COMPUTER ALGORITHMS AS PERSUASIVE AGENTS:
THE RHETORICITY OF ALGORITHMIC SURVEILLANCE WITHIN THE BUILT
ECOLOGICAL NETWORK

Estee N. Beck

A Dissertation

Submitted to the Graduate College of Bowling Green
State University in partial fulfillment of
the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2015

Committee:
Kristine Blair, Advisor
Patrick Pauken,
Graduate Faculty Representative
Sue Carter Wood
Lee Nickoson
ABSTRACT

Kristine Blair, Advisor

Each time our students and colleagues participate online, they face invisible tracking technologies that harvest metadata for web customization, targeted advertising, and even state surveillance activities. This practice may be of concern for computers and writing and digital humanities specialists, who examine the ideological forces in computer-mediated writing spaces to address power inequality, as well as the role ideology plays in shaping human consciousness. However, the materiality of technology—the non-human objects that surrounds us—is of concern to those within rhetoric and composition as well. This project shifts attention to the materiality of non-human objects, specifically computer algorithms and computer code. I argue that these technologies are powerful non-human objects that have rhetorical agency and persuasive abilities, and as a result shape the everyday practices and behaviors of writers/composers on the web as well as other non-human objects. Through rhetorical inquiry, I examine literature from rhetoric and composition, surveillance studies, media and software studies, sociology, anthropology, and philosophy. I offer a “built ecological network” theory that is the manufactured and natural rhetorical rhizomatic network full of spatial, material, social, linguistic, and dynamic energy layers that enter into reflexive and reciprocal relations to support my claim that computer algorithms have agency and persuasive abilities. I also address how computer code figures in digital surveillance environments on the web, as well as how to refigure digital rhetoric and literate practices through the built ecological network. My results help shift attention to the role rhetoric plays in materiality, and further implicates rhetoric as both under the realm of human and material activity.
For the path taken.
ACKNOWLEDGMENTS

This project was supported by both a non-service fellowship and graduate student assistantship within the Department of English at Bowling Green State University. I gratefully acknowledge the financial and administrative support offered by the Rhetoric & Writing Program, the Department of English, Graduate College, and university.

My role as a graduate assistant and fellow allowed me to thrive during the period of researching and writing this project. More importantly, my dissertation advisor, Dr. Kristine Blair, generously provided time, support, and advice during this process. Kris helped me to hone my argument and writing voice through chapter drafts with her extraordinary ability to provide timely and supportive direction, feedback, and insight. I am deeply indebted to Kris for mentorship during my graduate studies and through this project. Her examples of kindness, feminist ethic of care, and strong work ethic are ones that I will strive to model in my career. Committee members Dr. Sue Carter Wood and Dr. Lee Nickoson were generous with their time and feedback on this project as well. Sue helped me think through intersections of algorithmic surveillance with historical discussions of rhetoric, and Lee (as always) offered engaged commentary to help encourage me throughout the writing of this work. Outside committee member, Dr. Patrick Pauken additionally offered commentary that helped shape the direction of this project.

My peer colleagues in the Rhetoric & Writing program supported me during the research and writing process, and I am especially indebted to the following people: Laural Adams, Megan Adams, Nicholaus Baca, Matthew Bridgewater, Shirley Faulkner-Springfield, Mariana Grohowski, Aimee Taylor, and Heather Trahan—all of whom provided either (or both) sustained
collegiality, friendship or a pivotal relation which led to productive changes of my beliefs or values professionally and personally.

I am grateful for my Grammish, Betty Thompson, for her unconditional love, support, saucy and sage advice, and financial and emotional support over my lifetime. I am also grateful for the support and encouragement from John Thompson, Renee and Eddie Miller, Tonya Thompson, Janice and Phil Mc Nelis, Jean and Bill Spoeri, and Kay Alderson—all of whom have, at some point or another, encouraged me to continue with my education, and I thank you for such support.

To my spiritual and life friend, Revered Dr. Trevor Gates-Crandall, I have been (and remain so) deeply indebted to your practical wisdom and constant encouragement to continue with my studies, especially during times while I lived in Virginia and Illinois. Your example and support has helped sustain my intellectual pursuits over the years.

