Digital Rhetoric and Global Literacies:

Communication Modes and Digital Practices in the Networked World

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Chapter 3
Toward an Algorithmic Rhetoric

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ABSTRACT

Insofar as algorithms are digital problem-solving operations that follow a set of rules or processes to arrive at a result, they are constrained by the rules that determine their parameters for operating. While an algorithm can only operate according to its instructions, however, the potential rules that might govern an algorithm are inexhaustible. An algorithm's design thus makes rhetorical choices that privilege the importance of some information or desired outcomes over others. This chapter argues for a way of thinking about algorithmic rhetoric as macro-, meso-, and micro-rhetorical. Along these lines, it would be beneficial to think more about algorithms as digital rhetorics with terrific power to sway what counts as knowledge, truth, and material reality in the everyday lives of people across an astonishing range of global communities in the twenty-first century.

THE QUINTESSENTIAL DIGITAL RHETORIC

Suppose that, as I was typing this sentence, I'd misspelled the word "misspelled." It wouldn't much have mattered. No sooner would the wrong letters have materialized on my laptop's screen than they would have morphed at once into the accepted, proper spelling. This phenomenon is called auto-correction, and it's a common feature now of most all word processing software, from text messaging on a cell phone to plonking keys on a computer. Auto-correction—which fixes common spelling or grammatical errors when you type—and auto-completion—a related function that predicts the word or phrase you're typing so to spare you the Herculean labor of having to type the rest yourself—are now commonplace on virtually all digital interfaces, whether conducting a web search, writing an email, or editing source code. These technologies are powered by algorithms: those often hidden sets of instructions that intervene in organizing our world in astonishing ways.

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As algorithms go, Autocorrect and Autocomplete are relatively benign operations. They offer a modern convenience, albeit with some corresponding complications that might best be described as *communicative*. Under the sway of auto-completion, for instance, a text message might say, "Boil the pirates," when what it really means is, "Boil the potatoes." This can make for some funny exchanges, typically but not always harmless. In a widely reported incident in early 2012, the Hall County, Georgia police department placed West Hall schools on lockdown for two hours because someone had received a text message saying, "gunman be at west hall today." The sender had tried to type "gunna" as shorthand for "I'm going to," only for Autocorrect to change the word to one it found more appropriate (Gleick, 2012). While algorithms make possible innumerable minute operations that dapple our daily lives in ways we may not notice or regard as especially consequential, they nevertheless do often have stakes with real repercussions for what matters in how people come to understand, communicate, and negotiate the complex realities of our global communities today.

Indeed, in the twenty-first century, algorithms have become an outright pervasive force in our social world. From stoplights to stock tickers, sporting events to search engines, algorithms now are everywhere. Yet, scholars of communication, and of rhetoric in particular, have largely neglected to give the algorithm the attention it deserves. This neglect can certainly not be justified on the grounds that algorithms are neither communicative nor rhetorical. These digital problem-solving operations, which follow a set of rules and automated processes to arrive at a result, can reasonably be called the quintessential manifestation of digital rhetoric in the world today. How that might be so, and what to do about it, are the general inquiries guiding this chapter.

The closest precedent in the scholarly record for thinking about algorithms as rhetorical comes from Ian Bogost's (2007) work on what he calls the "procedural rhetoric" of video games. "Procedural rhetoric," Bogost says, "is the practice of persuading through processes in general and computational processes in particular" (p. 3). Procedurality, for Bogost, refers to the fundamental way software works: through the encoding of rules designed to execute processes that, when followed, represent the world in a particular way. He regards such procedurality as "the principle value of the computer, which creates meaning through the interaction of algorithms" (p. 4). Bogost is interested in the manifestations and consequences of procedural rhetoric in video games, and not in algorithms *per se*. But his idea of a procedural rhetoric—at base, the notion that the computational procedures powering video games are persuasive—nevertheless begins to indicate how something similar might be said at the level of algorithms themselves.

Algorithms can be seen as rhetorical insofar as they exert a persuasive influence upon what is held to be important or true in our social, cultural, political, and economic interactions. And certainly they do, as the example of something so commonplace as a web search reveals. It's algorithms, after all, that enable search engines to guide us through vast amounts of information toward what they hold to be relevant and significant, potentially limiting our intellectual purview based on how they do so. In a more complex sense, then, algorithms are best understood as rhetorical if we consider that their outcomes are not empirically inevitable but rather the product of a particular set of parameters designed strategically to lead toward a particular kind of result. In other words, algorithms implicitly make a rhetorical argument for what factors matter in order to persuade their "audience" that their resultant outcome is the best, truest, or most important. The simple observation that different search engines will often generate different results when given the same search terms illustrates the extent to which algorithms operate rhetorically in this way. Because the rules programmed into the proprietary algorithms that power respective

search engines are unique, each one privileges certain factors over others, making results vary between them and hence forwarding different cases for what matters most. Of course, search engines make just one example of this phenomenon. All algorithms perform rhetorically in more or less the same way.

Nevertheless, as programmatic operations reliant upon the automated execution of binary code, algorithms may seem to be grammars more than rhetorics. They may seem "objective" or coolly disinterested. And to a degree, they are. At least, once they're coded and operationalized they remain remarkably consistent. Algorithms take input data, pinball it through a decision-tree of filtering mechanisms, and turn it into an output result. Theoretically, as long as the filtering mechanisms remain the same, the exact same input will yield the identical output every time. But as the input changes, depending on how the code's rules value that input's nuances, the results likewise change, sometimes considerably. Thinking about algorithms as rhetorical thus means recognizing that they are neither infallible nor disinterested, but rather motivated by quite specific epistemic standards that can radically delimit what counts as valid or meaningful in various spheres of our intellectual, social, and material world.

