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The Ethics of Writing for Algorithmic Audiences

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Abstract

This article discusses the ethics of considering algorithms as audiences by drawing on a class dedicated to examining algorithms. While ethical commentary about the use of algorithms has been offered by cultural critics, I argue we need to consider the inner workings of algorithms, which requires demystifying or "unboxing" these things. I draw on my experiences teaching an upper-level elective course, during which we identified ways in which algorithms are obfuscated. I advocate for including technical literacies and methods, such as descriptive statistics, in writing studies courses that focus on algorithms. For writing studies, technical literacies and methods provide us with ethical ways to examine algorithms.

Keywords: Algorithms; Ethics; Audience; Writing studies; Pedagogy; Black box; Teaching; Social media; Digital rhetoric; New media

Introduction

"Consider your audience." A powerful, if perhaps cliché, phrase. It's a cliché phrase because we can consider audiences in many nuanced ways. A writer's audience is sometimes a fiction (Ong, 1975). Occasionally, writers may try to consider the "universal" audience (Perelman and Olbrechts-Tyteca, 1969, pp. 31–35)—if that's even possible. Other times, a writer's audience is a shared sense of thinking-acting-being between writers and audiences, an idea that is problematically[1] referred to as a discourse community (e.g., Bartholomae, 1985; Bizzell, 1992; Porter, 1992). Writers might be their own audiences, such as when they are writing-to-learn (Herrington, 1981; Forsman, 1985). We know that writers can consider various publics and counterpublics as their audiences (Cushman, 1999; Cushman and Green, 2010; Eberly, 1999; Eberly, 2000; Holmes, 2016) as well as the networks along which those publics and counterpublics move and circulate (Edbauer, 2005; Gries, 2015; Edwards, 2018). But there are more audiences in the world than our theories imagine. With the rise of inordinate computing power, everyday "smart" objects that turn activity into data, and datasets that dwarf terabytes, writing theory needs to account for advanced statistical methods that attempt to mimic human reaction and reception. These complex networks—not just theories but actual physical and electronic networks—provide us with exigences to refashion audience theories.

Consider, then, *algorithms* as audiences. Who is the audience of a student using a library search database? The code of the database, coupled with its interface and template forms, can become an audience for the student. What if

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[1] See Prior (1998, pp. 3–32), Reiff (1996), and Harris (1989) for significant critiques of discourse community as a concept.

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the student was doing a full-text search? After all, a full-text search "is not a finding aid analogous to a card catalog. It's a name for a large family of algorithms that humanists have been using for several decades to test hypotheses and sort documents by relevance to their hypothesis" (Underwood, 2014, p. 65). In a full-text search, the student might be thinking about the algorithm(s) in place. Alternatively, a student submitting an essay to a robot grader (e.g., Miller, 2007), might not consider a human reader as the audience but instead the procedures as well as the lifeworlds out of which those procedures emerge.

Let's push this line of thinking beyond the classroom: what about those who write computer code? To echo Donald Knuth (1984), other humans should certainly be part of the programmer's audience, if not the main audience: "Instead of imagining that our main task is to instruct a *computer* what to do, let us concentrate rather on explaining to *human beings* what we want a computer to do" (p. 97). Yet, when computers execute complex series of code, they could be considered part of the programmer's audience in the sense that the programmers hope the task will execute. Finally, consider advanced machine learning scientists[2] who design computational models that deploy dozens of algorithms and advanced statistics, thereby attempting to mimic human thinking or perception. Their models, which compute thousands if not millions of variables, yield results specifically produced to be unexpected. The models *themselves* could be an audience.

Crucially, then, what are the ethics of considering these algorithms as audiences? In the context of this article, I mean ethics as an empirical tracing of decision-making patterns as Latour does in *Science in Action* (1987) when he closely examines concepts in science, such as the DNA double helix structure. Here, tracing means to examine, document, and evaluate complex processes that are often simplified or "black boxed." Ethics, in this article, is a process by which we aim to investigate "black boxes" in hopes of demystification.

