Andrea L. 2019a. "Prioritizing the Audience's View of Automation in Journalism." *Digital Journalism* 7 (8): 1185–1190.
- Guzman, Andrea L. 2019b. "Voices in and of the Machine: Source Orientation toward Mobile Virtual Assistants." *Computers in Human Behavior* 90: 343–350.

- Guzman, Andrea L., and Seth C. Lewis. 2020. "Artificial Intelligence and Communication: A Human–Machine Communication Research Agenda." *New Media & Society* 22 (1): 70–86.
- Hepp, Andreas. 2020. "Artificial Companions, Social Bots and Work Bots: Communicative Robots as Research Objects of Media and Communication Studies." *Media, Culture & Society*. Advance online publication. doi:[10.1177/0163443720916412](https://doi.org/10.1177/0163443720916412).
- Ho, Annabell, Jeff Hancock, and Adam S. Miner. 2018. "Psychological, Relational, and Emotional Effects of Self-Disclosure after Conversations with a Chatbot." *The Journal of Communication* 68 (4): 712–733.
- Howard, Philip N., Samuel Woolley, and Ryan Calo. 2018. "Algorithms, Bots, and Political Communication in the US 2016 Election: The Challenge of Automated Political Communication for Election Law and Administration." *Journal of Information Technology & Politics* 15 (2): 81–93.
- Johri, Al, E. H. Han, and Dhruvil Mehta. 2016. "Domain Specific Newsbots." Computational Journalism Conference, September 30–October 1, 2016, Palo Alto, CA, USA. <https://journalism.stanford.edu/cj2016/files/Newsbots.pdf>.
- Jones, Bronwyn, and Rhianne Jones. 2019. "Public Service Chatbots: Automating Conversation with BBC News." *Digital Journalism* 7 (8): 1032–1053.
- Jones, Steve. 2015. "How I Learned to Stop Worrying and Love the Bots." *Social Media + Society* 1 (1): doi:[10.1177/2056305115580344](https://doi.org/10.1177/2056305115580344).
- Lazer, David M. J., Matthew A. Baum, Yochai Benkler, Adam J. Berinsky, Kelly M. Greenhill, Filippo Menczer, Miriam J. Metzger, et al. 2018. "The Science of Fake News." *Science* 359 (6380): 1094–1096.
- Lee, Seoyoung, and Junho Choi. 2017. "Enhancing User Experience with Conversational Agent for Movie Recommendation: Effects of Self-Disclosure and Reciprocity." *International Journal of Human-Computer Studies* 103: 95–105.
- Lewis, Seth C., Andrea L. Guzman, and T. R. Schmidt. 2019. "Automation, Journalism, and Human–Machine Communication: Rethinking Roles and Relationships of Humans and Machines in News." *Digital Journalism* 7 (4): 409–427.
- Lewis, Seth C., and Oscar Westlund. 2015. "Actors, Actants, Audiences, and Activities in Cross-Media News Work: A Matrix and a Research Agenda." *Digital Journalism* 3 (1): 19–37.
- Lichterman, Joseph. 2016. "Remember Facebook Messenger Bots? The Washington Post Just Launched One (with a Few Bugs)." <https://www.niemanlab.org/2016/07/remember-facebook-messenger-bots-the-washington-post-just-launched-one-with-a-few-bugs/>.
- Lokot, Tetyana, and Nicholas Diakopoulos. 2016. "News Bots: Automating News and Information Dissemination on Twitter." *Digital Journalism* 4 (6): 682–699.
- Long, Kiel, John Vines, Selina Sutton, Phillip Brooker, Tom Feltwell, Ben Kirman, Julie Barnett, and Shaun Lawson. 2017. "'Could You Define That in Bot Terms?': Requesting, Creating and Using Bots on Reddit." Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems, May 6–11, 2017, Denver, CO, USA, 3488–3500. ACM.
- Meyer, Morgan. 2010. "The Rise of the Knowledge Broker." *Science Communication* 32 (1): 118–127.
- Milosavljević, Marko, and Igor Vobič. 2019. "Human Still in the Loop." *Digital Journalism* 7 (8): 1098–1116.