The issues surrounding a rhetorical understanding of the algorithm are many. What is an algorithm's audience? How can bots persuade? Are programmers, quants, and hacks the new guardians of culture and power? What's the relationship between algorithms and all this talk about *information* and *information technology*? Is it algorithms that lead to so much narrowcasting on the web? Does that mean publics have now gone digital? Could algorithms be changing the way we think? What metaphors best help us understand how algorithms work? Is it reasonable to understand them as *arguments*? *Instructions*? Unknowable *black boxes*? How did automation become so ubiquitous in the first place? Have computer technologies finally pushed out the human? Do algorithms have agency? In fact, what does it even mean anymore to be technologically literate? Is *expertise* now obsolete? And what about our political economy? Surely the spread of automation influences that, too. *Right*?

Endeavoring to answer all these questions, at least most of them, is thankfully not the project of the pages ahead. But I do want to suggest that before we can make sense of the increasingly powerful role algorithms play in our daily lives, we will need to understand them better as the communicative and rhetorical operations that they are. Accordingly, my goal in this chapter is modest: I aim to advance the preliminary claim, introduced briefly above, that algorithms are rhetorical. By looking closer at how that's the case and what it might mean for our engagement with the changing world around us, we may then begin to develop appropriate methodologies and critical strategies to become more engaged members of a world where algorithms rule the roost. Indeed, as algorithms and automation become more pervasive forces in our world, understanding algorithmic rhetoric will correspondingly become a more urgent task both for scholars of communication and those invested in evolving conceptions of global literacy.

WHAT ARE ALGORITHMS?

It might help to begin with the basics. What are algorithms? Fortunately, one need not be a math prodigy or computer scientist to understand at least their fundamental concept. Consider an assortment of definitions. Algorithms have been called:

- "A procedure or set of rules used in calculation and problem-solving; a precisely defined set of mathematical or logical operations for the performance of a particular task" (Oxford English Dictionary online, n. d.)

- "A precise recipe that specifies the exact sequence of steps required to solve a problem" (MacCormick, 2011, p. 3)
- "An *effective procedure*, a way of getting something done in a finite number of discrete steps" (Berlinski, 2011, p. xvi)
- "Simply a set of step by step instructions, to be carried out quite mechanically, so as to achieve some desired result" (Chabert, 1999, p. 1)
- "A set of instructions to be carried out perfunctorily to achieve an ideal result. Information goes into a given algorithm, answers come out" (Steiner, 2012, p. 54).
- "A finite sequence of instructions" (Dyson, 2012, p. 247)

This isn't a quiz. All these definitions will do. But from this selection some recurrent concepts emerge. *Instructions, steps, results*: these are the fundamentals. Curiously, not one of the above definitions—and others could be marshaled that are pretty much the same—mention *digitization* or *automation* as integral to what an algorithm is or does.

In its widest sense, then, to speak of algorithms is to speak of any set of instructions, with specific steps, that lead to certain results. On this view, a recipe for chocolate chip cookies is as much an algorithm as the directions you give a friend to help her reach your house. Each offers instructions and steps—a procedure—that can be repeated indefinitely to achieve results with the same effectiveness. Along these lines, the arithmetical procedures you follow to multiply large numbers, carrying digits, marking the decimal, and so forth, are likewise algorithms in a basic sense. In fact, mathematical functions were the basis for algorithms in their original form.

The first known algorithm ever recorded came from the ancient Sumerians, living around 2500 BC near what is now modern Baghdad. It consists in a repeatable procedure for dividing grain equally between people, a procedure that would theoretically still work today. They etched this method on clay tablets that depict the algorithm in symbols, indicating its importance (Chaubert, 1999). The Greek mathematician Euclid of Alexandria also gives us algorithms that still work today despite being dated to roughly 300 BC. His book, *Elements*, for instance, was in part so successful because it leveraged an algorithm to find the greatest common divisor of two numbers to help establish a framework for the study of geometry that lasted the next twenty-three hundred years (Gazale, 1999).

But the word "algorithm" as we know it today derives neither from the Sumerians nor the Greeks, but rather from a Persian mathematician from the ninth century named Muhammad ibn Musa al-Khwarizmi. His book on "Calculation by Completion and Balancing," known in its original Middle Persian as *Al-Kitab al-Mukhtasar fi Hisab al-Jabr wa l-Muqabala*, is the first known book about algebra (a word that itself derives from *al-jabr wa* in the book's title). Scholars during the Middle Ages Latinized al-Khwarizmi's name and coined the phonetically similar word "algorism" to describe any automatic and systemic method of arithmetic calculation like those his work tried to develop (Chabert, 1999, p. 2).

Today, thanks to centuries of mathematical advancement, the reach of algorithmic automation has become far more extensive than progenitors of the earliest algorithms ever likely imagined. Fibonacci, Leibniz, Gauss, Pascal, Boole, Turing and others all played significant parts in developing our capacity to automate procedures of enormous complexity. But an investigation of the unique contribution that these and other brilliant minds have made to develop the complexity of algorithms, from the days of stone tablets to these days of microchips, is beyond the reach of this chapter.[1] My sights have rather been on the algorithm as we know it today, in order principally to show that we will not know it as well as we may suppose until we know it as rhetorical.

Accordingly, although a reasonable conceptual definition of algorithms might be framed so to include such phenomena as cookie recipes or driving directions, the algorithm as we know it now is digital, and magnitudes more complex than the example of such simple instructions would make it out to be. Automation has for decades now been so sophisticated that, to reach their desired result, algorithms themselves now execute the very instructions and rules that make them algorithms to begin with. In essence, algorithms don't just provide a *recipe* for cookies; they'll actually bake them. The bots behind Google's self-driving car, for instance, don't just offer a set of road directions to help a person drive someplace, the way a GPS device might. These bots navigate through traffic and do the actual driving on their own, street-legally by 2012 in Florida, California, and Nevada (Fountain, 2012). To give this and other examples more traction, it may help to conceptualize the rhetoric of algorithms metaphorically, as John Jones (2011) has tried to do by suggesting three metaphors for how algorithms work.