This article has four parts. First, I argue that approaches to considering algorithmic audiences must include ethical components because writing for these audiences risks pandering to crowds. While ethical commentary about the use of algorithms has been offered by cultural critics (Eubanks, 2018; Noble, 2018; O'Neil, 2016; Pasquale, 2015), we need also to consider the inner workings of algorithms, which requires demystifying or "unboxing" these things. Latour (1987) calls us to engage in such activity so that we research empirically (and not only theorize) the inner workings of complex issues rather than view these issues as rote inputs and outputs. Thus, I next address unboxing these audiences as part of the ethics of writing for algorithmic audiences. Unboxing asks us to examine what Jenna Burrell (2016) calls the *opacity*, or obfuscation, of algorithms. Burrell's argument helps writing studies researchers to demystify algorithms when they are black boxed. The third section describes an unboxing pedagogy to ethically teach about algorithmic audiences. Here, I draw on my experiences teaching an upper-level elective course, during which we identified ways in which algorithms are obfuscated. I advocate for including technical literacies and methods, such as descriptive statistics, in writing studies courses that focus on algorithms. For writing studies, technical literacies and methods provide us with ethical ways to examine algorithms. In the conclusion, I argue that better technical instruction related to algorithms can help us see the role of humans in the construction of algorithmic expressions.

Algorithms as audiences

This article argues for understanding algorithms not only as tools we use to communicate but also as audiences to communicate *with*, thereby extending my previous work (Gallagher, 2017). It is important to note that I treat algorithms not as metaphors but as executable procedures that must be actively investigated, documented, and researched. An algorithm is one or more sets of input/output procedures with a terminating endpoint that yield a result. Algorithms are not necessarily computer based but frequently are.

Like other theories, algorithmic audience reflects, at least in name, the "nonhuman turn" in the humanities during the past ten to fifteen years because it frames these nonliving objects as possible audiences. However, crucial to my argument is that algorithms are still built and designed by human beings. Algorithmic audiences take their forms from the builders and makers as well as the social systems out of which those people produce their algorithms. Glitches and unintended consequences are still possible, thereby allowing algorithms to become audiences *themselves*. Algorithms are machinations of human beings' intentions and the equations designed to achieve those intentions. These algorithms

[2] Computer scientist Pedro Domingos (2015) argues there are five types of machine learning scientists: inductive reasoning, connectionism, evolutionary computation, naive bayes theorem, and analogical modeling.

are important because everyday life is now dominated by internet-enabled objects ("the internet of things") and digital technology that are radically different from a typical tool, such as a hammer. Algorithms, such as advanced statistics that deploy massive sets of matrices, have become complex enough that these tools begin to mimic the decision-making of human beings ("machine learning").

Jim Brown (2014) argues for such a flexible version of machines through his discussion of a Twitter bot (@YourLetterBot) that composes short sentences by refashioning Erasmus's *De copia*. For Brown (2014), "[e]xcavating the machinic dimensions of rhetoric. . .reimagines the machinic as something dynamic and fluid" (p. 508). To take a rhetorical view of machines means to avoid seeing machines as mere executors of procedures. Brown's Twitter bot attempts to show ". . . that the boundaries between human and nonhuman continue to proliferate" and that ". . .the robot sits alongside the nonhuman animal. . ." (p. 511). Brown's take on a Twitter bot illustrates how we can understand algorithms as audiences. While it's easy to see algorithms as tools, we might treat them *alongside* audiences that are more recognizable: teachers, peer reviewers, commenters, etc. To reorient Brown's view, I propose understanding algorithmic audiences as fluid objects that are both human and nonhuman. Algorithms represent human audiences but are simultaneously apart from these audiences. On the one hand, if digital writers decide that human designers and programmers are their audiences, then the algorithm might not be an audience. On the other hand, if digital writers perceive that an algorithm makes decisions autonomously—*even if those decisions were originally programmed*—then digital writers may perceive those objects or procedures as audiences. As I've noted before (Gallagher, 2017), writers might consider the YouTube algorithm as their audience. Writers could consider any number of social network algorithms, including those of reddit, Facebook, and Instagram. Writers might also consider algorithms in websites where writing takes place, such as in online reviewing or Amazon's self-publishing venue, Kindle Direct Publishing (Laquintano, 2016).