* 

Manuscript notation: The BGSU Graduate College (“Graduate College”) “Thesis and Dissertation Handbook” (“Handbook”) (n.d.) recommends students to select a style manual for the style of the thesis or dissertation. Additionally, the Graduate College Handbook explicitly states:

The thesis or dissertation must conform strictly to the specifications of this Handbook and the style manual selected. In instances where the Handbook and the style manual differ, follow the Handbook regarding matters of form (required preliminary pages, margins, etc.) and the style manual regarding matters of style (grammar, table formatting, bibliography/notes, etc.) (n.d., p. 5)
As this dissertation emerges from a set of political, social, and cultural practices and historical decisions made within the sub-discipline of Computers & Writing, this dissertation conforms to matters of style from two style manuals. First, for all matters of grammar, table formatting, and notes this dissertation follows APA (American Psychological Association) guidelines. Second, for matters of bibliographic reference, this dissertation follows the *Computers & Composition: An International Journal Style Manual* ("C&C Style Manual"). Since APA guidelines represent author’s first names as first initials, the C&C Style Manual espouses a feminist positionality and practice of representing the full author’s first name in bibliographic entries to illustrate the intellectual contributions women, men, trans-identified, and gender-neutral people make in research. This dissertation honors this political stance in the bibliographic entries.
# TABLE OF CONTENTS

## CHAPTER ONE: CONTEMPORARY HISTORIES OF TECHNOLOGICAL RHETORICS, ALGORITHMS, AND SURVEILLANCE

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhetoric &amp; Writing</td>
<td>Computers &amp; Writing</td>
</tr>
<tr>
<td>Tracking Technologies</td>
<td>11</td>
</tr>
<tr>
<td>Surveillance Culture in the Internet of Things</td>
<td>14</td>
</tr>
<tr>
<td>Edward Snowden and the NSA</td>
<td>16</td>
</tr>
<tr>
<td>Algorithmic Ideology</td>
<td>18</td>
</tr>
<tr>
<td>Algorithmic processes</td>
<td>20</td>
</tr>
<tr>
<td>Algorithmic inclusion/exclusion</td>
<td>22</td>
</tr>
<tr>
<td>Algorithmic ideology</td>
<td>23</td>
</tr>
<tr>
<td>Surveillance Studies</td>
<td>25</td>
</tr>
<tr>
<td>A Note on Rhetorical Theory and Inquiry</td>
<td>30</td>
</tr>
</tbody>
</table>

## CHAPTER TWO: THE BUILT ECOLOGICAL NETWORK: WHAT MATERIALITY AND ECOLOGY MEANS FOR RHETORIC AND WRITING STUDIES

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theories Circulating within Writing Studies</td>
<td>36</td>
</tr>
<tr>
<td>Built Ecological Network</td>
<td>41</td>
</tr>
<tr>
<td>Shaping people’s morals with the City Beautiful movement</td>
<td>41</td>
</tr>
<tr>
<td>A Primer to Network(s) Theory: An Object-Oriented Strand</td>
<td>44</td>
</tr>
</tbody>
</table>
CHAPTER THREE: PERSUASIVE COMPUTER ALGORITHMS: A CASE STUDY OF GOOGLE’S PAGERANK ALGORITHM AND THE DYNAMIC WEIGHTED ALGORITHM

Persuasive Computer Algorithms ................................................................. 66

The Broader Picture of Algorithms and Data Analytics ................................ 71

Working With and Without Access to Proprietary Algorithms ................... 74

Background on Google PageRank and the Dynamic Weight Algorithm ........ 76

Application of the Built Ecological Network ................................................ 79

Method .............................................................................................................. 80

Research orientation ....................................................................................... 80

Google PageRank and the Dynamic Weighted Algorithm Study ................. 80

Data collection ............................................................................................... 81

Data coding and analysis ............................................................................. 81

Findings ........................................................................................................... 83

Composition and operation ........................................................................... 84