Algorithms, Jones says, can be seen as autonomous machines, Rube Goldberg devices, or Mechanical Turks. Regarding algorithms as *autonomous machines* means recognizing that once their rules are made, algorithms operate essentially on their own. Theoretically, these rules could be so complex that they enable an algorithm to process any new input, in effect setting the algorithm in autonomous motion, like a robot. Google's self-driving car makes an obvious example of this metaphorical understanding. But perhaps more frightening are military-industrial trends worldwide toward the armed but unmanned drones used for reconnaissance and weaponry in warfare. Powered by algorithms, drones now are programmed to make ethical decisions in absence of human intervention. They don't just carry out the commands of a human on the ground; they are able to enter potential combat situations and decide, on their own, if lethal engagement is or is not advised (Department of Defense, 2011). The algorithms that underwrite such autonomous machines as drones or self-driving cars are rhetorical operations because their instructions set the rules for how to make decisions in any conceivable (or at least plausible) circumstance. In effect, these rules work rhetorically to make certain factors matter in an autonomous machine's decisions and actions—for instance, by setting what satisfactory ratio of estimated enemy targets-to-civilian bystanders might suffice to justify lethal engagement. Though these machines act on their own, their action is guided by how they have been instructed—indeed, *persuaded*—to act.

Jones's second metaphor for understanding the algorithm is to see them as *Rube Goldberg* devices: kinds of digital contraptions that, let's say, send an egg down a chute, which knocks over a train of dominoes, which flicks a switch, which turns on a fan, which spins some cogs and so on until the egg's been poached, peeled, and peppered. In this metaphor, an algorithm is a series of causal steps to go from input A to output Z. The expression "garbage in, garbage out" comes to bear here insofar as these steps are only as good as the rules by which they're written. If you give the algorithm "garbage" data that the rules can't understand, it gives back "garbage" output that makes no sense. Internet radio providers that play songs for people on demand online work effectively in this way. They break songs into hundreds of component parts and, based on what it knows you like, recommends other songs with similar attributes. While these automated bots listen to the input users give them, they nevertheless act persuasively by processing input in a particular way: a way that unavoidably privileges certain assumptions about what qualities it thinks matter most in order to explain a user's tastes. Though their procedures may be linear and irrefragable, algorithms like this act rhetorically the moment they make these privileged qualities matter.

Finally, Jones suggests a third metaphor that would understand algorithms as *Mechanical Turks*. The Mechanical Turk was a chess-playing

machine designed by Wolfgang von Kempelen in the eighteenth century (Robert-Houdin, 1859). It appeared to be an automaton, capable of playing and defeating various opponents in chess, but in fact the machine was a hoax, with a person concealed inside and making all the moves. Conceptualizing algorithms as Mechanical Turks means recognizing their shortcomings and consequent complicity with humans who contribute in generating what they output. Amazon.com, for example, has a crowdsourcing program actually called Amazon Mechanical Turk, which they bill as "Artificial Artificial Intelligence" ("Amazon Mechanical," n. d.). Rather than create algorithms to perfect certain tasks, Amazon pays people to fulfill commissions ostensibly done through an automated process. Calling businesses to find the manager's email address, rewriting sentences, recommending similar movies—these and similar tasks are sometimes performed by humans alongside algorithms, when algorithms appear to be doing all the work.[2]

As all these conceptual apparatuses attest, I am interested here in a broad understanding of what algorithms are and do. While my repeated references to "algorithms" in these pages thus refers to the whole category of automated operations we know by that name, or at least to the basic conceptual apparatus behind algorithmic thinking (remember: *instructions, rules, results*), the specific algorithms of most importance to our changing world—and hence to my argument—are those most technologically of-the-moment: the ones whose hidden automated procedures end up quietly running our new media landscape. These algorithms are powerful, creative, unimaginably fast and, usually, the invisible but driving force behind the technologically mediated aspects of our current human condition.

An argument need not be advanced to show just how technologically mediated our lives and societies have become. By now, that much is self-evident. But if algorithms are the force behind so much, if not all, of today's ubiquitous computerized technology—if they're what make "apps" work; make communication possible; grant our access to unfathomably huge stores of information; regulate credit card purchases and trades on the stock market, and so on—then the importance of gaining at least a conceptual understanding of algorithms should also go without saying. Of course, it would be insufficient merely to claim that automated bots are influential these days and to leave it at that. Of crucial significance is not just *that* they matter. What matters is *what* they make matter, and *how* they do so.

MATTERING

Unfortunately, the technical intricacy and specialized programming language behind algorithms can intimidate unversed scholars that might, given the right technical know-how, be more inclined to consider their complex processes and influence. But we need not be scared away. Certainly, I am no expert in math or computer science; indeed, one of the points to my argument is that, notwithstanding the barriers to studying algorithms, there remain some nontrivial ways to approach the topic that merit elaborating. A rhetorical lens and vocabulary are crucial but perhaps not obvious ways to expose the shortcomings and repercussions inherent in what has been described by Steiner (2012) as the coming algorithmic takeover.

To call algorithms rhetorical is not to fixate on a minor aspect of their technology, nor to leverage an obscure definition of rhetoric, anomalous to common understanding of the term. Algorithms are rhetorical by nearly any notion of rhetoric available in the literature. There are plenty to choose from:

- "An ability, in each particular case, to see the available means of persuasion" (Aristotle, 2006, p. 37)
- "The use of language as a symbolic means of inducing cooperation in beings that by

nature respond to symbols" (Burke, 1997, p. 43)

- "The art of discovering warrantable beliefs and improving those beliefs in shared discourse" (Booth, 1974, p. xiii)
- "The symbolic inducement of social cooperation" (Hauser, 1999, p. 14)
- "An art of emphasis embodying an order of desire" (Weaver, 1985, p. 211)
- "A mode of altering reality, not by the direct application of energy to objects, but by the creation of discourse which changes reality through the mediation of thought and action" (Bitzer, 1968, p. 4)
- "The art, the fine and useful art, of making things matter" (Farrell, 2008, p. 470)

Despite their nuanced differences, from this sampling of notable definitions a sort of crowd-sourced sense of rhetoric's contours might be ascertained. Without adding yet another definition to the fray (no doubt in one of these meticulously phrased and conspicuously italicized passages so often found in academic writing), we can at least say broadly that rhetoric concerns the exertion of influence. It may persuade, it may aid identification, it may make things matter, and so on, but rhetoric pertains to various ways of influencing behavior and belief. For present purposes, I'm rather fond of Farrell's definition—that rhetoric is the art of making things matter—because it helps make the point about algorithms most clearly. At a technical level, algorithms function by making certain rules matter in certain ways, and the influence of these choices results in making other things matter in the world. In this sense, the rhetorical nature of algorithms is not just a descriptive quality of these automated procedures, variable from case to case. Algorithms are rhetorical at a structural level. Their rhetoricity is an inherent quality of what they are. No algorithms exist that are not also rhetorical.

