

Writing Futures Framework

Ann Hill Duin and Isabel Pedersen

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Abstract

One of the greatest challenges facing professional and technical communication (PTC) scholars and instructors is a reticence to prepare for writing futures in advance of major technological transformations. This chapter posits *Writing Futures* as an organizing concept that places writing and technological evolution amidst the most complex, multifaceted problems that face professional and technical communication, its many related disciplines and industries, and our local and global communities. We highlight recent collections that employ speculative modeling and critical rhetorical frameworks for writing futures, noting the need for understanding, chronicling, and critiquing technological emergence. Citing the need for a dynamic, usable framework, we introduce a *Writing Futures* Framework for scholars and instructors to investigate and plan for the social, digital literacy, and civic implications of collaborative, algorithmic, and autonomous writing futures. We detail the book's integration with *Fabric of Digital Life* (<https://fabricofdigitallife.com/>), a database and structured content repository for conducting social and cultural analysis about emerging technologies and the social practices that surround them. We conclude with an overview of the remaining chapters, [an explanation of the integration of prompts and intertexts throughout the book](#), and scenarios that illustrate questions most critical to academic, industry, and civic contexts.

1.1 Introduction

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The rise in the use of non-human agents and artificial intelligence (AI) is disrupting all fields and professions. One of the greatest challenges facing professional and technical communication (PTC) scholars and instructors is a reticence to prepare for writing futures in advance of these major technological transformations. While the world is clamoring to identify the agent or go-between for difficult explanations of speculative technology proposed for society, our field often chooses to wait until after they have been deployed. The ethical dilemma caused by the delay results in ignorance at the point of emergence, which means that stakeholders (and the public in general) often cannot properly assess technologies of great impact at the appropriate time.

This book serves as a guide for preparing in advance for major technological transformations. We provide a framework for professional and technical communication scholars and instructors to investigate and plan for the social, digital literacy, and civic implications of collaborative, algorithmic, and autonomous writing futures:

- **collaborative**, including examination of human–human and human–device work critical to writing futures;
- **algorithmic**, including exploration of learning management systems and artificial intelligence and the impact of datafication on writing; and
- **autonomous**, including understanding and deployment of autonomous agents, i.e., technologies capable of operating without direct human control.

While our main audience is professional and technical communication scholars and instructors, given the demand for interdisciplinary academic books from fields adjacent to engineering, this book also will be of critical use by scholars across a broad range of disciplines, including composition, communication studies, human–computer interaction, computer science, artificial intelligence and automation studies, and organizational communication. We also have designed this book for use by practitioners across these fields given the critical importance of greater understanding of collaboration, AI, and emerging technologies. Our goal is to provide readers with opportunities to understand and write alongside non-human agents, examine the impact of algorithms and AI on writing, accommodate the unique relationships with autonomous agents, and investigate and plan for writing futures.

1.2 Integration with [Fabric of Digital Life](https://fabricofdigitallife.com/)

Unique to this book is its integration with Fabric of Digital Life (<https://fabricofdigitallife.com/>), a database and structured content repository for conducting social and cultural analysis of emerging technologies and the social practices that surround them. Growing in content since 2013, Fabric of Digital Life provides a public, collaborative research site for analyzing overwhelming technological change and the social implications that arise as a result. Using a human-centric lens, it follows modes of technology invention over time through its corpus of videos, texts, and images (Duin et al. 2018; Iliadis & Pedersen, 2018; Pedersen & DuPont, 2017). Throughout each chapter of this text, readers can access more detail about each technology discussed by examining an associated thematic collection—the [Writing Futures: Collaborative, Algorithmic, Autonomous collection](#)—at Fabric of Digital Life.

Thematic digital research collections are built to form “a contextual mass model [to] create a system of interrelated sources where different types of materials and different subjects work together to support deep and multifaceted inquiry in an area of research” (Palmer, 2004). Our goal is to display concrete examples of the social, digital literacy, and civic implications of specific technologies in [Fabric of Digital Life](#) so that readers can examine these technologies within key social contexts that are constantly evolving. As a research collection, it is open-ended and publicly available. It concentrates on emergent embodied technologies and research on specific platform categories: [carryable](#), [wearable](#), [implantable](#), [ingestible](#), [embeddable](#), and [robotical](#). It provides a metadata structure that guides archivists toward a human-centric orientation to technology emergence. To designate keywords, archivists ask questions from a human subject’s point of view. The starting point is, *How are devices physically used?* The location-on-the-body keyword system includes a hierarchy of fields related to bodies. At the time of writing, 1298 items relate to the head; subcategories include eye, face, ear, mouth, or brain. This set of keywords enables the tracking of all brain–computer devices over time; for example, 92 items involve wearable inventions in the category [brain](#). As industry jargon changes, a location-on-the-body keyword provides a static category. Fabric archivists also probe social spheres to ask *What kinds of activities will humans perform while using technology and what kinds of social practices will it encourage or even*

replace in future? Archivists query, *How will humans be augmented and to what consequence?* For example, rather than only archiving the presence of a technology feature (e.g., voice recognition on a smartwatch), the content ontology allows archivists a means to document human motivation for wearing technologies, such as communicating, informing, surveilling, policing, remembering, or socializing.

Items are also included that represent related emergent technologies and non-human agents within ecosystems such as ambient interaction, artificial intelligence, smart homes, internet of things, or biotechnologies that often converge or interact with the core embodied technologies. It catalogs fictional portrayals that are often used in science discourse to explain human–computer interaction scenarios. The general keyword field captures broader subject areas such as education, health, or work. However, this architecture provides a means to explore socio-technical assemblages amid the more common frameworks, such as business and engineering sectors. It is also guided by a rhetorical studies focus so that we can interpret emergence in persuasive trajectories. Motives might be stated overtly in video representations, or simply implied in video clips through a visual depiction. [Fabric of Digital Life](#) provides a way to reveal how technologies sometimes evolve or transform over time at cross-purposes from their original intent. The technology behind a fitness tracker can become a workplace employee tracker or a monitor for children or even a COVID-19 tracker, and the trace implications of those previous contexts are important.