Consider a pedagogical example: a student preparing a resume. Traditionally, we might have the student consider various readers in the hiring process. We likely do not need to motivate the student to revise a resume, because these documents, in an era of corporate universities, provide enough motivation. Perhaps the teacher even recedes into the background as a possible audience. We could teach the genre conventions of a resume (e.g., the header, resume sections) as well as the social action of those genre conventions (i.e., to get an interview). The student likely also needs to submit this resume electronically, where the document will be processed by algorithms. Consequently, one audience of this document could be a parsing algorithm, which itself is part of software called applicant tracking systems (ATS). These resume parsers deconstruct a document into various constitutive parts and reassemble the parts into searchable elements. The elements are prioritized by a variety of emphases, depending on the company, department, and job. Oftentimes, resume parsers focus on the formal job call, identifying resumes that have certain keywords, phrases, or layouts selected by employers. Software such as ATS has entered the public imaginary to such an extent that I've had students openly discuss strategies for dealing with algorithms. For instance, several of my students have mentioned pasting job calls into their document and then changing the font color to white and font size to something tiny, such as one or two.[3] The intent here is to have their resume selected for further review. In other words, at least part of their audience is an algorithm.[4]

This concern for algorithms is not limited to resume documents, however. *The Wall Street Journal* ran a video that documents how companies such as DeepSense use advanced statistical audio and visual software ("artificial intelligence") to review candidates during interviews (Schellmann and Bellini, 2018). Schellmann and Bellini (2018) write the following:

> Nearly all Fortune 500 companies now use some form of automation – from robot avatars interviewing job candidates to computers weeding out potential employees by scanning keywords in resumes. And more and more companies are using artificial intelligence and machine learning tools to assess possible employees. . ..DeepSense, based in San Francisco and India, helps hiring managers scan people's social media accounts to surface underlying personality traits. The company says it uses a scientifically based personality test, and it can be done with or without a potential candidate's knowledge. (n.p.)

[3] I posted about this strategy on Twitter, and the tweet received more than 4500 "hearts" and 500 retweets before I deleted it. I deleted the tweet because several users pointed out that many companies guard against this technique by deleting resumes found to use this strategy.

[4] One need only to google "resume algorithm" to see a number of websites offering ways to systematically consider algorithms when writing resumes.

Schellmann and Bellini's article is accompanied by a video detailing how an algorithm analyzes candidates interviewing over video. Responses can be evaluated in terms of tone, word clusters, and "micro expressions," or "facial analysis software" (2:37–2:55). This software, referred to as artificial intelligence, could easily function as an audience, especially considering that interviewees are literally asked questions by the software.

While many in writing studies are rightfully concerned about the uses of ATS, DeepSense, and other automated software, we must develop audience theories to tackle these issues in addition to addressing normative claims ("should" or "ought" claims) about the deployment of this kind of software. Algorithmic audiences are *already* here. Although programmers initiate them, algorithms often function without human intervention (this is often what is meant by the term "scalable"). Algorithmic audiences curate us. They determine what we see on our screen and when we see it. We need audience theories that better account for how our students already write for algorithmic audiences, help our students develop accurate descriptions of such practices, and describe the new ethical challenges that arise from those practices.