These claims already may sound aggressive, but they can go still further. In particular, I argue that if algorithms are engaged in *the art of making things matter*, that is, if they are to be understood as rhetorical, then this requires conceptualizing algorithms along three tiers of rhetorical action. I call these the macro-, meso-, and micro-rhetorical tiers.[3] Each will receive its own attention in the pages ahead. Generally, though, the macro-rhetorical tier might tell us how algorithms themselves have come to gain such power and prevalence throughout the planet. The meso-rhetorical might consider to what extent algorithms play a part in making things matter in our world. And the micro-rhetorical might hope to scrutinize the particularities of those processes whereby algorithms go about doing so.

Only by attending to all three tiers of rhetorical action that surround and infuse the algorithm might we adequately respond to their unique and nonpareil significance in the world today. In short, these three algorithmic rhetorics call us toward three scales of *mattering*: algorithms matter immensely in our world; their operations generate results whose repercussions also matter; and they do so precisely through instructions and rules that have already privileged which factors matter in order to reach a result that matters. Juggling these three rhetorics, then, will ultimately mean investigating to what extent algorithms rhetorically re-circulate and sustain their own rhetorical prowess, perhaps as a concrete instantiation of what Niklas Luhmann (1992) has regarded as the autopoiesis of communicative systems.[4]

One thing is certain: if algorithms are the quintessential digital rhetoric, as I suggested in this chapter's opening section, we would do well to understand more about them as we face a future likely to be increasingly mediated by algorithmic automation. The obstacle of technological literacy need not impede us (though, of course, it can only help to know the algorithmic logic learned through

the study of higher calculus and computer science; and, in fact, I argue in this chapter's conclusion that achieving full algorithmic literacy in the coming years will eventually mean acquiring the technical chops to generate algorithms of one's own). For now the rhetorical lens of "making things matter" should suffice as enough of a frame to develop an approach to algorithmic rhetoric in greater depth.

The next section thus considers the three tiers of algorithmic rhetorics (macro, meso, and micro) by articulating them with the rhetorical tradition's basis in ancient Greece. Although what we now call "digital rhetorics" are drastically evolved notions of the rhetorical when compared to the models inherited from antiquity—which were based on a culture of orality that had no inkling of the automation or computer mediated communication that are now such commonplaces[5]—linking algorithmic rhetoric with some aspects of the classical period will show, surprisingly, that even these vanguard technologies are rhetorically less novel than they seem.

TOWARD AN ALGORITHMIC RHETORIC

Approaching algorithmic rhetoric through a model of three concentric tiers means taking a holistic approach toward algorithms and the rhetoricity that both surrounds and pervades them. We can get only so far by saying, "Look, algorithms are rhetorical." Surely that's an important truth. And recognizing as much is a meaningful step toward understanding the communicative implications of these automated processes. But there's critical work to be done if algorithms are the rhetorical procedures they appear to be. Doing such work means recognizing that all algorithms act rhetorically in unique ways. The specifics of these ways are partly a technical matter of the mathematical instructions and code by which they are programmed. But also in play are the axiological and praxeological positions that these programming choices operationalize. Moreover, and concurrently, there are also rhetorical aspects to the very ways algorithms in general have come to attain the influence that they have in our world. This discourse is larger than the details about how specific algorithms work; it concerns how people and institutions make the case for valuing algorithms *per se*. The holistic, three-tier model assumes that each type of these rhetorical activities is important, and that only by understanding them together will a comprehensive characterization of algorithmic rhetoric be possible.

Still, the three-tier model can be hard to envision, so allow me to diagram its conceptual scheme and to say more about why I have called the three tiers macro-, meso-, and micro-rhetorical instead of something else. To begin with, keep in mind that these three types of rhetoric exist concurrently. Each sustains the other. They surround and pervade the algorithm. It may help to know that the macro-rhetorical might have been called a *meta*-algorithmic rhetoric, because it is interested in those rhetorics that elevate the algorithm to such prominence at the level of society at large. Macro- or meta-algorithmic rhetoric, then, doesn't concern algorithms so much as the discourse *about* them. On the opposite scale, meanwhile, the micro-rhetorical might have been called *mesa*-algorithmic rhetoric inasmuch as "meta-" (meaning "above" or "beyond" in the Greek) has no common antonym, but "mesa-" (meaning "inside" or "within") makes a viable candidate.[6] In this sense, mesa-algorithmic rhetoric would be that rhetoric found within particular algorithms. The meta/mesa model, however, would have left no middle space to attend to algorithms categorically as rhetorical operations at the ontological level of structure. All things considered, the model of macro-, meso-, and micro-rhetorics offers what I believe to be the best way of recognizing that all algorithms are fundamentally rhetorical, though they each behave rhetorically in particular ways, and algorithms *per se* are leveraged as valued technologies on a large socio-cultural scale.