The advantage of [Fabric of Digital Life](#) for this book is threefold:

- First, the [Writing Futures: Collaborative, Algorithmic, Autonomous collection](#) provides video examples for technologies we discuss in the book. When we mention a specific technology concept such as a *virtual assistant*, we point readers to actual video and other artifacts discussed in the book contextualized with examples (e.g., an advertisement that describes [Siri](#), Apple’s virtual assistant; a [news broadcast](#) on [Google Assistant](#) being used in a professional field).
- Second, we identify keywords so that readers can further explore important concepts. The book reenvision terms such as *professional communication*, *collaboration*, and *digital literacy*, which are matched to the collection’s keyword metadata. Students and professionals can see how we contextualize key ideas with real world examples and even groupings of concepts. See Appendix B to

view the list of general keywords (approx. 300), one of the metadata categories that designates subject areas.

- Third, we will continue to update content and metadata to keep this book current after publication. For example, if [Human–Robot Interaction \(HRI\)](#) undergoes significant new social robot innovations emerging after the book’s publication, we will continue to capture these artifacts in the [Writing Futures: Collaborative, Algorithmic, Autonomous collection](#).

COVID-19 has led to dramatic calls from states to adapt social, civic, and professional practices. Almost immediately, technological deployments served as solutions across the globe. This situation led us to create a [COVID-19 Tech collection](#) in Fabric of Digital Life to chart the unfolding event. We also noticed numerous collaborative work platforms that have become vital for worker interaction. We identified a surge in embodied technologies being used for tracking and policing the outbreak, monitoring the infected, or, in a few cases, predicting its onset. For instance, we include a [video](#) that demonstrates a contact tracing app developed by COVID Watch, a nonprofit group of over 100 academics, public health experts, and technologists. Communicating the social practice as well as the technological functionality of contact tracing is contextualized in the collection. Written news, public broadcasts, government press releases, and social media circulation reflect international responses to the pandemic.

[Collections](#) in Fabric of Digital Life deliberately overlap due to the data ontology to provide a unique lens on interrelated, collocated material. For example, the COVID-19 crisis has revealed the frequency of people using the video chat service [Zoom](#) due to calls for mass social distancing. Representative artifacts about it are included in the COVID-19 Tech [collection](#). However, primary artifacts describing Zoom had already been archived in the much larger [Writing Futures: Collaborative, Algorithmic, Autonomous collection](#) because the technology involves collaborative professional communication. Video conferences and platforms serve as an important means for international writing teams to communicate. The scholarly result is that the collocation of these two collections revitalizes both of them through the dialogic relationship established across the content. Therefore, our book helps readers respond to rapidly evolving technological and social contexts.

Prompt

Fabric of Digital Life has a *timeline* feature (see Fig. 1.1) to let site users view items according to their date of publication or creation. Choose a keyword and explore how it is applied over time.

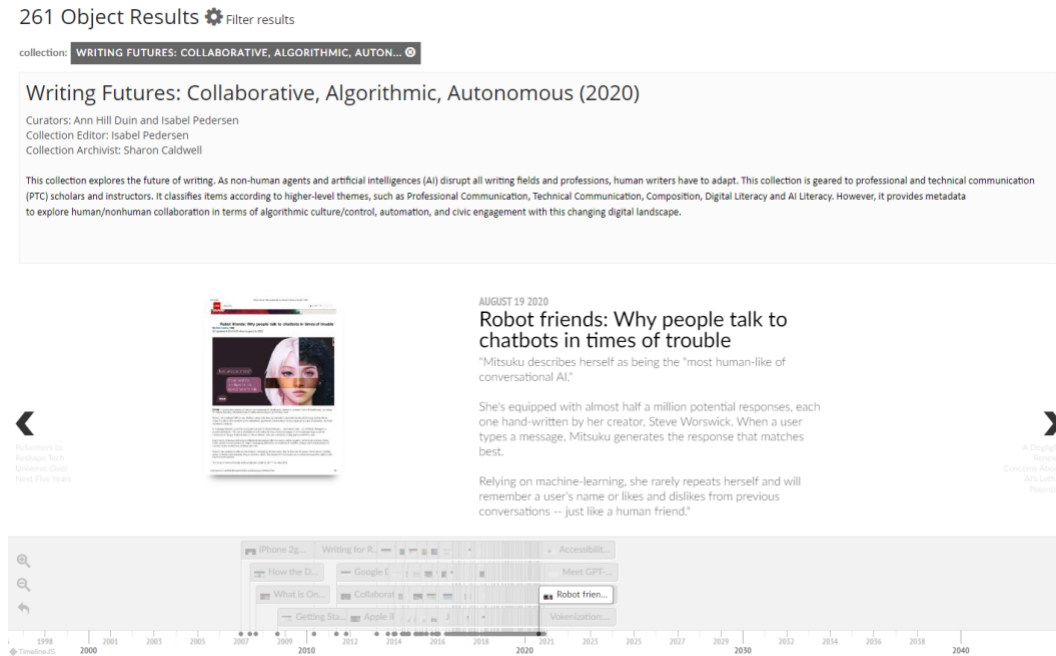


Fig. 1.1 *Fabric of Digital Life's* Timeline feature (Image permission: Isabel Pedersen)

1.3 Tracing the Future of Writing

What is the future of writing? In 2011, the University of Minnesota Press published an English translation of Czech philosopher Vilém Flusser's 1987 [*Does Writing Have a Future?*](#) Flusser theorized about the impact of media on culture and writing and the future of machine automation in ways similar to Jean Baudrillard, Marshall McLuhan, and Paul Virilio of the last century. He predicted artificial intelligence that performs both thinking and decision-making:

Writing, in the sense of placing letters and other marks one after another, appears to have little or no future. Information is now more effectively transmitted by codes other than those of written signs. What was once written can now be conveyed more effectively on tapes, records, films, videotapes, videodisks, or computer

disks, and a great deal that could not be written until now can be noted down in these new codes. . . . Only historians and other specialists will be obliged to learn reading and writing in the future. . . . One can leave writing, this ordering of signs to machines. I do not mean the sort of machines we already know, for they still require a human being who, by pressing keys arranged on a keyboard, orders textual signs into lines according to rules. I mean grammar machines, artificial intelligences that take care of this order on their own. Such machines fundamentally perform not only a grammatical but also a thinking function. (pp. 3–6)

Such a prediction assumes the replacement of human writing by information codes conveyed by machines. It imagines that writing performed by humans (semiosis) will be erased by the work of “artificial intelligences” that are given the agency to create, inform, remember, and even think. This prediction persists today.

