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Using Algorithmic Imaginaries and Uncanny Pedagogy to Facilitate Interdisciplinary Research and Digital Scholarship

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Abstract: An interdisciplinary honors course titled "Minds, Machines, and Meaning" incorporates the notion of the algorithmic imaginary, which explains how people make use of algorithms to create new information infrastructures and communities and how these algorithms shape us in turn. Describing a culminating writing assignment in speculative research, the author explains how this course facilitates interdisciplinary research while fostering student and faculty growth, and he reflects on the possibility of its future variation, the uncanny valley of algorithmic anti-humanism.

Keywords: algorithms; speculative fiction; digital scholarship; scholarly identity; James Madison University (VA)–Honors College

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THE ARTIFICIAL OTHER

A simple joke, reputedly more than a half-century old, still passes between science fiction convention-goers: "The golden age of science fiction is 12." The point of the joke is that the age of the reader determines when something is "gold," not the era into which the fiction falls. This was almost exactly the age when I began furtively reading science fiction. I never really connected with the protagonists of hard SF—they all seemed populated by the same "man in the gray flannel suit"—but remember fondly the conceptual and technological innovations. I came for the entertainment but stayed for the ideas. I loved SF because the authors wanted to solve problems with science and technology and, in the process, make the world a better place.

I joined the faculty of the University of Central Arkansas in 2004 and quickly became passionate about personal identities, a fundamental concern of the honors core curriculum. "Where does the self come from?" the college wanted to know. Perennial answers included god, nature, relationship with others, the self itself, the absence of self, and so on. As a champion of science and technology, I gravitated toward theories of digital identity. I liked to tell my freshmen that the self is a stochastic Boltzmann machine inscribed in Planck's constant on the outer edge of the holographic universe.

Every member of the honors faculty was expected to teach a class on ideas that directly engaged notions of pluralism and diversity (race, class, gender, ethnicity, culture, or species), so naturally I drifted toward "The Artificial Other," a Foucauldian catchphrase bestowed upon me by my colleague Donna Bowman. As I set about the task of creating my syllabus, old memories of themes and tropes of SF flooded back. I have since been regularly teaching an honors course on Minds, Machines, and Meaning at two different universities for more than fifteen years.

ALGORITHMIC IMAGINARIES

Machine learning, robotics, and automation are today captives of computer science and engineering, but computing is notable historically for its interdisciplinarity. The polymath computer pioneer Herbert Simon had academic training in economics, political science, and cognitive psychology. He preferred calling the new field of computing machines "the sciences of the artificial." In the 1980s and 1990s, books and magazines featured titles about the "new new" or "next big" thing in computing; in those decades, anything innovative might be shoehorned into its study. Computer science remains future-oriented by design. The field is self-consciously incomplete, driven in part by Moore's law and other exponential rates of growth in component density, speed, memory, and cost.

A main purpose of my Minds, Machines, and Meaning seminar is to understand the historical, literary, cultural, psychological, and philosophical origins of smart technologies along with their ongoing influential roles as metaphors, analogies, and drivers of technological change. The course might be considered humanities-driven STEM (HDSTEM), following the definition by Carrell, Keaty, and Wong (2020) that puts "the human—human need, desire, creativity, aesthetics, play, diversion, strength, and vulnerability—back into the realm of scientific curiosity and discovery" (56). The artificial other opens us up to another way the world might be positively imagined and

sensitizes us to the richness of the human search for meaning. Students study real and imagined efforts to artificially simulate thinking and creativity and to mechanize work. They learn that machines and algorithms are helping people generate new knowledge, create businesses, provide care, invent arts, and make music. Artificial intelligence (AI) is helping us unravel the origins of life and the ultimate shape of the universe. It is also precipitating a gut-wrenching Fourth Industrial Revolution.

Algorithms are seemingly straightforward and stepwise procedures for calculating answers to technical problems from given sets of inputs, yet they also have vast cultural power. Algorithms threaten to throw people out of jobs, upend capitalist systems of wealth, and blur boundaries between biological and digital worlds. Finn (2017) says that algorithms are "culture machines" operating at the "macro-social level," where they fundamentally reorganize our "objects, processes, and experiences" (p. 34). Ziewitz (2017) explains how algorithms are "inscrutable entities" that nonetheless are used routinely in the humanities, social sciences, and popular culture to make sense of public and private life (p. 1). Munn (2018) and Bucher (2018) show how seemingly innocuous processes like classifying, sorting, and ranking unite into the salient angles of algorithmic agency, power, and control that dominate everyday life. Algorithms of racial oppression and gender bias undergo dissection by Benjamin (2020) and Perez (2021), respectively. The long list of discriminatory designs includes criminal justice AIs that give longer sentences to black people than white people who commit the exact same crime, soap dispenser electronics that fail to recognize dark hands, and job screening tools that exclude applicants from women's colleges.