These three tiers of algorithmic rhetoric are meant, though, not only to demonstrate the rhetoricity of algorithms. The three tiers also aim to point rhetorical critics who might wish to think about digital automation as a subject of analysis toward important areas of critical attention. The three tiers then encompass quite different areas, fit for scholars of different dispositions and aptitudes. Not only do their scopes differ; so do their corresponding stakes[7] and critical focus (see Table 1). The macro-rhetorical requires attention to the circulation of discourse that contributes to elevating the status of algorithms as valuable technologies. The stakes here are epistemological, having to do with what count as valid knowledge claims. The meso-rhetorical requires attention to identifying the category of technological operations we call "algorithms" as rhetorically constituted. The stakes here are ontological, having to do with the algorithm's nature. And the micro-rhetorical requires critiquing the repercussions and implications of algorithmic rhetoric in its particular instantiations. These stakes are both praxeological and axiological, as they pertain to the practical ramifications and values algorithms exert on the world they mediate. Each will be elaborated below.

The Macro-Rhetorical

In Plato's *Gorgias*, Socrates famously demotes rhetoric to mere cookery. In doing so he disparages Gorgias and other Sophists who conceived of rhetoric as a reproducible art (*technê*) and taught its principles to citizens for whom a facility in oratory posed major advantages in the direct democracy of ancient Athens. The principle behind at least Gorgias's sophistic teaching maintained pragmatically that those who spoke more persuasively would be able to sway public opinion, and the opinion of the courts, about whatever topic they happened to carry forth. The rhetorical arts were those that cultivated these persuasive, oratorical skills. For Plato, though, rhetoric was a sham. Its tenets, if executed deftly in public speech, may well serve to sway opinion (*doxa*), but Truth was a far different matter. In Plato's view, only the method of dialectic—exemplified through his dialogues in what we now call the Socratic method—can lead to the one universal Truth or knowledge (*episteme*) with which all right-thinking people ought to be concerned. By denigrating rhetoric to mere cookery, then, Plato suggests that rhetoric merely follows a recipe; and, as methods go, it can lead only to belief but not to knowledge.

Many readers here will be well familiar with this common history about the first tensions between philosophy and rhetoric, which continue to trouble scholars today. Nevertheless, foregrounding a discussion of algorithmic rhetoric in so ancient a precedent is useful because it reminds us of the stakes in thinking about algorithms as rhetorical. What counts as a valid truth claim? If I can make you believe something, does that make it true? What does communication have to do with what we might claim to know? Are some methods better than others for arriving at the truth? What are they? And where does the algorithm fit in?

The macro-rhetorical tier of algorithmic rhetoric marinates in these questions. It can be understood as the realm of rhetorical discourse

Table 1.Scopes, foci and stakes

	Macro-Rhetorical	Meso-Rhetorical	Micro-Rhetorical
Scope	Society	Algorithms *per se*	Algorithm's Components
Critical Focus	Circulation	Identification	Critique
Stakes	Epistemological	Ontological	Axiological / Praxeological
Ancient Basis	*Episteme* / *Doxa*	*Technê*	The Five Canons

concerned with legitimating the algorithm as an epistemically viable method for intervention in our world. In a sense, then, the macro-rhetorical has nothing to do with how *algorithms* behave rhetorically. The "rhetorical" aspect here is rather found in discourse *about* algorithms and their value for innumerable ends. But such discourse is not just concerned with ends, with *what* algorithms can do or make, predict, discover, or learn. The macro-rhetorical realm is also one in which arguments are made for algorithms as the best, most efficient, appropriate / consistent / reliable / disinterested / precise / and accurate *means* for reaching the various ends to which their automation might be directed. It is the macro-rhetorical that calls us to think critically about how and why algorithms have become so pervasive and commonplace across societies and cultures. Of course, this *how* and *why* have inherently rhetorical explanations.

The work required to explore the macro-rhetorics circulating in public discourse and substantiating the algorithm's claim to supremacy as *the* technological meaning-maker of our time is beyond the scope of this chapter. It is possible, however, to adumbrate here what this work might look like and to situate it in relevant scholarly conversations. At issue is a matter of scale. Macro-rhetorics, as the name suggests, take place at the level of big-D Discourse: they permeate entire politico-economic systems (particularly neoliberalism as described by Harvey, 2007), cultural policies (in Miller and Yudice's conception, 2002), ideological state apparatuses (Althusser, 1971), and more generally, those scientific "paradigms" (Kuhn, 1996) whose epistemic regimes hold a powerful, if invisible influence in global thinking. In other words, the growing ubiquity of digital automation has not been arbitrary, or even the result of technological imperatives, but rather it has developed through the interaction of technology and culture—an argument Thomas Streeter (2010) makes about the Internet in general. Trying to isolate macro-rhetorics on this scale is a bit like catching smoke with a net. But the idea is to look for those laws, policies, conversations, socio-cultural "trends" and the like that reveal a disposition to entrust computerized automation with responsibilities of growing magnitude.

Consider the U.S. stock market. Our markets are no longer operated by a bustling floor of frenetic traders, waving their arms and papers, shouting out, "Buy! Buy! Buy!" (or even, more grimly, "Sell! Sell! Sell!"). Today, algorithms run the market—quietly, coolly, and faster than you can ever imagine. Sixty percent of all trades now "are executed by computers with little or no real-time oversight from humans" (Steiner, 2012, p. 17). In a global political economy that encourages free market competition, algorithms offer an indisputable advantage, making it possible to execute automated trades both faster than others and based upon the interpretation of enormous data stores. The rhetorical topoi that contributed to this takeover have tacitly mobilized such values as speed, consistency, repeatability, and the logical indubitability of quantification in order essentially to make a case that algorithms are a better, more competitively viable way to operate Wall Street today. The more investment bankers, hedge fund managers, and other powerful industry players utilize algorithmic automation to broker their financial decisions, the more others will have to do so to keep up. In this case, as in countless others, algorithms thus exhibit a built-in capacity to sustain and regenerate their own authority.