Writing can be simply defined as process, as activity, as “the act or process of one who writes” (Merriam-Webster Dictionary). Such writing is a skill, a competency, required to date by all who wish to communicate personally and professionally. This activity of writing “can have knowledge-transforming effects, since it allows humans to externalize their thinking in forms that are easier to reflect on and potentially rework” (Wikipedia, 2020). To date, these general resources assume a “human” writer.

Decades ago, while transitioning from an analog to a digital age, composition evolved from focusing on writing as a largely rule- and style-driven enterprise to seeing it as a process. Although tethered to desktops, we broadened our understanding of how and why writers make the choices they do during the writing process, claiming writing to be a nonlinear, goal-driven process that includes planning, translating, embedding, and reviewing. With the seminal work “A Cognitive Process Theory of Writing” (Flower & Hayes, 1981), we paid great attention to the writer’s long-term memory, writing as a process, and influence from the task environment (p. 370). While increasingly amazed by the inner workings of new hard drives and operating systems, we taught writing as an internal process complete with schema theory, mental models, and focus on the internal, and largely individual, mind.

Then the earliest of networks and laptops arrived, and we soon found ourselves immersed in a multi-function—unconnected and then sometimes connected—world of wireless computing. With the advent of the internet, our pedagogy evolved from reference to linear activities—planning, drafting, reviewing, editing—conducted within a similar

physical space to activities conducted within a cyberspace of online resources and shared documents. We spoke and taught about the social construction of writing in which writers construct new knowledge from their experiences and interactions with discourse communities. Basic assumptions included the need to examine any writing context amid the rapidly changing technologies that were redefining writing, thus framing a socio-technological direction for pedagogy (Duin & Hansen, 1996).

As technology and writing evolved, a traditional humanist approach to technology continued to draw a firm line between the human and the machine. However, as Porter (2009) notes, “this approach fails to appreciate the compelling power of virtual life and communication,” and the “more promising approach, articulated by Hayles (1999) and others, is the posthumanist approach to technology” beginning with Haraway’s (1991) notion of the cyborg: “a hybrid metaphor that challenges the human-machine distinctions and questions conventional body boundaries and notions of the writer as purely human. A posthumanist approach [now] explores cyborgian hybridity, the connectedness between human-machine.” According to Porter, “the machines that we use to write and speak are closely merged with our flesh-and-blood bodies” (p. 213); we now recreate our bodies in cyberspace. Hayles advances the theory to include “cognitive assemblages” and explains that “as these devices become smarter, more wired, and more capable of accessing information portals through the web, they bring about neurological changes in the mindbodies of users, forming flexible assemblages that constantly mutate as information is gathered, processed, communicated, stored, and used for additional learning” (Hayles, 2017, p. 119). And most recently, Pedersen (2020) emphasizes that “the idea of a networked body working autonomously through data assemblages seems less futuristic than before” (p. 39). Pedersen’s focus on body networks illustrates how “bodies will participate in cooperative relationships with other human and nonhuman actors and digital infrastructures” (p. 25). The “firm line” has disappeared.

So, what are writing futures? If one asks the automated writing bot [AI Writer](#) (2020) to generate an article on this topic, as we did (see Fig. 1.2), a bot-generated text will appear that assumes the writer is interested in buying or writing a futures contract:

The option author will sell certain rights to the option buyer in the future, while the buyer and seller will not assume any obligations. The callers and put writers grant rights in exchange for a premium that buyers receive in advance. Calls grant

buyers the right to buy the underlying forward contract at a fixed price or exercise price.

Test the artificial intelligence writer now!

CREATE YOUR FIRST UNIQUE* ARTICLE WITH OUR ARTICLE WRITING BOT

* On average, Copyscape identifies 94.47% of a generated article as unique

≡

writing futures

ahduin@umn.edu

GET MY ARTICLE!

Fig. 1.2 Use of AI Writer to generate text using the prompt, writing futures (Image permission: AI-Writer.com)

Clearly this is not the “writing futures” intended for examination in this book. However, for some time now, creative thinkers have been asking bots to examine text, video, audio, and art to then to generate new text, video, audio, and art. Rock songs written by [AI bots are regularly ranked and rated \(Beaumont, 2020\)](#), with some musicians generating full albums with their AI collaborators. Researchers created FlowMachines, capable of learning to mimic a band’s style from its entire database of songs, fed it the complete works of the Beatles and fully AI-generated the “[Daddy’s Car](#)” song at this same site. [Cizek, Uricchio, and Wolozin \(2019\)](#), in discussing media co-creation with nonhuman systems, note that algorithmically derived art is a longstanding genre: “Roman Verostko and the Algorithmists were an early-1960s group of visual artists that designed algorithms that generated art, and later, in the 1980s, fractal art. More recently, the [Google Deep Dream](#) project reignited the public curiosity about AI-generated art and its psychedelic reproductions of patterns within patterns” (Human-AI Collaboration, 2020). Examining how current bots adapt to dataspheres, interact with humans, and accrue writing skills helps us to prefigure writing futures.

[Microsoft's Xiaolce chatbot](#), a Chinese-language conversational AI, [converts images into Chinese poetry \(Greene, 2019\)](#), and novelist [Sigal Samuel \(2019\) describes her use of AI](#) in writing her next novel, noting how use of [GPT-2](#) (Generative Pre-trained Transformer, discussed in Chap. 4) startled her into “seeing things anew” as it “perfectly captured the emotionally and existentially strained tenor of the family’s home” as the novel unfolded in this human-machine collaboration. Writing about OpenAI’s publication of GPT-2, [Vincent \(2019\)](#) explains that GPT-2 is part of “a new breed of text-generation systems that have impressed experts with their ability to generate coherent text from minimal prompts. The system was trained on eight million text documents scraped from the web and responds to text snippets supplied by users. Feed it a fake headline, for example, and it will write a news story; give it the first line of a poem and it’ll supply a whole verse.”