I am not the first educator who has been pushing in the direction of giving weight to the speculative in understanding design thinking and decision-making in our encounters with and shaping of smart technologies. For decades, researchers assumed that algorithms were largely invisible. The hidden nature of the digital networks, algorithms, and robotics that shape our moods and habits of consumption and that humans iteratively and unconsciously refashion are now obvious to both scientists and humanists. In 2004, sociologist Patrice Flichy anticipated what is now called the *algorithmic imaginary* in her piece "The Imaginary Internet," which explained how utopian fantasies, founding myths, and ideologies contribute to the real-life assembly of new information infrastructures and cybercultures.

We can now see how competing imaginaries—fashioned by counterculture geeks, universities, and corporations—have all contributed to the design and use of the internet. Much of what the public understands about how online

networks work was shaped by programmers who, as cultural anthropologist Christopher Kelty (2005) explains, "imagine their social existence through these technical practices as much as through discursive argument" (186). Others have since piled on. Anthropologist Daniel Miller (2017) has published a provocative piece in which he questions whether digital social media should be considered a kind of fabricated meta-best friend. A few years later, communications scholar Taina Bucher (2017) more fully explored user interactions with algorithms. "How does the algorithm perceive its subjects, and to what extent does it influence their sense of self?" she asked. "How, in turn, does the way in which people perceive algorithms affect the logic of the system?" (42) Recently, English professor Jennifer Rhee explored *The Robotic Imaginary* (2018) and its "twinned processes" of anthropomorphizing machines and dehumanizing people, and communications scholar Sarah Myers West (2018) cross-examined discourse and debate on the cryptographic imaginary.

UNCANNY SCHOLARSHIP AND CREATIVITY

Honors courses are well-suited for examining speculative design and algorithmic imaginaries because they demand collaborative interdisciplinary thinking and because the students themselves come from a diversity of majors. Though they may not immediately recognize it, honors students possess firsthand knowledge of how algorithms impact their lives as hidden currency. The National Collegiate Honors Council (n.d.) offers guidance for breadth and depth in honors course design. An honors course on the algorithmic imaginary ought to analyze and synthesize a comprehensive range of material, make connections between domains of thinking and experiences, and apply skills that that stand above and beyond what is expected in individual disciplines.

Students completing the Minds, Machines, and Meaning seminar develop skills in research methods and in oral, written, and visual communication. In addition, students are meant to achieve intermediate mastery of intellectual and practical skills such as evidence-based reasoning, fluency with principles of analysis, critical and creative thinking, quantification, and information literacy. They experience integrative and adaptive learning, including the demonstrated ability to apply knowledge, skills, and responsible conduct from a variety of fields to complex problems and new settings. As the instructor and guide, I spark and stoke conversations about speculative figures and futures along with uncanny—even otherworldly—forms of posthuman creativity. My subjects are always both real and imagined.

In this way, I promote *uncanny scholarship*. The point is to propagate the strange and unsettling while tracing out the ordinary and familiar. Students research and write about topics selected from a regularly refreshed list of technical topics, give half-hour presentations, design and create posters, deliver short public presentations, and generally fake-it-till-they-make-it. A generative researcher myself, I favor a bottom-up approach. I encourage students to consider themselves 'T-shaped professionals' (broadly knowledgeable with deep expertise in one particular area), a concept popularized by the late word-processing pioneer David Porter Guest. Thinking about the course in this way is important because I am teaching undergraduate honors students from more than sixty majors and at all undergraduate academic levels. Some have prior familiarity with computer jargon, but many do not.