Network ........................................................................................................... 86
CHAPTER FOUR: SUSTAINING CRITICAL LITERACY IN AN AGE OF ALGORITHMS

Critical Literacy Background .................................................................................................................. 104
New Ways of Thinking: Algorithms and Critical Literacy ..................................................................... 109
Algorithmic Agency .................................................................................................................................. 111
Critical Literacy and Algorithms .......................................................................................................... 116
Information Literacy .................................................................................................................................. 120
Writing Center, Collaborative, and Technology Pedagogies .................................................................... 122
Conclusion .................................................................................................................................................. 132

CHAPTER FIVE: PATHWAYS TO PRACTICE: RESEARCH, TEACHING, COMMUNITY BUILDING

.......................................................................................................................................................... 134
LIST OF TABLES

Table 1. Indivdualized instruction. ................................................................. 126
Table 2. Collaborative learning. .................................................................. 127
Table 3. Technology. .................................................................................... 128
Table 4. Built ecological network. ................................................................. 130
“. . . But you’re now the ambassador. You’re the face of it. The benign, friendly face of it all. And the closing of the Circle—it’s what you and your friend Francis made possible. Your mandatory Circle account idea, and his chip. TruYouth? It’s sick, Mae. Don’t you see? All the kids get a chip embedded in them, for safety, when they’re infants. And yes, it’ll save lives. But then, what, you think they suddenly remove them when they’re eighteen? No. In the interest of education and safety, everything they’ve done will be recorded, tracked, logged, analyzed—it’s permanent. Then, when they’re old enough to vote, to participate, their membership is mandatory. That’s where the Circle closes. Everyone will be tracked, cradle to grave, with no possibility of escape” –Dave Eggers, *The Circle*

In 1987, a U.S. broadcasting company, ABC, aired a new television show: *Max Headroom*. Set in a dystopic futuristic city, the show’s protagonist, television reporter Edison Carter, chased stories to expose the oppressive regime of control by networked television. In this fictionalization, television networks controlled the functions of their products, including surveillance technology that allowed networks to monitor people’s movements through their television sets. In the first episode, Carter discovers his employer, television company, Network 23, created a type of subliminal advertising called, “blipverts,” which had lethal side effects on certain viewers. Network 23 designed blipverts to solve the problem of people changing channels while advertising appeared between programming by compressing the then-traditional 30-
seconds of advertising into a massive 3-second high-dose advertising “blip.” However, the human brain of inactive television watchers would stimulate the electrical charges in the human body’s nerve endings, which would cause some people to spontaneously combust. After learning about blipverts, Carter rushed from his workplace and sustained an injury during a motorcycle accident. Network 23 child genius, Bryce Lynch, fearing public outrage over Carter’s death, uploads a copy of Carter’s mind into a computer to assuage public concerns. This upload gives birth to the character, Max Headroom (named so because the last image Carter saw before his death were the words ‘Max Headroom’ indicating the height a vehicle could pass through safely in the parking lot), who solely exists in the networked cables of televisions and continues to expose the unethical practices of Network 23.

The television show, much ahead of its time, drew attention to a key problem in networked spaces: surveillance in digital spaces acts as a method of social control, and influences how people respond (voluntary and involuntary) to digital stimuli. In attempting to solve the problem of mass-surveillance, Max Headroom exposes corruption by hacking televisions signals to broadcast his message to the people. He ultimately recommends that people should destroy televisions to disrupt Network 23’s power. While Headroom’s character acts as the revolutionary protagonist, calling attention to the injustice in the political and economic economy, the problem with this narrative trope rests with the appointment of one crusader activist to call attention to the larger networked power structures of the dystopic political landscape. In contemporary real life, it takes more than just one person to stand up to oppressive regimes of the surveillance state.