But, just as macro-rhetorics dye the very fabric of our institutions and the dominant worldviews that govern them from the top down, macro-rhetorics also pervade vernacular contexts from the bottom up. These vernacular rhetorics are powerful conversations, small-d discourses, circulating among ordinary people in everyday life to shape public opinion and inspire political action (Hauser, 1999). Even if "the algorithm" never comes up explicitly as a topic of conversation in vernacular publics (it remains a fairly specialized subject, after all), citizens with no institutional power still contribute to the macro-rhetorics that

position algorithmic technologies as desirable and nonpareil on a variety of measures. Our personal computers, cell phones, tablets, and all the services their applications provide, are made possible by algorithms on which we are increasingly made to depend. When algorithms now write AP news articles; when they help us book a plane ticket, help air traffic controllers map the flight patterns, and help pilots fly the planes; when they navigate our way through customer service calls ("For English press one, para en espanol oprima el numero dos"); when they deliver us customized banner ads on the Internet; when they recommend movies or books we're likely to enjoy; when they predict everything from the weather to *coup d'etats* to the outcome of sporting events—and when we let them do all these things and more, whether we relish their possibilities or are wholly oblivious to their existence, we contribute to the macro-rhetorical realm that sustains the algorithm's influence. Manuel Castells (2008) puts it in terms of technological globalization: "Not everything or everyone is globalized," he admits, "but the global networks that structure the planet affect everything and everyone" (p. 81). The macro-rhetorical invites us to think about how algorithms now "structure the planet" and come to "affect everything and everyone," whether we know it or not.

Attending to what I've called the macro-rhetorics surrounding the algorithm thus means engaging the sorts of concerns that bothered Plato so long ago. It means thinking about algorithms as a particular way of conceiving what counts as truth and what counts as mere manipulation of belief. It means thinking about why algorithms are, by and large, being granted the status of truth-makers as they are implemented, extolled, and faithfully trusted to mediate so many parts of global experience. Finally, attending to the macro-rhetorical tier of algorithmic rhetoric means articulating the convergence of our quotidian personal complicity in vaunting the algorithm's status with the deeper, structurally endemic ways algorithms are valued in the globalized world at large.

The Meso-Rhetorical

Rhetoric is a *technê*, a reproducible art. Certainly the same can be said of the algorithm. After all, today we think of algorithms as technologies (a word that derives from the Greek *technê*) largely because they operate through a strict set of learnable rules and instructions that can be repeated effectively for similar results.[8] Plato, in fact, often listed such algorithmic precursors as calculation or arithmetic among the examples of *technai* he provided in various dialogues (alongside cookery, medicine, carpentry, and so forth). Such skills, though, however reproducible, also require a deft hand, a keen eye, and a measure of genuine artistry. Isocrates, for instance, is said never to have given a speech because he had a weak voice and poor delivery, despite possessing an intellectual mastery of the rhetorical principles that make for effective oratory. As a result, in his school Isocrates would *teach* oratory but never *deliver* it. Instead he had his students practice by creating and performing speeches of their own. Gorgias, meanwhile, was a superior oratorical artist and delivered his own speeches, teaching his students by asking them to imitate his own speechmaking. The point here is that a *technê* requires both a repeatable set of precepts and a level of artistry to be well executed. Rhetoric qualifies. And algorithms do, too: as anyone who writes algorithms will tell you, there is without doubt a real artistry to doing so.

Of course, just because the algorithm and rhetoric alike meet enough criteria to make them *technai* does not mean we have proved that the algorithm is rhetorical. What's curious, and on the surface hints at paradox, is that the surefire way to recognize that algorithms operate rhetorically is to observe that they behave less like ancient notions of rhetorical oratory than like Plato's method of dialectic. In classical dialectic, a philosopher asks his interlocutor questions, receiving answers that then prompt subsequent related questions, and then more answers, and then more questions based on those answers again. In this way, the philosopher

channels his questions toward a particular desired result; only by asking the right questions at the right times can the dialectician whittle the input of an interlocutor's answers into the output of a conclusion that the interlocutor may not have been able to reach without the questions guiding the conversation to that end. In effect, the authors of algorithms operationalize this dialectic method into a set of procedures capable of being automated and repeated through digital processes. Thinking again of algorithms as decision-trees brings their similarity to this kind of dialectic into focus.

Imagine, for instance, an algorithm designed to do your laundry.[9] In a sense, it would proceed through a dialectic method by asking questions meant to provide it the input data from which to reach its conclusion. Are these clothes whites or colors? Colors. Is the fabric cotton? No. Is it polyester? No. Is it denim? Yes. How dirty is it? Very. By asking certain questions, the algorithm can draw toward a conclusion about how to do the laundry: using a particular water temperature, a certain spin cycle, an appropriate amount of detergent, and so on. Without asking these questions and receiving understandable answers, it would not be able to reach the conclusion it does and do your laundry without shrinking your favorite shirt or leaving all your whites turned pink.

The trick, of course, is that algorithms ask questions strategically because they bring a set of assumptions to bear on the input they receive in response. It's here where the rhetorical becomes more evident. Knowing that the laundry involves colorful clothes is meaningless data unless the algorithm also knows that colorful clothes typically require cold water. The questions algorithms ask thus look for answers it already knows how to translate into actionable conduct or knowledge. In this sense, they don't arrive at conclusions naively at all; some conclusions are already in place, such as what temperature the water ought to be for different kinds of clothes, or how much detergent is necessary for varying degrees of soil. Because, in this fashion, aspects of an algorithm's results are already predetermined, the procedures for arriving at them are biased toward directing the data in a particular way. This clever directing procedure is rhetorical. That it goes disguised in a technical process whose instructions and rules look a lot like a rhetorical handbook might have looked to Plato, while the rhetorical element in fact plays out in a process far more like dialectic, attests to Aristotle's perspicacity in his *Rhetoric* when he called rhetoric and dialectic counterparts (*antistrophos*).