A long tradition of curricular innovation and experimentation in honors education is valuable in constructing a course of this sort. Traditionally, honors students are cautious, and the NCHC (n.d.) highlights the need to challenge them to become intellectual risk-takers. One way to help students become independent, interdisciplinary, and critical thinkers, for example, is to inspire them to explore divergent and potentially controversial solutions to problems. Chaney et al. (2020) encourage us to use design thinking and interdisciplinary methodologies to develop soft skills like entrepreneurship, flexibility, and creative self-confidence that are useful on and off campus. Honors faculty too are enjoined to "step out of their comfort zones and experiment" (Werth 2005, 44) well beyond the normal bounds of narrow specialties and immediate spheres of concern. Ladenheim et al. (2011) advise us to accept that the biggest questions about the world and its future may have plural solutions, that these explanations are best explored and interpreted through oral ideation and written expression, and that confidence is inspired in both faculty and students by "shared ownership" of concepts, designs, and perspectives drawn from a variety of disciplines and life experiences (137).

One of the central assignments of Minds, Machines, and Meaning involves writing a speculative research essay describing a possible or preferable algorithmic future. The essay may involve an Agartha or electrocene, a wilderness, a meditation on the self, a paradise or catastrophe, a proposed STEM technology, a digital ritual, a portal to everyday life, a technopolitical movement, or something else. Students combine knowledge gleaned from research on real and imagined past and present smart systems and technologies in order to form an original speculative argument about an algorithmic future they can argue is possible. Individual essays include 1) an abstract, 2)

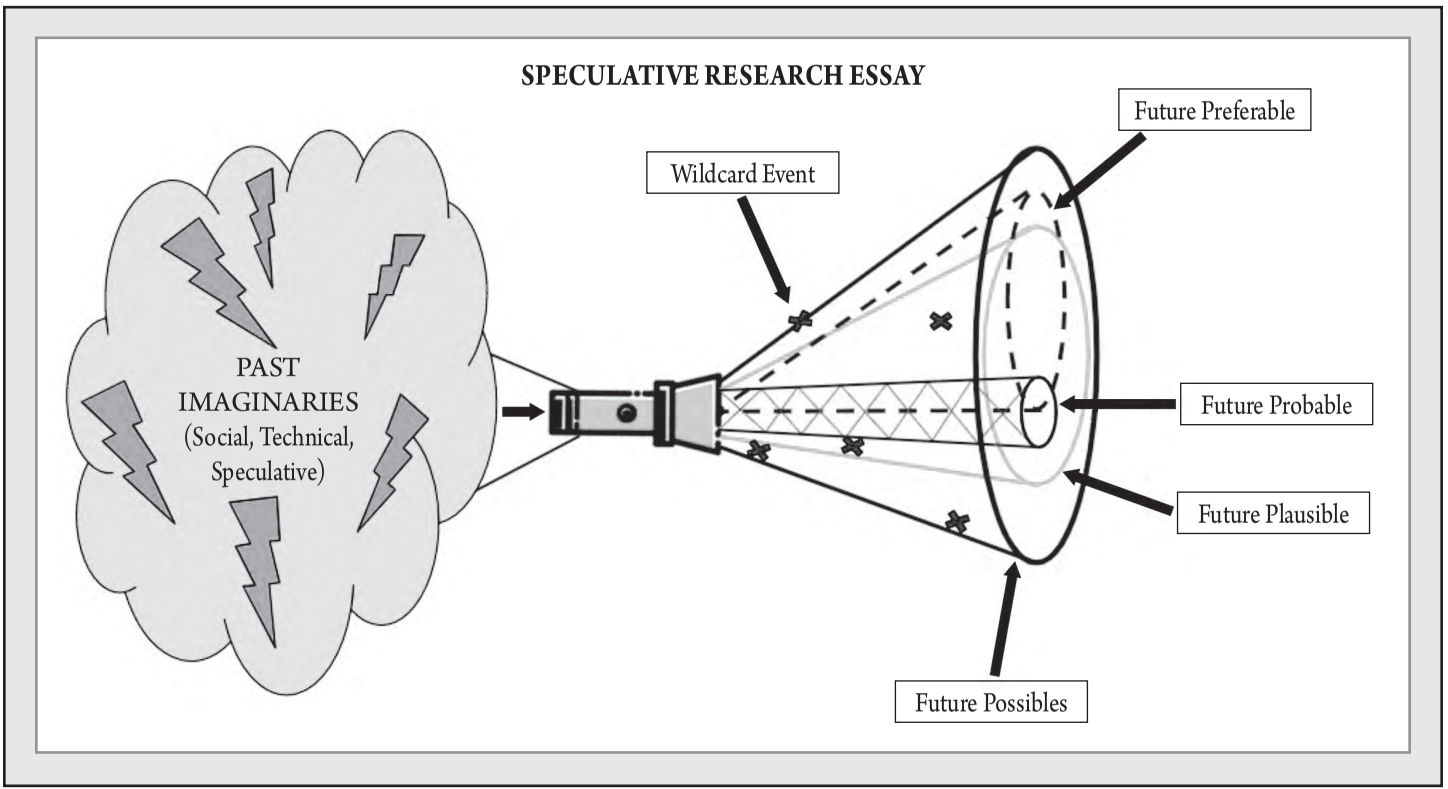
one or more imaginaries as precedents, 3) an assessment of the present context, 4) a critical overview of relevant positions on issues, and 5) a clearly reasoned path to a possible future. Sections on the past, present, and future are about equal in length. Essays as assigned are about ten double-spaced pages in length, excluding a list of suggested readings. Research is crucial but, because the artifacts of the computer age are overwhelmingly digital, can usually be completed on the web. Good essays are grounded in a solid understanding of the known limits and opportunities of particular technologies yet daring enough to take a speculative leap into the near future. Students are encouraged to incorporate at least one example from SF's past or present.