This project takes up the concern of surveillance by exploring dataveillance—surveillance through metadata in computer networks—as a domain affecting the psycho-social
conditions of citizenry through the agency and persuasion of computer algorithms—the mathematical equations and procedures computers use in programs. Instead of setting up one crusading work calling attention to the surveillance state of Internet and mobile app technologies of our time, this project calls for educators to infuse discussions of surveillance, privacy, and algorithms in curricula to inform students about the surveillance practices of Internet companies, and what students and teachers can do to make productive changes that protect the legal and ethical rights of people. In grounding such a position, I position dataveillance as “algorithmic surveillance,” a method of monitoring people by computers as rhetorical events bounded and unbounded by the features and definitions of rhetoric. Simply, I argue algorithms have agency and are persuasive non-human entities. In order to make this connection, I look to Christian Lundberg (2013) who described rhetoricity as a dynamic act capturing “the excessive qualities of discourse that exceed the specific applications of critical artifice” (p. 250) set in juxtaposition (not necessarily a binary) to rhetoric’s nature and character as a knack or pedagogical or social/interpretive technological function. Lundberg argued that the condition or features of rhetoric obstruct the overall interplay of discourse in a given context. I would also add traditional definitions of rhetoric, borrowed from Aristotle and passed through in literature, hinder consideration of materiality, spatiality, and locative elements indicative to the totality of the rhetorical context. In this project, I argue for embracing rhetoricity as the integration of all forms and conditions that permit communicative exchange. Such a position allows discussion of computer algorithms and algorithmic surveillance within the domain of rhetoric as agents of control with abilities and conditions to persuade other algorithms and people.

In discussing the rhetoricity of computer algorithms, the question remains, how does such discussion connect with writing studies, especially the work teachers perform in undergraduate
and graduate classrooms? In his reflective essay on technologies effects upon writing, James Porter (2002) addressed the relationship between writing technologies and writing itself and wrote, “Writing is not only the words on the page, but it also concerns mechanism for production . . . for distribution or delivery, invention, exploration, research, methodology . . . audience, persuasiveness, and impact” (p. 384). Porter introduced the meshing of writing with embedded technologies by addressing Dennis Baron’s argument in “Pencils to Pixels” (1999), wherein Baron presented the computer as just another functional writing technology in a historical line of writing tech. Porter casts an alternative perspective to Baron, claiming that writing technologies are dependent up their “social and ideological context” not just in the “instrumental way” Baron described in his essay (p. 384). Porter’s contribution helps this project position computer algorithms as underlying “production mechanisms” central to the writing process when people compose using computer technologies, since computer programs are made up of algorithmic processes. Shifting attention to the principal architecture and apparatuses of electronic writing spaces also draws attention to the ideologies that form algorithmic procedures, since people write programs and algorithms, and their affordances and constraints within information exchange online.

Much like how Max Headroom calls attention to the power structures of networked television to the background characters in Max Headroom, who mindlessly watch television while the social fabric of the city erodes around them, attending to the complex and dynamic forces within screen life must address apathetic stances about surveillance and privacy online. The malaise about surveillance online comes on the heels of the culture of sharing information about daily activities online through social media. With more people sharing photos, videos, thoughts, and images, the idea of companies tracking people online is of little concern to some
populations. Thus, such a stance toward surveillance online requires vigilance. However, as producers and consumers (or prosumers) of technology, people may be aware of such forces, but sometimes forget to attend to the roles such forces play in their everyday lives. One reason for such a position comes from Jay David Bolter and Richard Grusin’s notion of immediacy of the screen (1999). The interactive content presented through certain devices, like computers, mobile phones, and televisions are so vibrant and rich that the delivery medium recedes in people’s minds. For example, when watching an engaging film, whether at home or in the theater, people may often allow their attention of their bodies and minds fade in favor of immersion into the world of the film. Digital technologies seduce people to cast aside critical analyses of the interfaces at times. There is real political and social danger in digital mediums eclipsing responsiveness to what lies beneath the surfaces of the interfaces. Part of this risk includes how people’s worldviews shape the design and programming of digital tools—and, even how surveillance technologies monitor and record movements and behaviors of people and machines. As people move within and around these spaces, they must acknowledge their parts in sustaining a technological surveillance society through their interactions. They must continue attending to developing critical apparatuses for understanding how these digital spaces influence people as much as they influence them as well.