Of course, the disguise of algorithms is part of what makes them so pervasive and quintessentially rhetorical, and it's what we're concerned to think about when considering the meso-rhetorical level of algorithmic rhetoric. Unlike the macro-rhetorical interest in how algorithms *per se* came rhetorically to acquire such preponderance and trust in society at large, the meso-rhetorical is interested in engendering awareness about how algorithms are themselves rhetorical. This awareness need not proceed to the level of specific rhetorical actions that algorithms sometimes perform, variably from case to case, in their code or programming language. That analysis remains for the micro-rhetorical tier. Meso-rhetorics are those that take place at the categorical level, making ontological claims about the fundamental rhetoricity of algorithms in general. The trope of the disguise is apposite here because algorithms are, more often than not, invisible to human perception. We may know they're working, but they function so quickly and commonly now that we scarcely take notice. To think about meso-rhetorics is, first and foremost, to take notice of algorithms in their context, and to recognize them as the rhetorical operations that they are. Carolyn R. Miller (2010) has argued that rhetoric is fundamentally an art of concealment; its tools must not be named, lest rhetoricity be exposed as artifice and rendered ineffective. I argue that, given the potentially dangerous power we have accorded algorithms today, naming their tools and exposing their concealment is a valuable act.

The Micro-Rhetorical

In *De Inventione*, Cicero's (2001) treatise on rhetoric from around 50 BC, he suggests that rhetoric operates through five canons that together constitute the integral parts of effective speech: invention (*inventio*), arrangement (*dispositio*), style (*elocutio*), memory (*memoria*), and delivery (*actio*). Some 150 years later Quintilian (1980) elaborated on the five canons in his *Institutio Oratoria*, establishing a basis for rhetorical education that lasted at least through medieval times. Although our interpretation of these canons has expanded considerably since then, and will continue to expand as our sense of what counts as rhetorical also grows more universal, the original five canons offer one way to think of the particular ways algorithms work rhetorically.

The micro-rhetorical tier of algorithmic rhetoric asks us to do more than consider how algorithms have come to be accorded such faith as knowledge-producers in our world, and it asks more still than to identify the structural rhetoricity of the algorithm as a *technê*. The micro-rhetorical tier involves the particular rhetorical maneuvers a given algorithm performs to make something matter. Given the technical complexity of the algorithms behind, say, our computer software—which, as best I could tell you, are designed roughly by compiling advanced computer language into executable code and then converting it into binary by an assembler—it may seem that a critical effort to uncover their inherent rhetorical tools would require literacy in higher levels of computer science than many humanists or social scientists might have, myself included. Such a technical approach is certainly valuable. And looking for evidence of the five canons embedded in a bot's operational language offers a method to do it. But approaching these automated processes through the five canons can also help to reveal in a more widely communicable sense just what axiological and praxeological stakes particular rhetorical choices raise for humans as we interact with and are influenced by algorithms in our daily lives.

From a critical standpoint, the difficulty lies in correlating the five canons as they pertain to speech with their commensurate techniques as associated with algorithmic automation. My sense is that not all algorithms we encounter will make manifest all five canons. Unfortunately, the inner-nuances of most algorithms are closely guarded from public scrutiny (often for proprietary reasons but also a host of others) and given this guardedness, critical analysis of what I'm calling algorithmic micro-rhetorics may seem impossible without access to the technical specificities that reveal an algorithm's priorities and procedures. It's not. Focusing on human interaction with computers or other automated processes, and doing so through the lens of the five canons, can still accomplish meaningful critical work. Doing so makes it possible to consider how an algorithm known to exist generally, if not in any technical specificity, can rhetorically advance claims with practical and value-laden implications as we communicate with mixed media technologies on a regular basis.

The algorithm that regulates how customer-submitted reviews are ranked on Amazon.com might make a useful example. Although Amazon holds this algorithm close to its chest, we know it exists because the site ranks its regular reviewers with different measures of status and because product reviews on the site (say, of a book) appear in a particular, non-arbitrary order. Drawing from the five canons, we could consider this ordering a kind of rhetorical *arrangement*. In terms of *style* or *delivery*, the way the reviews appear to visitors on Amazon's website represent another rhetorical element, algorithmic insofar as the design is a result of output determined through dynamic automation instead of a static template.[10] The canon of

memory in this example involves those inputs the algorithm needs to know and remember in order to arrive at a particular result such as ranking a reviewer in a particular way or placing one review higher than another. For instance, when visitors to the site are asked if a review was helpful, yes or no, their answer provides data for the algorithm to remember, tabulate, and consider among many other factors in ranking a reviewer with particular status. These status attributions say that some reviews and reviewers are better than others—the very act of which suggests that Amazon seeks to cultivate a particular way of reviewing its products. The canon of *invention* comes forth in the algorithm that relegates this status by virtue of its implicit argument for the superiority of certain ways of reviewing. Such factors as the length of a review, its documented helpfulness, the amount of products a reviewer has written about overall, and how long the reviewer has been reviewing on the site thus constitute some of the invented available means of persuasion. Accordingly, their scrutiny can reveal the motivations and logic behind this algorithm's rhetorical impact.

The micro-rhetorical tier of algorithmic rhetoric is one that investigates a specific algorithm's strategies, biases, and assumptions to reveal the values it promulgates and the practical effect these values have. As the case of Amazon's customer-review ranking algorithm indicates, something so innocent as an automated measure of status given to a book review submitted by an anonymous reader can in practice delineate what qualifies as the proper means of critical engagement, aesthetic taste, or discourse about cultural artifacts from literature to blenders. While this kind of analysis can valuably take place at the level of code (see, for instance, the edited collection *From A to <A>: Keywords of Markup*, 2010), it need not be resigned to that level alone. We all interact with algorithms more often than we probably realize, and paying more attention to the ways their intervention in our lives makes claims about what matters will help us to attend more critically to their potentially undesirable repercussions.

DIGITAL RHETORIC, DIGITAL LITERACY

In these pages I have tried both to show that algorithms are rhetorical, and to forward a model for understanding algorithmic rhetoric in a way that situates these automated procedures as key loci of critical attention in the years ahead. Although more scholars are beginning to recognize that digital rhetorics are powerful forces all around us (the chapters in this volume offering several extraordinary examples), attention to algorithms has been largely underdeveloped from a rhetorical standpoint. This may be because of gaps in literacy. While the cybernetic tradition in the study of communication theory as a field is thought to have emerged from a quite mathematical basis among engineers—the seminal work being Shannon and Weaver's *Mathematical Theory of Communication* (1948)—it has come a long way since then. Not all of us who study communication can claim to know much at all about math. The rhetorical tradition in particular has its basis in humanism, which has meant that, as James Aune (2001) puts it, "most rhetoricians became rhetoricians in part because of a math phobia" (p. 174). At the least we can say that the majority of rhetoricians tend not to have the math or computer science to approach the algorithm with confidence. I consider myself in this group. But as I have tried to show, the technological hurdles that might discourage us from studying the rhetoric of algorithmic intervention in our world are not so great as to justify the neglect of these important technologies.