The ethics of algorithmic audiences

In this section, I address ethics in terms of algorithmic audiences, notably the issues of pandering and *ad populum*. When digital writers consider algorithms, they are in many ways considering the procedures as their audiences. If the writers fulfill these procedures, then they are likely to be rewarded by these audiences within the context of the writer-audience relationship. As a result, digital writers may view this process as less a matter of making rhetorical choices than filling out these procedures. They may decide to view their writing, or other discourse, as a rote input/output exchange. Digital writers might pander to a perceived algorithm and appeal to whatever is popular by systematically manipulating an algorithm ("gaming"). For example, a YouTube content creator may decide to title a video with extreme qualifiers in order to be picked up by an algorithm, e.g., "The best. . .!" or "The worst. . .!". The creator, in this example, is producing content with an algorithm in mind, understanding that even though humans have decided on the *multiplicative weights* used in an algorithm, the output of the procedures themselves becomes a primary audience. The content creator does not use clever or artistic titles but rather responds to the reward system in place, e.g., appearing in search results.

These ethical concerns are not new for audience theory or pedagogy.[5] As Ede and Lunsford (1984) canonically noted, an overemphasis on the audience addressed becomes "pandering to the crowd" (p. 159). They note that "The resulting imbalance has clear ethical consequences, for rhetoric has traditionally been concerned not only with the effectiveness of a discourse, but with truthfulness as well" (p. 159). Hawk (2018) too notes, by way of Ede and Lunsford, "Any attempt to fully adopt the audience's position becomes pandering" (p. 225). These sentiments, salient in a time of disinformation and misinformation on social media, highlight the ethical concerns with algorithmic audiences. The question thus arises: how can we frame algorithms as audiences for students while guarding against pandering?

To answer this question, we must demystify algorithms, making them objects of study. Investigating how algorithms *actually* work allows for a fuller view of the procedures, social choices, and human roles that go into these potential audiences. To do this, however, requires understanding why algorithms are obscured in the first place. According to Jenna Burrell (2016), algorithms are "opaque" or obfuscated due to intentional corporate or state secrecy (p. 3). For Burrell, ". . .algorithmic opacity is a largely intentional form of self-protection by corporations intent on maintaining their trade secrets and competitive advantage" (p. 3). Algorithms are black boxed actively by companies, organizations, and people due to the economic or surveillance advantages of having these procedures opaque. They are also opaque due to "technical illiteracy" (p. 4). In other words, "writing (and reading) code and the design of algorithms is a specialized skill. It remains inaccessible to the majority of the population" (p. 4). To summarize Burrell, technical illiteracy means that even if we gave a populus access to the technical aspects of algorithms, a large portion of them could not understand the computer code, mathematics, and statistics.

In addition to being obfuscated because of corporate secrecy and technical illiteracy, algorithms are opaque due to how they "operate at the scale of application" (p. 4). Machines "think" differently from human beings because they fundamentally operate on a binary system of logic, whereas human beings can operate in non-logical and associative

[5] Concerns about pandering are not new for rhetorical theory. If one attempts to persuade, then one may risk simply telling an audience what the audience wants to hear in order to achieve a particular aim.

ways. Algorithms become black boxed because they function differently than human ways of understanding the world. Burrell offers an example of a machine learning algorithm that detects handwriting (pp. 6–7). This algorithm breaks handwritten numbers into small squares (an 8×8 chart) that can be processed by shading within a specific number. Burrell observes:

> What is notable is that the neural network doesn't, for example, break down handwritten digit recognition into subtasks that are readily intelligible to humans, such as identifying a horizontal bar, a closed oval shape, a diagonal line, etc. This outcome, the apparent non-pattern in these weights, arises from the very notion of computational "learning." Machine learning is applied to the sorts of problems for which encoding an explicit logic of decision-making functions very poorly. . ..Where an algorithm does the "programming" (i.e. optimally calculates its weights) then it logically follows that being intelligible to humans (part of the art of writing code) is no longer a concern, at least, not to the non-human "programmer" (pp. 6–7).