As part of the speculative research process, students are introduced to an adapted and extended version of CCCB (Centre de Cultura Contemporània de Barcelona) Lab's futures cone diagram, which is partially inspired in turn by the Nesta Foundation's model for prototyping desirable futures (see Figure 1). Students are asked to sort and classify narrative artifacts they have collected on the web and think about which ones have contributed to competing or converging social, technical, and/or speculative imaginaries. These imaginaries spark the battery in the flashlight of the present, which casts light onto possible futures.

As CCCB Lab defines them, *probable futures* are those future states that have some measure of probability of existing soon or are viable given existing knowledge or resources. They may be considered relatively linear products of past imaginaries and present realities and justifications. *Plausible futures* are not quite as likely to occur as probable futures, but viable knowledge and resources about them do exist, perhaps with some gentle nudging of actors with economic, political, or social power. *Possible futures* contain both probable and plausible futures, but also futures that—because the knowledge and resources for them do not exist but can be imagined as emerging soon—would not seem utterly impossible. A final chunk of the light cone defines *desirable futures*. These are futures intersecting all the other ones—the possible, the plausible, and the probable—but that are hoped-for. Wildcard events are those unimagined or unforeseen events that could alter the trajectory of any of these futures, bending the path of light into an alternative probable future (Roselló 2017).

In order to form an original speculative argument about a future for which they can argue, students combine knowledge gleaned from the more didactic moments of the course, open classroom discussions, and internet research on real and imagined technologies. I do not restrict them to the selection of one particular beam of light (possible, plausible, probable, or preferable) but

Figure 1. Adapted and Extended Version of CCCB Lab's Futures Cone Drawn by Brenna Frana



Note: The CCCB Lab's model is an adaptation of a figure by Jessica Bland and Stian Westlake of the Nesta Foundation. The original futures cone model is attributed to Trevor Hancock and Clement Bezold. See Roselló (2017).

for the sake of clarity ask that they pick only one. I recommend that students begin with a problem they care passionately about or perhaps an issue that emerged from our classroom conversations. I often share examples. Fifteen years ago, I talked about how early counterculture personal computer enthusiasts in the WELL online community dreamed of an internet for sharing information about the Grateful Dead and free software and how they eventually bumped up against the consumptive capitalist impulses of people like Jeff Bezos and Jack Ma. This semester I have been directing students to the Lowercarbon Capital website created by angel investor Chris Sacca. Sacca's investment fund aims to fund startups that protect the environment and reduce human and animal suffering with zero-carbon technologies, many of which require advanced digital technologies. The jargon-free examples of technologies he thinks we need are in some cases quite literally "fantastic": kelp-farming carbon-sinking robots; AI to capture carbon and restore forests; tree-planting drones; clean, fast, cheap lithium mining; superfast hydrofoil cargo ships; automated carbon footprint reporting. If these are the futures that are possible (if not plausible), can we trace their twisty path from past imaginaries to present circumstances and into a new future?