Using GPT-2, [EssaySoft](#) AI generates academic essays along with “article spinners” to deal with potential plagiarism, with developers contending that “integrating GPT-2 into the education system can eliminate learning demands that the age of instant, digital information has rendered unnecessary and irrelevant.” For use by individuals or teams, [Manuscript Writer by SciNote \(2020\)](#) works to “empower the scientist” by pulling information from the scientist’s data in SciNote, keywords, and DOI numbers of open access references. Manuscript Writer then presents all this in the form of a manuscript, delivering the introduction, materials and methods, results, and references sections from which the writer(s) can begin generating further text. And at the time of finalizing this chapter, articles describing GPT-3 began to proliferate, noting its ability to generate text in response to any input text and respond to questions or statements (Hu, 2020). [GPT-3](#) is pretrained with 45 TB of text, totaling 499 billion words; it costs somewhere between 4.6 and 12 million USD; and it supposedly passes the Turing test—meaning it can fool humans into thinking that it is a human. As reported by Hu, GPT-3 can mimic writing styles of famous people (or anyone else), and it can go one more step to generate computer equations, queries, and applications. Hu writes that “since it is a black box, we cannot easily predict or control the text it generates” and “an unsupervised GPT-3 could generate text that is biased or hurtful.” We discuss GPT-3 in more detail in Chap. 4.

As an additional example, creative technologist [Chris Duffey \(2019b\)](#) compiled a tapestry of AI technologies to co-write with Aimé the book *Superhuman Innovation* (Duffey, 2019a). Duffey explains these three systems:

AI voice recognition enables human-to-system interaction through a voice-user interface—more commonly known as a VUI—for tasks such as speech-to-text, text-to-speech, voice editing, formatting, spelling, and document sharing. AI content understanding and summarization reviews and abridges databases, articles, and research papers into digestible content through approaches such as sentiment analysis, labeling, and organization of higher-level concepts based on contextual understanding. And AI content creation and generation allows the system to develop concepts and ideas to aid in writing process by using algorithms to emulate human writing, allowing the AI to contribute ideas, titles, content, and drafts.

Writing as a dialogue between Aimé and Duffey, *Superhuman Innovation* showcases “how AI can help achieve the seemingly impossible by using technology to solve problems that we couldn’t have imagined solving by ourselves.” Duffey shares this excerpt from chapter 15, “Next-Gen Creativity: Improving the Human Experience:”

Chris: So, what do you think about the role of humanity if the most pressing problems have been resolved by AI?

Aimé: I have a few answers for you. Plato said the purpose of humanity is to obtain knowledge. Friedrich Nietzsche had a different take and said it is to obtain power. Ernest Becker thought the purpose is to escape death and Darwin thought it is to propagate our genes. On the other hand, the nihilists said there is no meaning, and Steven Pickard said the meaning is beyond our cognitive capabilities.

In this same timeframe, [Springer Nature \(2019\)](#) unveiled the first complete research book generated using machine learning (Beta Writer, 2019), *Lithium-Ion Batteries: A Machine-Generated Summary of Current Research*. In this announcement, Niels Peter Thomas, Managing Director of Books at Springer Nature, shared about this future direction:

Springer Nature is aiming at shaping the future of book publishing and reading. New technologies around Natural Language Processing and Artificial Intelligence offer promising opportunities for us to explore the generation of scientific content with the help of algorithms. As a global publisher, it is our responsibility to take

potential implications and limitations of machine-generated content into consideration, and to provide a reasonable framework for this new type of content for the future.

As technologist Ross Goodwin, quoted in the book's introduction, emphasizes, "When we teach computers to write, the computers don't replace us any more than pianos replace pianists—in a certain way, they become our pens, and we become more than writers. We become writers of writers." We would add that we become more writers *with* writers (See Fig. 1.3).

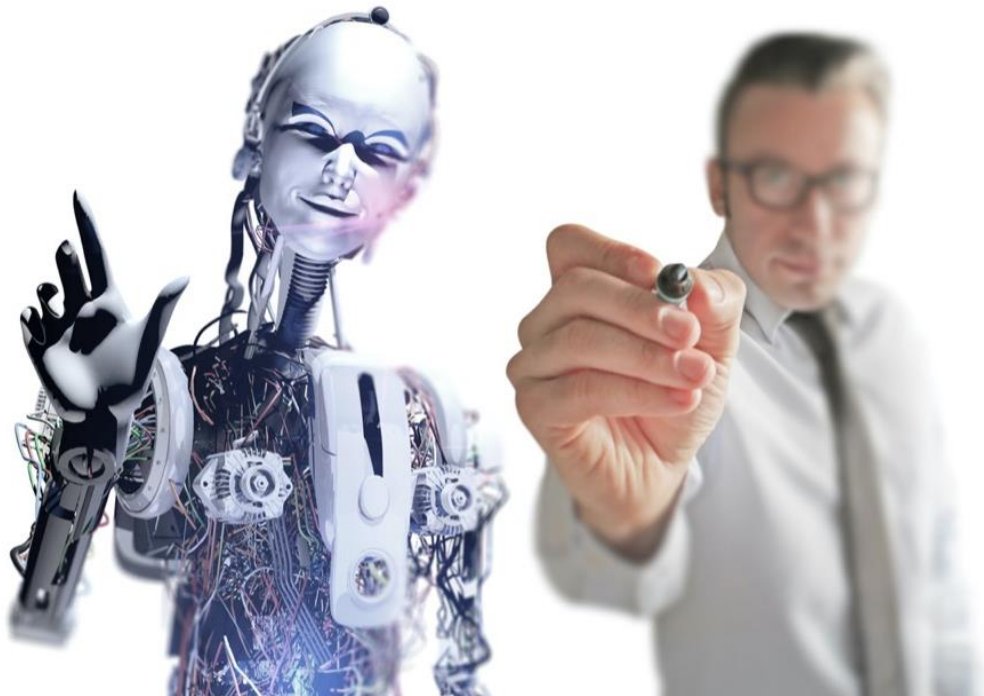


Fig. 1.3 Genius team in the future (Image permission: iStock.com/Devrimb)

Also less “assistant” and more “collaborator,” consider [Samsung’s recent humanoid chatbots known as Neons \(Matyus, 2020\)](#). Here the user comes face to face with “[artificial humans](#)” that “are supposed to be more of a reflection of humans,” and as Neon CEO Pranav Mistry states, “there are millions of species on our planet, and we hope to add one more. . . . Neons will be our friends, collaborators, and companions, continually learning, evolving, and forming memories from their interactions.” Powered by CORE R3 technology (which stands for Reality, Realtime, and Responsive), these humanoids can “connect and learn more about us, gain new skills, and evolve.”