In the history of computers and writing—an academic discipline dedicated to the examination of computer technology and its effects on writing—teachers and researchers have, for over four decades, turned attention to how digital tools afford and constrain composition processes. Attending to the opaque structures of digital life have allowed for rich conversations on literacy, language, agency, identity, gender, race, values, code, pedagogy, community practices, multimodality, and so on. The discussions have yielded thoughtful commentaries and
critiques on the relations between humans and machines, and the desire to commune with, understand better or even master technologies. Computers and writing specialists position themselves among a vast field of colleagues working with, analyzing, and producing digital tools for research and classroom use. These conversations stem from the co-editors Cynthia Selfe and Kathleen Kiefer’s early call (1983) in the then newsletter, later turned journal, *Computers and Composition*, to focus on the relations between human and machine. This call is where this project emerges.

My motivation in writing this project comes from a desire to sustain the conversations of literacy and technology from four decades worth of scholarship by furthering discussions about the underlying architecture of the computer interface. I specifically examine the algorithms companies like Google and Facebook use to surveil end user habits and behaviors online to learn how algorithms and surveillance shape people’s activities, habits, and behaviors.

It is necessary for educators to study algorithms because these complex equations actively shape virtual environments and lifestyles. For example, in one prominent study, a Facebook data scientist, Adam Kramer, joined with communication and information sciences professor, Jeffrey Hancock, and graduate student Jamie Guillory (2014) from Cornell University to study how alterations in Facebook’s newsfeed algorithm could produce emotional contagion or the transference of positive or negative emotions onto data, people, and objects without conscious awareness by the end users. After the academic journal, PNAS published the authors’ findings, the news media picked up on the story (for example, cf. Goel, 2014; Hill, 2014; Robinson, 2014; Voosen, 2014) and a media fracas ensued over the ethics of altering 689,003 Facebook users’ newsfeeds for emotional contagion. Briefly put, the media, bloggers, and end users expressed concern (and support) over Facebook’s study because Facebook failed to inform
end users of the psychological experiment and non-consensually used information for the research. And, yet, while the media predominately focused on the ethics of the research, I believe attention should also shift to the algorithms Facebook used to present information to users.

For example, EdgeRank, Facebook’s newsfeed algorithm\(^1\), personalizes newsfeed content based on how much friends interact with each other or how much time users spend on the site, and what content is “liked.” In the ecosystem of Facebook, algorithms adjust to users’ habits and activities, and then deliver content the algorithms “think” the users want to experience and interact with in their screens. While some people may claim that having personalized content is appealing because of time management or efficiency, the algorithms deliberately control the content users engage with in their Facebook space. This type of engineering presents concerns when all of the end users of Facebook do not understand the criteria Facebook uses for the algorithms, and more importantly how peoples’ content, behaviors, beliefs, and attitudes are categorized—thus potentially opening up concerns with information discrimination.

The complexity of algorithmic culture, in this particular example, highlights a rhetoricity between technology as tool and technology as producer. If the nature and characteristic of rhetoric continues in definition as the study and use of all the available means of communication of human activity, then the emotional contagion study does not fit under rhetoric’s features because algorithms, in this case, arranged, stored, and delivered content that effected people’s emotions offline. In grappling with the problem of rhetoric, it is important to keep in mind that even though our relationships with information technologies affect how people invent, arrange, design, store, and deliver communication, in our more modern technologically driven time, agency and persuasion may come from non-human entities, like computer algorithms. In a more

\(^1\) Facebook no longer uses EdgeRank for their newsfeed algorithm.
broad scope, historically our ways of thinking about technology in the West have been influenced by Cartesian thought with tension between the body and the machine or the perception that technologies are in service of human agency and use. In many ways, technologies such as the writing instrument, printing press, and video recording devices are inert until some force is applied to the object, usually human intervention. However, computer algorithms are programmed to read and write data without human intervention, and some algorithms, like Facebook’s EdgeRank, provide information to users incorporating ideological and commercial data to appeal to logos, pathos, and ethos of the users. In short, algorithms have the power to divide, sort, classify, organize, filter, and alter the way people receive information online without being in a subservient relation to people. Algorithms can have such a profound influence, as the emotional contagion study demonstrates, that they shift people’s attentions, activities, thoughts, emotions, and behaviors—all elements under the purview of rhetoric’s focus. Ultimately, for rhetoricians and writing teachers, the information technologies we use in our classrooms and research require critical examination into how people are shaped by algorithms.