To put this another way, human beings process handwriting differently than machine learning algorithms process information. Human beings might, for instance, look at numbers as a gestalt, seeing the handwriting holistically and without being able to explain decisions at a more granular level. (In this way, some human learning, processing, and thinking are as black boxed as algorithms.) It may be problematic that Burrell moves from a discussion of algorithms to machine learning algorithms given the exponential increase in computational processes. However, the point remains that algorithms process information differently than human beings do, especially at scale. In fact, it is precisely this difference that enables algorithms to scale, which is why we need to interrogate these aspects.

These reasons help us better articulate in our assignments and activities why algorithms and machines are "black boxed." These reasons also provide us with a language for naming and explaining why these processes and procedures are obscured. More specifically, Burrell's approach helps the development of ethical audience concerns by providing a three-pronged approach to researching algorithms in a classroom. Rather than encourage students to see algorithms as *simple* input/output solutions, and thereby risk ethical issues of pandering and *ad populum*, we can use these reasons as classroom teaching practices for unboxing or demystifying algorithms. To do so, we must trace and document how algorithms explicitly function.

Unboxing the black boxes of algorithms ethically guards against pandering and *ad populum* because it buttresses a *rhetorical* of view algorithmic audiences rather than mere manipulation or pandering (e.g., "gaming" a system or procedure). One might not see writing for algorithmic audiences as rhetorical if writers are merely executing the procedures of a machine or algorithm. Indeed, if writers are simply fulfilling procedures, I suspect many of us who research writing would think such fulfillment is not rhetorical. Instead, I advocate for tracing out the social forces that go into the creation of a machine's or algorithm's procedures. To unbox the procedures—and thereby better understand how, why, and when those procedures are appropriate or not—is a significantly more rhetorical view of writing for algorithms than the mere fulfillment of such procedures.

Unboxing algorithms

Pedagogically, I attempted to unbox or demystify algorithms, and writing for/to algorithmic audiences, by developing an undergraduate/graduate course in the fall of 2018, titled "Writing and Rhetoric in an Age of Algorithms." Six undergraduate students and two graduate students enrolled in this upper-level course. The course description read as follows: "This course examines the role of algorithms in digital writing and rhetoric. It asks students to critique procedures and instructions as they relate to writing processes and production. The course covers rhetorical theory in economic, mathematical, and digital contexts. Students are asked to critique an algorithm of their choice, design a writing interface to facilitate algorithms, and write two papers drawing on course texts and outside research." Course questions included the following: How do procedures and instructions relate to writing? What is the role of writing with respect to online content and digital delivery mechanisms? How are digital rhetoric, algorithms, and the internet related? What groups and communities are at risk in an age of algorithms? How might we protect these (and other) groups from algorithmic procedures while taking advantage of procedural rhetoric? How might we design interfaces and templates to minimize the risk of algorithms and increase oversight over algorithms?

Through various readings, we spent the initial five weeks defining technical definitions of algorithms and interfaces as well as studying how news media frames algorithms in publicly facing venues (e.g., *The Atlantic* and *Wired*). While all students came to the course with a vague awareness of algorithms, often framed in terms of a specific social media

site such as Instagram, YouTube, or Google, my main goal was to establish technical definitions of algorithms, cultural depictions of algorithms, and ways that users imagined algorithms. Overview articles about algorithms included Beck (2016), Burrell (2016), Kitchin (2017), and Laquintano and Vee (2017). I assigned Magalhães (2018), Massanari (2017), and Hallinan and Striphas (2016) in an effort to address explicitly ethical issues related to algorithms. We read Cathy O'Neil's bestselling *Weapons of Math Destruction* (2016) during the last three weeks of the semester while students worked on their final projects.