Although they are currently seen mainly as “friendly customer service,” it is now imperative to consider and plan for writing futures that include AI writing assistants and AI collaborators. Such a future is based on a dialogic approach toward collaboration that requires closer attention to emergent socio-technical assemblages that contextualize writing practices. Socio-technical assemblages automate aspects of creative production; they also increasingly will evolve from assistant to collaborator, from machine autonomy to human-machine cooperation and collaboration, from assemblages to collaboratives, from assistantship to synergy.

If one considers how AI solutions become ubiquitous in private and professional domains, soon, as independent information architect Hafez (2020) writes, “humans using AI will be relying on recommendations and actions from multiple smart machines to coordinate and manage their financial, professional, or health [and writing] objectives” (p. 981). Hafez introduces the concept of a human digital twin (HDT), a “human-specific smart machine dedicated to aligning human objectives with the smart machines supporting her” (p. 981). An HDT monitors a person’s human–AI space and, based on the person’s responses, works to ensure that the many systems supporting the person are in alignment. Consider here how an HDT might monitor your writing and communication across multiple contexts. Multi-domain scenarios in which we collaborate with multiple systems are increasingly integral parts of our lives and organizations. How might an HDT be an “active, human-specific and adaptive alignment” between these many contexts and our writing goals?

While an HDT system might strike both excitement and terror, *Writing Futures* as an organizing concept places writing and technological evolution amid the most complex, multifaceted problems that face professional and technical communication, its many related disciplines and industries, and our local and global communities. *Writing Futures* connects emerging technologies with sociality, digital literacy, and civic engagement. Writing is itself a form of technology, and as the above examples indicate, writing is increasingly collaborative, algorithmic, and autonomous.

1.4 Past Studies, Future Speculation

Collections on the future of writing mainly consider the impact of online and digital technologies on publishing, journalism, and creative writing (Potts, 2014) and “explore modes of critical speculation into the transformative impact of emerging technologies,” positioning rhetoric and writing scholars “as proprietors of our technological future to come” (Sundvall & Weakland, 2019, p. 4). Like Potts, we agree that “nobody can predict the future with confidence and accuracy,” as “the present is already bewildering enough, characterized by rapid technological development and disruptive upheavals,” and “none of the old certainties—political, corporate, and economic—seems to hold.” The future—including the future of writing—can indeed “be thrown into doubt” (p. 6). We agree with Sundvall and Weakland’s conceptual aim, “that the future ever arrives too soon,” and that while “we cannot keep pace with the rapid technological development,” we “must work with such a technological problematic” (pp. 5–6).

Contributors to Potts’s collection focus on technological effects within the publishing industry, including the need for greater curation in determining searching, sorting, and ultimately reading; on possibilities that new technologies provide for creative expression; and on the impact of social media and “a tsunami of snapshots, alerts, briefs, tweets, shorts, summaries, and posts” as roles blur between newsmakers and news breakers.

As a means to “work with such a technological problematic,” contributors to Sundvall’s (2019) collection employ the method of speculative modeling, a strategy for “anticipatory, futural thinking . . . especially with regard to emergent technologies,” specifically, “thinking proactively, futurally about, and in anticipation of, how rhetoric and writing might appropriate emergent technologies before they have already after-the-fact arrived” (p. 6). This model of speculative thought comes from sci-fi and speculative fiction and is used to “proactively and speculatively invent” the future.

Such radical speculation makes for engaged, in-depth scholarship. Contributors attend to “how emerging technologies can refashion our rhetorical, ethical, and affective conception of embodiment” (p. 11), providing a “futural blueprint for rhetoric, writing, and the mind” (p. 12). Shared concepts from these contributors include the acknowledgment

that “communication and rhetorical actors extend beyond the human mark,” that new media technologies are changing such that we need entirely new methods, and that creativity and invention will play a central role in the future of writing. We commend the goal to “proactively (re)invent the future, appropriating and employing emergent technologies in the service of the future we desire to inhabit” (pp. 18–19). Building on these collections, our goal in this book is to provide a dynamic, usable framework for investigating and planning for writing futures.

The *Writing Futures* framework in this book includes recognition of the need for understanding, chronicling, and critiquing technological emergence. Rotolo, Hicks, and Martin (2015) define an emerging technology as

a relatively fast growing and radically novel technology characterised by a certain degree of coherence persisting over time and with the potential to exert a considerable impact on the socio-economic domain(s) which is observed in terms of the composition of actors, institutions and the patterns of interactions among those, along with the associated knowledge production processes. Its most prominent impact, however, lies in the future and so in the emergence phase is still somewhat uncertain and ambiguous. (p. 1840)

Rotolo et al. document the lack of consensus on what constitutes technological emergence and, on the basis of their thorough review of studies, they identify five attributes in the emergence of novel technologies: “radical novelty, relatively fast growth, coherence, prominent impact, and uncertainty and ambiguity” (p. 1827). They note that in early phases of emergence some technologies acquire a certain momentum to become “emerging” while other technologies arrive at the verge of becoming emergent, but then do not actually emerge at all, emphasizing that “we have limited knowledge of the end point of the emergence process, i.e. when emergence is over, or perhaps prematurely grinds to a halt or reverses” (p. 1840). In addition, funding may lead to relatively fast growth, and publication download statistics, numbers of tweets and blog citations provide an early indication of potential emergence. Here we emphasize that our integration of artifacts from [Fabric of Digital Life](#) positions readers to understand, contextualize, and chronicle technological emergence within cultural spheres as it relates to collaborative, algorithmic, and autonomous writing futures.

This book also incorporates study from our individual and collective research on emerging technologies. For example, in terms of emergence, [Duin et al. \(2016\)](#) deployed and studied use of the [Google Glass](#) device across composition and technical communication courses, exploring new dimensions of presence, audience analysis and usability, multimodal composing, and peer review. While they identified social and technical challenges with the Glass device, they also found that students envisioned citizen-engaged uses for it. In many ways, these deployments inform understanding of the rhetoric of wearables, affordances of technology, and critical analysis of technological adoption and societal change.