This avenue of investigation is directly under the purview of rhetoric and writing studies because this field has a history of civic, political, and social engagement. Compositionists and rhetoricians attribute writing and rhetoric as a participatory activity in various discourse communities and practices. Since the 1950s and 1960s in U.S. composition instruction, as James Berlin (1987) has reminded us, educators included national discourse into their classrooms—thereby allowing student writers engagement in civic and political discourse. The field has a rich history of examining ways people shape and are shaped by various discourses, and this project moves in current with such participatory activity through positioning the spaces, places, and machine language of computer algorithms as persuasive forces shaping the techno-political,
social, and cultural landscapes of people’s bodies and minds. Thus, this project imagines the reciprocal relations between humans and algorithms through both participatory activity and rhetoricity of the networked relations of what I call the “built ecological network,” or a manufactured and natural rhetorical rhizomatic network full of spatial, temporal, material, social, and lingual layers of energy that enter into reflexive and reciprocal relations. This ecological network is not a new concept, but rather builds upon Margaret Syverson’s work on ecology theory (1999) by extending the conversation in the material realm of technology, an area she noted as underexplored. This project also positions persuasive computer algorithms within postmodern theory, object-oriented ontology philosophies, post-process composition, and critical literacies by acknowledging the embedded ideologies in computer algorithms, and how those cultural, political, and social beliefs shape people’s interactions with content on their screens. Persuasive computer algorithms articulates a vision of the materiality of machines, the rhetorical agency of algorithms to persuade machines and people into action, and describes the roles ideologies play in the social landscapes of education.

This project draws upon the converging web of objects and humans in natural and virtual environments when objects along with social, cultural, and ideological forces intersect in material, spatial, lingual, social, and temporal dimensions. I do so to move in a direction of a more robust consideration of “rhetoric,” as something other than human. Specifically, I place computer algorithms as lingual, spatial, and temporal equations that are increasingly sophisticated in process and practice, and illustrate abilities to influence the flow of information in online networks to change human behaviors, thoughts, and actions. My argument in this project comes from examining the rich textual and algorithmic procedures existing in contemporary times and realizing the sheer power algorithms have in ordering and organizing
data from databases for various human and machine needs. This inquiry pushes rhetoricians and writing instructors to consider the implications for persuasive computer algorithms, not only on human writing practices, but on also imagining a discipline engaged in pursuing all available means of persuasion, even when those means might be embedded in circuit boards of computer technologies. With this said, the audience for this project is not just computers and writing specialists or even rhetoric and writing researchers, but all researchers and educators who engage in technologies of composing from communications, media studies, digital humanities, and the sciences. While much of the content in this project aligns with disciplinary conversations in computers and writing, and rhetoric and composition, the theoretical approaches and implications, at least in my mind, cross disciplinary boundaries, thus resulting in new understandings, definitions, theories, and practices.

What is under consideration before us is twofold: How are computer algorithms persuasive, and are all computer algorithms persuasive? There are varieties of computer algorithms in machine settings that run sub-routine processes in various computer applications. From various sort lists—bin, merge, bubble, shell, quick—to proprietary algorithms like Google PageRank and Facebook EdgeRank—all algorithms function as a set of instructions or commands for computer execution; the computer programmer writes the program, and the computer follows the parameters given. In a conventional sense, one may view algorithms as nothing more than commands to a machine to perform discreet functions, with no deviations or machine consciousness to decide upon how the machine will execute the command. Taken rhetorically, another may consider the algorithm as action, i.e., a set of steps, written in computer language, producing an outcome that has the potentiality to shape future discourse and behaviors. The interplay between the two views provides a fascinating perspective on the
conventions of knowledge in the disciplines of computer science and even media studies as well as rhetoric and writing studies. In one sense, computer programmers use disciplinary conventions and knowledge to codify algorithmic procedures as lock-step commands or as computational discourse practices. Rhetorically, however, algorithms represent a reasoning process for argumentation and persuasion. Embedded within the structure of the algorithm are the lingual layers of mathematics or language that circulate in discourse conventions, which have symbolic meaning. These symbols work to convey information to the audience thereby completing a persuasive action. Exploring how this works in depth is part of the conversation in chapter three.