- Moon, Youngme. 2000. "Intimate Exchanges: Using Computers to Elicit Self-Disclosure from Consumers." *Journal of Consumer Research* 26 (4): 323–339.
- Nagy, Peter, and Gina Neff. 2015. "Imagined Affordance: Reconstructing a Keyword for Communication Theory." *Social Media + Society* 1 (2). doi:[10.1177/2056305115603385](https://doi.org/10.1177/2056305115603385).
- Nass, Clifford, and Youngme Moon. 2000. "Machines and Mindlessness: Social Responses to Computers." *Journal of Social Issues* 56 (1): 81–103.
- Nass, Clifford, Youngme Moon, and Nancy Green. 1997. "Are Machines Gender Neutral? Gender-Stereotypic Responses to Computers with Voices." *Journal of Applied Social Psychology* 27 (10): 864–876.

- Nass, Clifford, Jonathan Steuer, and Ellen R. Tauber. 1994. "Computers Are Social Actors." Conference Companion on Human Factors in Computing Systems, April 24–28, 1994, Boston, MA, USA, 204. ACM.
- Oh, Sanghee, and Sue Yeon Syn. 2015. "Motivations for Sharing Information and Social Support in Social Media: A Comparative Analysis of Facebook, Twitter, Delicious, YouTube, and Flickr." *Journal of the Association for Information Science and Technology* 66 (10): 2045–2060.
- Picard, Rosalind W. 2003. "Affective Computing: Challenges." *International Journal of Human-Computer Studies* 59 (1–2): 55–64.
- Reeves, Byron, and Clifford Ivar Nass. 1996. *The Media Equation: How People Treat Computers, Television, and New Media like Real People and Places*. New York, NY, USA: Cambridge University Press.
- Schuetzler, Ryan M., G. Mark Grimes, Justin Scott Giboney, and Jay F. Nunamaker. Jr. 2018. "The Influence of Conversational Agents on Socially Desirable Responding." *Information Systems and Quantitative Analysis Faculty Publications*, 61. <https://digitalcommons.unomaha.edu/isqa-facpub/61>
- Shechtman, Nicole, and Leonard M. Horowitz. 2003. "Media Inequality in Conversation: How People Behave Differently When Interacting with Computers and People." Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, April 5–10, 2003, Ft. Lauderdale, FL, USA. 281–288. ACM.
- Solomon, Jacob, and Rick Wash. 2014. "Human-What Interaction? Understanding User Source Orientation." *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* 58 (1): 422–426.
- Strauss, Anselm, and Juliet Corbin. 1998. *Basics of Qualitative Research Techniques*. Thousand Oaks, CA: Sage.
- Sundar, S. Shyam, and Clifford Nass. 2000. "Source Orientation in Human-Computer Interaction: Programmer, Networker, or Independent Social Actor." *Communication Research* 27 (6): 683–703.
- Thurman, Neil, Seth C. Lewis, and Jessica Kunert. 2019. "Algorithms, Automation, and News." *Digital Journalism* 7 (8): 980–992.
- Vosoughi, Soroush, Deb Roy, and Sinan Aral. 2018. "The Spread of True and False News Online." *Science (New York, N.Y.)* 359 (6380): 1146–1151.
- Waisbord, S. 2019. "The 5Ws and 1H of Digital Journalism." *Digital Journalism* 7 (3): 351–358.
- Wallace, Julian. 2018. "Modelling Contemporary Gatekeeping." *Digital Journalism* 6 (3): 274–293.
- Walther, Joseph B. 1992. "Interpersonal Effects in Computer-Mediated Interaction: A Relational Perspective." *Communication Research* 19 (1): 52–90.
- Wojcik, Stefan, and Adam Hughes. 2019. *Sizing Up Twitter Users*. Washington, D.C., USA: Pew Research Center.
- Wojcik, Stefan, Solomon Messing, Aaron Smith, Lee Rainie, and Paul Hitlin. 2018. *Bots in the Twittersphere*. Washington, D.C., USA: Pew Research Center.