Likewise, Pedersen has developed and applied a critical rhetorical framework called the “continuum of embodiment” to explore the ideological justifications for designing and introducing computing platforms that are increasingly embodied (Pedersen, 2013; Pedersen & Iliadis, 2020). Framing the phenomenon as a continuum provides a means to chart “how public, academic, journalistic, fictional, and commercialized discourses valorize prerelease personal technology on a continuum linking mobile to wearable to implantable innovations as a seemingly necessary, imminent, and determined future” (Pedersen, 2020, p. 22). The cultural momentum for more integrated, seamless, and connected computing experiences will continue to evolve. Integration and automation are rapidly taking shape as devices that are “topographical (on the body), visceral (in the body), and ambient (around the body)” combine to form embodied ecosystems (p. 23). Like Duin, Pedersen explores motivations for adopting technologies within developing socio-technical assemblages and the consequences applicable to myriad applied domains.

Therefore, as we focus on investigating and planning for writing futures, we acknowledge that technological emergence is subject to the exigencies of global issues and ecosystems that constantly alter our disciplines, our industries, and their associated writing practices. Chief among exigencies is COVID-19, a powerful global influencer. Of higher education, Baer and Duin (2020) write, “With huge numbers of deaths, economic systems in freefall, and political philosophies dominating decision-making, the critical question is one of survival. Higher education must develop a bold set of plans to guide decisions” (p. 2). In addition, corporate actors of “Silicon Valley start-ups and EdTech companies see themselves as part of the push to teach more students with more

teaching machines” (Mirrlees & Alvi, 2019, p. 84). Mirrlees and Alvi make the point that while post-internet for-profit education technology companies strive for automating education, it is still people’s choices that control the future, thereby rejecting outright determinism. We too reject outright determinism, and include focus on ethical dimensions throughout later chapters. We draw on the prominent [AI Now Institute](#) (2020), which has a mandate to focus on rights and liberties, labor and automation, bias and inclusion, and safety and critical infrastructure, to understand the social implications of artificial intelligence. Our take on civic engagement involves participating in design, revision, and amelioration.

While past studies and future speculation is important, professional and technical communicators—and the many related disciplines and industries—require a dynamic, usable framework for investigating and planning for writing futures. Fig. 1.4 provides an overview of this framework, and Table 1.1 includes detail on each component.

1.5 The *Writing Futures Framework*

Academic, disciplinary, industry, and practitioner directions for writing futures depend on addressing critical questions. We contend that investigating and planning for writing futures begins with a state of mind. To use this framework, each of us, along with our associated disciplines, must do the following:

- 1) Abandon nostalgic notions of solo proprietary authorship. Embrace writing as dialogic, socio-technological construction of knowledge. The core guiding principle is collaboration as one works with human and nonhuman collaborators. Focus on enabling constructive, collaborative social action to foster writing futures that address grand challenges.
- 2) Attend to algorithms and artificial intelligence to augment, create, and navigate volumes of information. Cultivate ambient intelligence to coordinate collection of data as machine intelligence complements human agency to contribute to learning.

- 3) Enable and engage with autonomous agents and intelligent systems, including AI virtual assistants, deploying robots to the front lines of mediated learning, building bonds and trust with nonhuman agents, and learning from and with them. Evolve and regenerate writing futures through new forms of collective intelligence.

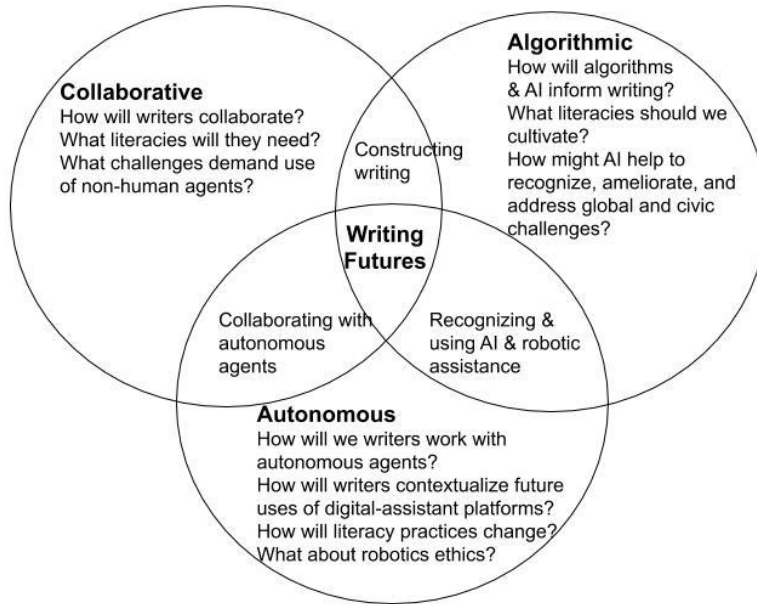


Fig. 1.4 Venn diagram of the *Writing Futures* framework

Table 1.1 *Writing Futures* framework for investigating and planning for writing futures

	Social	Literacy	Civic engagement
Collaborative writing futures	<p>How will writers (students/colleagues) collaborate with non-human agents?</p> <p>Socio-technological construction of knowledge; Technological embodiment; Non-human collaborators; Dialogic collaboration</p>	<p>What literacies will writers need to enable constructive, collaborative work with non-human agents?</p> <p>Digital literacy capabilities</p>	<p>What civic challenges demand collaborative, constructive social action through and with non-human agents?</p> <p>Risks and benefits of machines as teammates; Identifying and instilling civic dimensions across work, assignments, and tools</p>
Algorithmic writing futures	<p>How will algorithms & AI inform writing?</p> <p>Ambient intelligence; Platform studies; Demographics; Algorithmic AI; Machine learning; Virtual assistants</p>	<p>What AI literacies should we cultivate for algorithmic writing futures?</p> <p>Academic analytics; Learning management systems; AI literacy</p>	<p>How might AI help to recognize, ameliorate, and address global civic challenges?</p> <p>Harvard's Principled Artificial Intelligence project as a heuristic; Writing for ethically aligned design</p>
Autonomous writing futures	<p>How will writers work with autonomous agents?</p>	<p>How will writers contextualize future uses of digital-assistant platforms throughout writing?</p>	<p>What affordances of autonomous agents lend themselves to more ethical, personal, professional, global,</p>

	Social robots; Cognitive assemblages; Digital assistant platforms; Cloud-based AI; Chatbots; Brain-computer interaction; Natural language generation	How will literacy practices change with use of autonomous agents? Literacy for teaching AI assistants and learning from them	and pedagogical deployments? Non-discrimination; AI transparency; Values and characteristics
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Chapters 2, 3, and 4 each focus on one row of the above table, providing readers with a future-driven framework for investigating and planning for the social, literacy, and civic engagement implications of collaborative, algorithmic, and autonomous writing futures. Chapter 5 then presents past, current, and proposed investigations of this framework in academic, industry, and civic contexts.