Chapter one, “Contemporary Histories of Technological Rhetorics, Algorithms, and Surveillance” charts the history of digital rhetoric and surveillance scholarship in computers & writing and rhetoric & composition moving into an in-depth discussion of algorithms, and their roles in computer technologies many educators use in writing classrooms today. This chapter considers how algorithms function as a matter of regulation of code—drawing on Lawrence Lessig’s work—to shape digital surveillance environments in social media spaces and other online websites and app technologies.

“The Built Ecological Network: What Materiality and Ecology Means for Rhetoric and Writing Studies,” moves from historical discussions into theoretical grounding using new materialist and ecological theories to position computer algorithms within a layered and complex dynamic network. I argue algorithms have an object-agency and a type of persuasion because of their performative functions within what I term, the built ecological network. Because of the energy layers within this theory, algorithms take on non-human material functions and performative actions of both manufactured and ecological actors, actants, and objects as unique and relational entities capable of generating action and discourse. What I am advocating extends
Latour’s actor-network theory (2005) and even Margaret Syverson’s ecological matrix (1999) by accounting for non-human composing alongside human composing. In this chapter, I argue that we look to a complex rhetorical model, one that acknowledges both human and non-human symbolic action using a variety of theoretical approaches.

In chapter three, “Persuasive Computer Algorithms: A Case Study of Google’s PageRank Algorithm and the Dynamic Weighted Algorithm” I apply the built ecological theory developed in chapter two to demonstrate how the theory operates when applied to the discussion of two separate algorithms. The primary focus of this chapter is on the data collected from articles discussing both algorithms from an open analysis (Strauss & Corbin, 1998) of the articles before imposing variables created from the built ecological theory. The results show that taking into account multiple energy layers through the built ecological network theory opens discussion into the rhetoricity of computer algorithms in ways traditional definitions of rhetoric do not perhaps allow. In short, by exploring algorithms through the rhetoricity of the built ecological network, we learn it’s not just the rhetorical event of algorithms persuading users to certain actions, but all of the elements conjoined in multiple layers and events outside of the given interaction between end users and the strike of a key or touch of a screen, which give way to a dynamic and rich rhetorical network.

After applying the built ecological network theory to computer algorithms, chapter four, “Sustaining Critical Literacy in an Age of Algorithms” takes up pedagogical and instructional concerns for educators to use in light of the rapidly increasing digital surveillance state online with computer algorithms. The critical literacy pedagogy proposed in this chapter builds from the works of Freire, Shor, and Giroux along with the digital critical pedagogy Stuart Selber proposed in his 2004 *Multiliteracies for a Digital Age* to shift attention to the need to sustain and develop a
digital algorithmic surveillance literacy to help students and colleagues acquire and develop ways to cope with, subvert, and speak out about surveillance and algorithmic habits online.

The final chapter of this project, “Pathways to Practice: Research, Teaching, and Community Building” considers the future implications of algorithmic surveillance by offering suggestions for more theoretical and empirical work with colleagues across disciplines. Additional considerations include ways to integrate discussions of algorithms and surveillance in curricula at a programmatic level.