The midterm (appendix 1) asked students to investigate a particular algorithm, one that was perhaps either personally of interest or that they interacted with in their digital lives. I gave students one month in the fall semester (October) to complete this assignment. According to my evaluations, they needed more time. We had three separate class periods dedicated to peer review and class discussion based solely on student projects. Projects ranged across a diverse set of possible algorithms: YouTube, Instagram, Spotify, Tumblr, baseball and basketball prediction algorithms (two students), insurance algorithms, and Vox news media. Three students were able to find the algorithm itself, i.e., the mathematical expression: one about the insurance agency and the other two about baseball and basketball prediction algorithms. The remaining five students could not locate the actual expressions and were actively discouraged from looking by those they contacted. None were able to understand their targeted algorithms fully, although the three students who found expressions made strides in trying to break down the formulae. In this sense, Burrell's argument played out effectively in our class discussions: proprietary reasons and functional illiteracies prevented students from identifying algorithms in many ways. There was also purposeful obfuscation that seemed designed to keep an algorithm transparent when in fact the algorithm was black boxed. The student who investigated the insurance company (Progressive) found the following expressions[6] from a subcontracted company (H_2O.AI) (Figs. 1 and 2):

There was a customer assistance website with a forum for the insurance algorithm, but when this student posed a question, he received no answer (and monitored the forum for two weeks). He also encountered dead links and circular links that led back to where he started. Moreover, the insurance company seemed to offload the algorithm itself to another company (H_2O.AI), meaning that responsibility for the algorithm's effects was murky at best. In this regard, during class discussion, our class identified two more ways in which algorithms are black boxed: circuitous directions for finding algorithmic expressions and unclear pipelines for the effects of an algorithm.

The other students who were not successful in their algorithm searches found vague documentation about algorithms (not the actual expressions), but this documentation was not comprehensible to them because they had little to no training in formal computation. Students were not sure if this documentation was trustworthy because it was not clear who created the documentation. Several students, including the students who did find algorithmic expressions, reported talking or emailing with people who claimed to know the algorithm from personal experience but could not discuss the actual expressions. Our class thus determined there was yet another way that algorithms are black boxed: disinformation and misinformation online.

From my observations of the students' experiences, we were unsuccessful in identifying actual algorithms or their expressions. Students documented *perceptions* of algorithms quite effectively and did well in their projects, but our objects of inquiry remained unclear, obfuscated by corporate policies, noncompete clauses, technical illiteracies, competing imaginaries, and circular information pathways. For my own digital writing and rhetoric pedagogy, I need to document ways in which algorithms are obfuscated as well as find people who can better explain the technical aspects and methods of algorithms. Doing so could address some of the failures in this course. Some of the reasons for my students' failure included a need to examine algorithms functionally; I spent just one class period on functional algorithms, during which I introduced filtering algorithms such as Bubblesort and Quicksort. Students were not prepared to read advanced computer code or closely interpret actual algorithms. They also did not have the statistical background required to understand algorithms. Understanding algorithmic audiences necessitates technical literacies and methods.

When I teach this subject matter again, I will first introduce technical components of algorithms early, including the mathematical symbols and notations, while reviewing basic descriptive statistics. Second, for more advanced algorithmic concepts, I will seek out institutional collaborators who can help explain the more advanced statistics, such as probabilistic modeling and inference as well as linear algebra. It is my hope that discussing this course and presenting this assignment can help other faculty develop additional or revised assignments oriented towards algorithms in ethical

[6] These expressions were found at http://docs.h2o.ai/h2o/latest-stable/h2o-docs/data-science/coxph.html

$$h(t) = \lim_{\Delta t \downarrow 0} \frac{Pr[t \leq T < t + \Delta t | T \geq t]}{\Delta t}.$$

$$h_i(t) = \lambda(t) \exp(\mathbf{x}_i^T \beta)$$

Figs. 1 and 2. Two algorithmic expressions, known as Cox Proportional Hazards, for the way Progressive calculates risk in its "Snapshot" driver rewards program.

ways. We need to continue identifying the diverse ways algorithms are obfuscated, often through media depictions and public metaphors, so that students can more accurately discuss algorithms and their role in everyday life.