In time, inevitably, algorithmic literacy will rise. It will have to. Cathy Davidson (2012) has gone so far as to argue that that in the twenty-first century's new model of global literacy, it will no longer suffice to learn the "three Rs" of reading, writing, and 'rithmetic, which have been imperative for one's social and cultural capital since the industrial age. Today, she says, in the digital age of Web 2.0, we need to add the 'rithm as a fourth indispensible "R" to our wherewithal in a globalized world where technology is becoming

a common language. Algorithmic thinking, Davidson says, "helps to end the false 'two cultures' binary of the arts, humanities and social sciences on the one side, and technology and science on the other." The digital humanities are just one area of inquiry that supports this trend to shatter tired divisions of epistemic cultures.

The digital humanities scholar Stephen Ramsay (2011), for example, advocates for algorithmic criticism mindful of rhetorical implications like those I have tried to draw out here. "To speak of algorithms," Ramsay says, "is usually to speak of unerring processes and irrefragable answers" (p. 18). They are, in other words, strictly constrained within the black box of their own parameters. Algorithms thus fit snugly within the epistemic culture of science that favors objective, quantifiable data. But the choices that determine the nature of an algorithm's constraints are unending. These choices are rhetorical, belonging within the qualitative doxastic culture of the humanities. Ramsay wants scholars to see algorithms "loosed from the strictures of the irrefragable and explore the possibilities of a science that can operate outside of the confines of the denotative" (p. 18). By helping to address the limitations of how knowledge is formed, a call for more algorithmic thinking might become a valuable heuristic beyond the algorithm, wherever different epistemic cultures collide.

It comes as no surprise that similar projects are becoming more commonplace. Nathan Johnson (2012) calls us to look "at infrastructure instead of through it," claiming that "investigating the rhetoric of classifications, standards, protocols, and algorithms is an important part of understanding modern rhetorics" (p. 2). Similarly, Lev Manovich (2002) has suggested that *representation* is a key term for new media. New media, he says, "represent/construct some features of physical reality at the expense of others, one worldview among many, one possible system of categories among numerous others" (p. 15-16). This biased way of representing reality sounds suspiciously similar to the one I have tried to problematize through the algorithm. Any automated procedure that makes things matter by making some things matter more than others is one we have to regard as rhetorical. And if so, the work then begins for those of us interested in critically exposing how different rhetorical practices delimit particular and invested versions of what matters in our world.

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KEY TERMS AND DEFINITIONS

Algorithm: A set of instructions with specific steps that lead to certain results; they are usually performed through automated mechanisms.

Macro-Rhetorics: The largest scale in the rhetorical analysis of algorithms, in which one examines the preponderance of algorithms across society. Macro-rhetorics are keyed toward circulation related to classical distinctions between *episteme* and *doxa*. Their stakes are epistemological.

Mesa-Rhetorics: The middle scale in the rhetorical analysis of algorithms, in which one identifies the presence of an algorithm in different parts of lived experience and engenders awareness about its rhetorical nature. Mesa-rhetorics are keyed toward identification based in the classical concept of *technê*. Their stakes are ontological.

Micro-Rhetorics: The smallest scale in the rhetorical analysis of algorithms, in which one scrutinizes the particularities of those automated processes whereby algorithms behave rhetorically. Micro-rhetorics are keyed toward critique grounded in the five canons of the classical rhetorical tradition. Their stakes are axiological and praxeological.

Procedurality: A term used by Ian Bogost to denote the fundamental way software works by encoding rules designed to execute processes that, when followed, represent the world in a particular way.

ENDNOTES

1 I have relied heavily for my historical understanding on two books: *A History of Algorithms* (Chaubert, 1999) and *The Advent of the Algorithm* (Berlinski, 2000). Curious readers might also consult these texts for a better and more technically rich account of the rise of algorithms than I am able to provide.

2 The example of drones works here, too, inasmuch as they are often operated or monitored remotely by invisible humans.

3 Despite their apparent symmetry with Jones's three metaphors for understanding how algorithms work, the three tiers share no direct correspondence with those conceptual apparatuses. There are innumerable varieties of algorithms and metaphorical

ways to understand them. The three tiers of algorithmic rhetoric offer a way to understand the rhetoricity of algorithms, and not just algorithms themselves, though the two are inherently intertwined.

4 Luhmann is a systems theorist who leverages the concept of autopoiesis as a way to describe a closed system that creates and (re) produces itself. In his vision, communication itself is an autopoietic system in that it's closed from anything but itself, even the human. In other words, for Luhmann, humans don't communicate; "only communication can communicate" (1992, p.251). Algorithms might be seen as autopoietic to the extent they (re)produce their own authority through automated procedures operationally absent of human involvement.

5 Interested readers should see Walter Ong's excellent book, *Orality and Literacy* (2002), in which he traces the shift from oral to print to electronic cultures with an eye toward the rhetorical ramifications of each.

6 For more on this terminology, see Joe Cheal (2011), who has investigated the opposite of "meta" and proposed "mesa" as the best solution.

7 Note that these "stakes" have been mapped along the four metatheoretical standpoints described by Anderson (1996; Anderson & Baym, 2004).

8 For more on *technê*, see Janet Atwill's extended treatment of the term in *Rhetoric Reclaimed: Aristotle and the Liberal Arts Tradition* (1998).

9 For this example I am indebted to Steiner (2012), who uses a hypothetical laundry algorithm to explain his decision tree model, though I extend it for different purposes.

10 For more on the canon of *delivery* as technological discourse, see McCorkle, 2012.