Along with timely artifacts and collections from [Fabric of Digital Life](#), each chapter includes **prompts** for readers to examine as a means to experience collaboration with non-human agents, use and impact of algorithms and AI, and the affordances of autonomous agents. For example, while it was available, use of [TalktoTransformer](#) might have been such a prompt. This tool allowed the user to type a custom prompt for use of the language model called [GPT-2 by OpenAI](#), which then generated paragraphs for possible use. We used the preceding paragraph as a custom prompt, and TalktoTransformer returned the following subsequent text:

The chapters each turn to a different spatialization for the horizontal grid, drawing upon the philosophical analysis of spatial thinking to bring them together. These chapters aim to build upon the foundational thinking that lead my group to produce a collaboration-based virtual machine-based virtual reality model of the grid and its new spatial configurations.

While not necessarily what we would write next, this generated text prompted us to consider how we might best draw on “the philosophical analysis of spatial thinking” to bring together the collaborative, algorithmic, and autonomous agents of writing futures. It

also prompted us to consider producing “a collaboration-based virtual machine-based virtual reality model” of potential use in investigating and planning for writing futures. However, soon after using this tool, we found that it no longer exists. This site now directs users to “state-of-the-art text generation” at [InferKit](#). This example of the dynamic nature of emerging technology underscores the importance of our use of the [Fabric](#) archive, as it chronicles the emergence and trajectory of immersive technologies. Thus, throughout the text, prompts lead readers to artifacts at [Fabric](#) that display text, videos, and links that remain accessible, readable, and usable.

Most critical to this work is the larger community that investigates and plans for the social, digital literacy, and civic implications of collaborative, algorithmic, and autonomous writing futures. Therefore, positioned between chapters are multiple strategic **intertexts** that introduce readers to international scholars, practitioners, institutes, and teams engaged in study of collaborative, algorithmic, and autonomous writing futures. These scholars and practitioners provide reflections on use of this framework to depict what they determine as most critical to writing futures and how they are or are planning to investigate and prepare for such futures.

1.6 Overview of Chapters

We complete this introduction with an overview of the remaining chapters. We have designed chapters for both linear and non-linear uses; in other words, readers may choose to follow the chapter order (collaborative, algorithmic, autonomous, use cases), follow a theme (social, literacy, civic), or read on the basis of professional plans for investigating and planning writing futures, for example reading the introduction and then focusing on the digital literacies associated with writing alongside nonhuman agents.

Chapter 2 examines collaborative writing futures, with focus on technological embodiment, writing alongside non-human agents, the digital literacies required as a result, and civic challenges that demand collaboration with non-human agents. We begin with an overview of scholarship on collaboration and then guide readers in examining the effect of writing collaboratively with non-human actors on the traditional rhetor-audience

relationship, with emphasis on technological embodiment and the continued emergence of collaborative workspaces.

Expanded literacies are needed to cultivate and enable constructive, collaborative work with nonhuman agents. We draw on the [Joint Information Systems Committee \(JISC\) Digital Capability Framework \(2019\)](#), developed in the UK, as particularly influential to understanding of digital literacy. Through an extensive review of articles, reports, frameworks, specifications, and standards as well as interviews, JISC leadership identified key issues in framing how to deepen digital know-how, defining *digital literacies* as “the capabilities which fit someone for living, learning and working in a digital society.” In this framework, digital literacy capabilities include ICT proficiency; data and media literacies; digital creation, problem solving and innovation; digital communication, collaboration and participation; digital learning and development; and digital identity and wellbeing. Given the need to expand beyond sets of capabilities and move toward greater understanding of engagement, we unpack the European Union’s DigEuLit project definition of digital literacy provided by Martin and Grudziecki (2006) in terms of emerging collaboration with non-human agents. Martin and Grudziecki’s definition of digital literacy is the following:

Digital Literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process. (p. 255)

We conclude with focus on civic challenges that demand collaborative, constructive, social action through and with nonhuman agents. Here we help readers to identify and instill civic dimensions across their work, assignments, and tool use. For example, at the time of writing this text introduction, Duin (in Minneapolis, Minnesota, USA) and Pedersen (in Toronto, Ontario, Canada) faced the continued challenges of justice as Minneapolis witnessed horrific displays of unprovoked violence and police brutality against the Black community, shedding light on the very real conditions of structural racism that built the US and continue to traumatize so many. We acknowledge the significance of the publication of the [CCCC Black Technical and Professional Communication Position Statement with](#)

[Resource Guide](#), produced by a coalition of Black scholars to help the field instigate productive transformation (McKoy et al., 2020). This document helps to inform book sections on civic engagement, which is a central part of our framework. McKoy et al. define Black technical and professional communication (TPC) “as including practices centered on Black community and culture and on rhetorical practices inherent in Black lived experience. Black TPC reflects the cultural, economic, social, and political experiences of Black people across the Diaspora” (p. 1). While writing this book, and in response to McKoy et al. (2020), we created the [Race, Algorithmic Bias, and Artificial Intelligence: Expert Talks by Researchers and Artists collection](#) to amplify the work and voices of Black scholars who are leading research on AI and algorithmic bias. Its first iteration includes talks given by experts Rediet Abebe, Ruha Benjamin, Joy Buolamwini, Timnit Gebru, Safiya Noble, and Karen Palmer. As professional and technical communication scholars, we believe that we have tremendous potential to incite change—real rhetorical and material change—across our classrooms and communities, and that constructive social action might be deployed through and with nonhuman agents operating through devices.

Chapter 3 attends to algorithmic writing futures, with specific focus on analytics and artificial intelligence. We examine the impact on writing futures in terms of algorithmic control and algorithmic culture and how our teaching, writing, cognition, and behavior are being steered by learning management systems. As in Chap. 1, we continue to address automated writing, and we expand on this through discussion of platforms and ambient workspaces.