NEW OPPORTUNITIES

Eileen Scanlon (2018) at the Open University argues that the influence scholars have in contemporary academic networks is fortified by digital scholarship, formation of online identity, and social networking. New kinds of digital scholarly activities, Scanlon finds, foster "new ways of working and interdisciplinary practices" and "new models for publication and dissemination of research" (2). In last year's volume of *Honors in Practice*, Betsy Greenleaf Yarrison (2021) exhorts honors programs to be "crucibles for innovation, not archives of the obsolete" and asks us to invite students into "brave, new, virtual worlds" (185).

Students in Minds, Machines, and Meaning explore brave new forms of scholarly identity and visibility, gain experience with incipient scholarly identity tools, and evolve in their scholarship through meaningful action. Along the way, they notice unique elements of the research process: completing work in new ways, using new tools, and creating open and shareable digital products. This is where my own experience with the course has become uncanny. Students are emulating digital research practices and training, but they are also developing the convergent analytical, divergent, and abductive reasoning skills that anticipate the future. In other words, the pedagogy

encourages students (and me) to learn habits of mind and strategies that make them uncomfortable as they begin to think about how they might anticipate or even leap into novel careers, technical roles, or interdisciplinary endeavors where understanding digital patterns and the "data self" is essential.

The students have made the course uncannily real in their completed undergraduate speculative research products. Over the years, they have made a public Artificial Other website, compiled their essays into collections, submitted to undergraduate journals, and developed personal websites highlighting their own areas of inquiry. A noteworthy example of what is possible is student Dora O'Donnell's (2015) feature article in *Digital America* entitled "Along for the Ride: The Implications of Extended Memory, Lifelogging, and the Quantified Self." Course results have been disseminated at NCHC2019 ("Disrupting Education: Creativity and Innovation in Honors") during a DIH Opening Session and at an Honors Creativity Workshop ("Six Ways to Teach Creativity in Honors"); at the Cohen Center for the Humanities (panel discussion on "Sentient Selves"); and at the Northeast Modern Language Association Annual Meeting ("Uncanny Simulacra: Pedagogy and Student Artwork as Tools for Interrogating Post-Human Worlds"). The approach has also been applied in intellectually stimulating spaces where faculty and students are not directly cross-examining speculative sociotechnical pasts, presents, or futures.

My personal scholarship has undergone its own sort of uncanny evolution through personal outreach under the moniker The Artificial Other. So-called "Academic Twitter" and influencer culture teach that scholarly identities are shaped by taking control over your own brand. The internet and social media are fundamentally altering the way professionals in higher education share information and ideas. Many years ago, I came across an unpublished conference paper by Java et al. (2007) showing that Twitter was doing more than connecting friends; the microblogging service was meshing communities composed of information sourcers and information seekers. At about the same time, the well-respected research group Faculty Focus (2009) released a report showing that most scholars who described themselves as regular Twitter users were also using it as a way to collaborate with colleagues and students and as a learning tool in the classroom. I occupied a rather unusual niche in the academy as a humanist who studied computer software in an honors interdisciplinary context and in a place located far from a tech hub. Perhaps my community would never come together unless I attempted to use social media to help "birds of a feather flock together." Could Twitter help me create an academic community that promoted nurturing relationships and new scholarly endeavors?

I eventually took the plunge in 2012. I established a professional Twitter account separate from my personal account for family and friends and began using the service as a content curation tool. An early and useful roadmap for me was the London School of Economics Public Policy Group's guide for academics and researchers *Using Twitter in University Research, Teaching, and Impact Activities* (Mollett et al. 2011). The handle for my professional account is @ArtificialOther. Over the past ten years, I have microblogged daily on this account, most often tweeting out what I am reading and researching. I use the Google Chrome browser to bookmark sources I want to share and TweetDeck for regular and orderly posting. I try to post about once an hour (which I know sounds excessive, but it's not). Ecologist Emily Darling calculates that scientists on Twitter have about 700 times as many followers in their "virtual department" of professional connections as exist in their physical department (Darling et al. 2013, p. 9). By 2020, I had built up almost 5,000 followers and followed back around 2,000 accounts. That is 625 times larger than the size of my home department. Twitter helped me find my communities of interest and practice, and—judging from the follows, likes, retweets, and positive direct messages—helped others too. Most of my followers are scientists, scholars, graduate and undergraduate students, academic organizations, and public policy groups. A strong minority are members of the educated public and journalists. Some of them are science fiction authors looking for good ideas.