Conclusion

If we are to teach the ethics of writing for algorithms, then we need to teach the methods and literacies of those algorithms. As Ede and Lunsford (1984) remind us, there is a dual nature when composing for audiences, one that emphasizes ". . .the creative, dynamic duality of the process of reading and writing, whereby writers create readers and readers create writers" (p. 169). This duality is as true in our algorithm-saturated world as it was in the early 1980s. To be an effective writer in an age of ubiquitous technologies requires knowledge of algorithmic audiences. Basic statistical knowledge, computer coding skills, and empirical methods are necessary for understanding algorithms as audiences precisely because this kind of knowledge helps demystify how Figs. 1 and 2 function and originate. These figures do not emerge *ex nihilo* from software. People, often large groups of people, craft these complex expressions. But these expressions are treated frequently as golems—animated monstrosities that must be critiqued socially. If we are to develop ethical paradigms for writing for algorithms, then we need to see the intersection between the technical and social, the quantitative and qualitative, and the human and nonhuman.

Appendix 1. Unboxing an Algorithm (from fall 2018)

"One argument in the emerging literature on the 'politics of algorithms' is that algorithmic opacity is a largely intentional form of self-protection by corporations intent on maintaining their trade secrets and competitive advantage. Yet this is not just about one search engine competing with another to keep their 'secret sauce' under wraps. It is also the case that dominant platforms and applications, particularly those that use algorithms for ranking, recommending, trending, and filtering, attract those who want to 'game' them as part of strategies for securing attention from the general public." ~Jenna Burrell's "How the machine 'thinks': Understanding opacity in machine learning algorithms" (p.4)

". . .there is a pressing need to focus critical and empirical attention on algorithms and the work that they do in the world." ~Rob Kitchin's "Thinking critically about and researching algorithms" (p. 16)

Description

For our midterm, I'm asking you to investigate a company or organization that has an algorithm. Your mission is to (attempt to) "unbox" that organization's algorithm. "Unboxing" here means to identify the algorithm and its contexts as well as the way that algorithm fits into the organization's larger ecosystem, e.g., interface, data collection, data cleaning, outputs, company goals. You should draw on our readings from this semester to help inform what kinds of questions you could ask and what kinds of projects you should create (e.g., Beck, 2016; Burrell, 2016; Kitchin, 2017; Laquintano and Vee, 2017). Please use as evidence: emails, interviews, first-hand research (experience of the algorithm), and literature about algorithms. You may use surveys and code if you feel comfortable.

Purpose

There are two purposes to this assignment. First, you should gain experience about how difficult it is to conduct empirical research on algorithms. Companies frequently keep them hidden for proprietary reasons (and sometimes also claim that people wouldn't understand the algorithms anyway, what Burrell calls "technical illiteracy"). Second,

you should gain experience trying to solve a problem that is unlikely to be solved; in other words, I'm giving you a real-world problem that isn't the "game of pretend" that many classroom-based assignments tend towards. Instead of a final paper or test, I'm asking you to document the activities in which you engage. This documentation will help showcase this project for whatever professional endeavors you may have (and potential employers may like to see a non-classroom problem).

Tasks

- Articulating the following activities in an electronic format of your choosing
- Research about the algorithm (websites, academic articles, business articles)
- Hands-on research (you should include in #1 a script of questions asked of interviewees, drafts of emails sent, and other empirical work you conduct)
  - o Email & Interviews (phone, video conferencing, online chat)
  - o Surveys & Code (if comfortable)
- Make connections to course readings (thus far)
- Experience of unboxing black boxes (a narrative)
- Provisional argument about how your chosen algorithms works, the algorithm's strengths and weaknesses, and advice for novices about how to game the algorithm (a formal argument)
- Advice to and from your fellow classmates about their interview questions, general approaches, and algorithm analysis (in and outside of class throughout October)
- Appendix collating and documenting your activities
- References

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