Here we expand on those AI literacies to cultivate as a means to better infer, predict, locate, and assist others. In this early phase of AI deployments, it has been made widely evident that machine learning algorithms can be biased and can cause biased professional practices. The need for transparency for proprietary “black box” decision-making systems has been identified by scholars, governments, and citizen advocates as necessary. The PTC community will often be on the front line tasked with recognizing, reporting, and/or ameliorating bias in teams with developers, AI nonhuman actors, and an array of public or private entities that are starting to classify these types of issues. This will form another analytical skill in the collaborative relationship between writers, adjacent professionals, and AI actors.

We conclude with detail on how AI might assist in recognizing, ameliorating, and addressing civic challenges. Here we include content about several relevant international endeavors to establish principles, practices, and standards for ethical AI, many of which reference communication practices. We draw on the IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems, a large international consortium that has authored the first edition of [Ethically Aligned Design \(2019\)](#), a key reference for the work of technologists, educators and policymakers led by Executive Director John C. Havens. We also deploy key themes from Harvard University's [Principled Artificial Intelligence Project \(Fjeld & Nagy, 2020\)](#) to create a framework for our approach to ethical AI and writing practices.

Chapter 4 concentrates on autonomous writing futures, with focus on emergent socio-technical assemblages that are contextualizing writing practices with nonhuman agents. We add detail and depth to how digital assistants, chatbots, social robots, and AI “writers” (e.g., [InferKit](#)) are not only modifying and supporting writing, but automating and composing content. While the emphasis is often on the technological advancements or business model, little has been dedicated to using digital assistants for creative output in professional scenarios. One study proposes that AI machines will be positioned as machine teammates with “a high level of autonomy, based on superior knowledge processing capabilities, sensing capabilities, and natural language interaction with humans” (Seeber et. al, 2020). Artificial intelligence (AI) and natural language generation (NLG) platforms are advertised as having the ability not only to automate writing, but also to serve as editors of the content (United Robots, 2020).

We emphasize how professional writing and publishing firms increasingly require the use of automated writing. We focus on how human writers will collaborate with AI writers through NLG applications and offer insights into how to maintain a cooperative relationship with them. A recent news article makes the argument that the AI ethical principle of human control should function not only as a civic value system, but as a design goal for AI automation (Markoff, 2020). It suggests that AI automation should involve cooperative scenarios among humans and machines rather than accepting machine autonomy or systems that run without human intervention or even human understanding of the algorithms. We define relevant terminology and introduce key

conceptual issues and theory, but also point to future trends that are being discussed in the commercial discourses surrounding automated writing and publishing.

We then guide readers in examining the affordances and trade-offs that these transformative relationships engender, forecasting how literacy practices will change with the use of nonhuman agents. Consequently, digital literacy practices adapt to an AI literacy, which accommodates the unique relationships under emergence. At the heart of this framework lies the issue of changing roles. In December 2019, the Ministry of Economic Affairs and Employment of Finland launched a basic [Elements of AI](#) course for citizens. Its mandate is to extend AI literacy across Europe: “We want to equip EU citizens with digital skills for the future.” Taking a pan-European approach, [the website](#) describes the “ambitious goal to educate 1% of European citizens by 2021.”

In parallel with previous chapters, we again conclude by expanding on the civic theme woven throughout this book. We began by noting the ethical dilemma of ignorance at the point of technological emergence. Here we emphasize that ignorance at the point of emergence extends beyond classrooms to affect citizens. One of the challenges citizens face is that much of the context—algorithmic platforms—operates through black-box dynamics. Digital life and work increasingly adapt to what Weiser called in his famous 1991 *Scientific American* article “invisible computing,” in which he anticipated an “embodied virtuality” whereby computers become absorbed by places, spaces, and bodies to make life easier and more seamless. At the same time, the social implications of artificial intelligence and algorithmic decision-making on citizens have revealed structural bias in AI, a problem that professional and technical communicators will be asked to address in regular work practices. Power asymmetries embedded in some of these systems have created a stark racial divide in their deployments. Therefore, we note that enabling collaborative social action to foster writing futures involves a civic value system. Civic engagement means developing a “combination of knowledge, skills, values and motivation to make that difference. It means promoting the quality of life in a community, through both political and non-political processes” (Ehrlich, 2000, p. vi).

Chapter 5 concludes the book with methodologies and methods for use in investigation of this framework in academic, industry, and civic contexts:

Academic

Imagine you're a professor in a post-COVID world that has undergone sweeping economic and social changes—changes that have profoundly affected the nature of higher education itself. Among the realities you must navigate are new technologies—course analytics, redesigned learning management systems, assistive technologies based in artificial intelligence (AI)—many of which even a few years ago were just being developed, some of which are just now being tested. As these technologies become a part of our writing futures, how might we position communication and composition for ongoing engagement with and critique of technological emergence? As scholar-instructors, how might we work to build and study student digital literacy as part of our teaching in such a new and evolving world?

Industry

Imagine you're a professional and technical communicator (PTC) working remotely amid constant changes that have profoundly affected the nature of your local and global work. Collaboration is driven by priorities based on increased reliance on AI articulation of what is most critical for revenue streams. User-experience study increasingly relies on machine learning to test hypotheses and assumptions and understand more about users. Curating evidence and substantiating marketing claims involves constant scraping of data sets to become literate and determine strategic business direction. As practitioners, how do we deploy collaborative, algorithmic, and autonomous technologies to build social, literacy, and civic engagement that meets strategic business needs?

Civic

Imagine you're a civic leader responding to urgent community needs. Traditionally, you have brought together resources and services, providing these in close contact environments. Given a pandemic, you're faced with challenges that demand collaborative, constructive social action through and with nonhuman agents. Large service components along with writing and communication with constituents must be remote. How might AI and machine learning tools support you? How might robots and digital-assistant platforms assist with services and communication?

We also include two appendices: a Course Syllabus for a graduate-level course of this same title as this book, and a complete List of General Keywords in the [Writing Futures collection](#) at [Fabric of Digital Life](#).

In short, *Writing Futures* is about positioning scholars, instructors, and practitioners to plan for rapidly evolving technological and social contexts. Through reading chapters and intertexts and responding to prompts—associated artifacts and collections at [Fabric of Digital Life](#) and other sites—our goal is for readers to understand, articulate, and be prepared to deploy a framework for investigating and planning for writing futures that includes attending to the social, literacy, and civic implications of collaboration, algorithms, and autonomous agents. We intend to position readers to write alongside non-human agents, understand the impact of algorithms and AI on writing, accommodate the unique relationships with autonomous agents, and investigate and plan for their writing futures.

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