Because of this activity, pedagogy in my honors course began to change, supporting innovative uses of technology to study technology. Twitter makes available to its users an archive; it is downloadable as an Excel spreadsheet and as a browser widget. The widget is extremely useful as a searchable database to the 20,000 unique tweets I have made over the past nine years. I first used my Twitter archive to create reading packets. Later, I realized that I could embed my archive into my school's learning management system as a bibliographic reference tool. The tool allows students to conduct a curated search for information about the topics of their speculative research essays. My professional Twitter archive has also helped me prepare and refresh the topics and suggested readings in my syllabus, as the subjects for the course obsolesce rapidly. Twitter has shaped the way I generate and experiment with new ideas, discuss them with others, form collaborations, share and disseminate research and publications, and engage in outreach activities (Mahon 2017). I can confirm what other researchers have found: that Twitter is a highly influential space for scholarly identity formation, sharing and discussing academic research and practice, and personalized learning (O'Keeffe 2019).

In 2016, the acquisitions editor of a respected press believed me sufficiently well networked to build community in artificial intelligence. He proposed that I plan, write, and edit an *Encyclopedia of AI: The Past, Present, and Future of AI*, now published (Frana and Klein 2021). The editor was right; I was able to identify one thousand possible contributors to the encyclopedia effort, whom we whittled down to a final list of about seventy. I developed the book plan using raw data from my tweets and a supervised learning algorithm, with the clearly defined goal of extracting and classifying the encyclopedia's headwords. I now routinely take a text-mining approach to interpreting social and material aspects of digital innovation in my research and scholarship.

Another result of experimenting with uncanny pedagogies and personal research practices is my involvement since 2016 with the Washington, D.C.-based nonprofit Museum of Science Fiction (MOSF). As director of science programming for the MOSF's annual Escape Velocity convention, I have become engaged in the organization's mission to reinvigorate the interest of young people in science, technology, engineering, art, and math (STEAM) by producing and presenting the most compelling, exciting, educational, and entertaining science festival in the United States, using science fiction as the primary engine (Viggiano et al. 2020). This festival has proved an exceptional way to recruit and engage like-minded faculty and students interested in pursuing science in the public interest; space humanities; computational ethics; eco-criticism; design fiction; and future studies. My involvement in the activities of the Museum of Science Fiction were predicated on discovery through my Twitter account and online networking community, including contacts with people having similar interests in honors education.

FUTURE DIRECTIONS

Reflecting on these experiences, I can now see that my teaching and learning have become a strange loop, a contrivance of cognitive scientist Douglas Hofstadter to describe recurrent symbolic structures that pass up and down and through various micro and macro levels of observed reality and abstraction, ultimately arriving back where they begin. Strange loops are often compared to paradoxes or fractal patterns. Hofstadter believes they throw light on the origins of consciousness, on personal identity, and on the narrative fictions we construct (or hallucinate) to explain everyday life. Am I now a determined subject of the speculative fictions and digital sciences I use in my teaching and learning, only dimly aware of the discursive formations

that determine my work and my professional identity? I think it is *probable*, though perhaps not *preferable.*

The body of work on algorithmic imaginaries points the way toward reimagining these strange loops in our ways of knowing that feed recursively back into themselves. Disempowering and re-empowering though it may be, we are training new machine learning technologies, systems, and software that train us right back. Software may be "eating the world," but we are lively participants in that process. One of the more unique intellectual discoveries made in Minds, Machines, and Meaning is *algorithmic anti-humanism*, a label we apply to the profoundly reactionary effects of computing. Students have found instances of algorithmic anti-humanism in the work of economist Herbert Simon, who asked if the complex "wiggly path" of an ant on a beach derives from maneuvers made under its own volition or only from rule-bound reactions to impeding sand grains and driftwood. (He thought the latter.) Students have also located algorithmic anti-humanism in the pages of an Alfred Bester SF story, where a protagonist asserts that "the great majority of people live the sort of linear life that could easily be programmed into a computer." One alert student discovered it stenciled on the wall of the weight room at the local high school: "We Don't Use Machines, We Build Them." Future iterations of the course might approach and simulate the uncanny valley of algorithmic anti-humanism in order to avoid the catastrophe of implementing technologies and innovations that push beyond well-considered guardrails.

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