Ultimately, this project positions computer algorithmic surveillance as a contemporary concern that scholars, researchers, and teachers may take notice of in light of the rapidly increasing surveillance state. If nothing else, this project is, at its core, about how digital surveillance shapes writers in strange ways, both knowingly and unknowingly. However, the project is also about moving forward the rhetorical tradition to consider the non-human position, and what agency and invention may occur through objects. As a result, this project encourages educators to think about their online habits, and ways they encourage students to go online and click around while “big brother” watches.
CHAPTER ONE:
CONTemporary Histories of Technological Rhetorics, Algorithms, and Surveillance

Often when designers conceptualize a product, the best intentions for the widest use are imagined. Take the design of the iPhone 6 by American company, Apple, for example. Since the development and launch of the original iPhone in 2007, the company has released eight versions of the iconic phone to the global public, with the size of the screen interface increasing in length and width each time. When Apple introduced the dimensions of the iPhone 6 to the public in September 2014, news outlets, social media commentators, and bloggers marveled over the size of the 4.7” display for the iPhone 6 and the 5.5” display for the iPhone 6 Plus. Apple’s website claimed the large displays, “make sharing easier … [with] stunning clarity” and “with a larger viewing area, you’ll be able to see and do more on the new Retina HD display” (Apple, 2014). Ablest language aside, Apple designers, conceivably, made a good-faith effort to design a phone making the most of technological advancements while considering how people would use the phone in everyday life. In some ways, the latest Apple product plays upon an American trope, made famous by citizens in the state of Texas in the United States, “bigger is better.” The new iPhone is, indeed, bigger and better than its predecessors are. In one case, however, bigger is not better.

While there is technological advancement with the latest iPhone, there is one glaring design problem: American women cannot place the newest edition of the iPhone in their pants pockets. Why? Several women fashion designers create what I call “women pockets,” shallow pants pockets that allow for a tube of lipstick or Chap Stick, or perhaps a tissue or two, but never a small card case, a wallet, and importantly, the iPhone 6. In a quest to fulfill the American trope
of bigger is better, the Apple design team overlooked an entire demographic of their product’s users: anyone (this includes women, men, and trans-identified individuals) who wears pants with women pockets. What a design quandary!

This example illustrates how the designers of the latest iPhone 6, in an effort to maximize their patented Retina screen technology, privileged image quality (for those with the abilities to perceive such craftsmanship) while inadvertently drawing attention the gendered notion of who the iPhone’s imagined audience was during the design phase. Arguably, user testing of what lay-commentators within social media circles dubbed the “Pop-Tart phone,” for its similar size to that of a Kellogg’s Pop-Tart breakfast food, certainly did not include learning if the iPhone 6 would fit in “women’s pockets.” More seriously, this example teaches how designers’ ideological values become embedded in products and sometimes those parameters exclude people from using the product in ways they perhaps would like to do daily.

For a moment, let us consider ideological function in another way, through rhetoricity. When a design team develops technologies with parameters in mind, i.e., for specific uses and audiences, the discourse surrounding the development of the tech is best described as entering a rhetorical situation. In the oft-cited and regarded “The Rhetorical Situation” by Lloyd Bitzer (1968), he described the rhetorical situation “as a natural context of persons, events, objects, relations, and an exigence which strongly invites utterance” (p. 5). Bounded within the technologies are materials, gestures, and languages that make up a conveyance of information. For example, the iPhone contains metal, plastic, glass, and lights. Taken together, these materials form a mass with the purpose of improving communication between people. When a person uses their iPhone, the iPhone and the person engage in a rhetorical event, i.e., both exchange masses. The person her or his bodily mass, forcing the iPhone to action with a touch on the screen, and
the iPhone’s mass in shaping the user’s body (eyestrain from continued use of such a bright small screen or carpal tunnel from repeated interface touching). Both user and iPhone inform one another of their affordances and constraints in working with each other to produce communications. In engagement, the user learns about the material makeup of the iPhone, and learns how to work with or against the object—further supporting Bitzer’s position “participation with [a] situation obtains meaning and its rhetorical character . . . the situation dictates” (p. 5). The iPhone in this example is part of a rhetorical situation because it is an “object” that “invites utterance.” Then again, does the iPhone have a much larger role in rhetoric’s theater? It the object, perhaps, a rhetorical non-human actor? For Bitzer, the person—or rhetor—is the main actor on rhetoric’s stage, and the iPhone is just a prop or knack. He located rhetoric within the rhetorical situation as human response(s) to social and physical stimuli, but not necessarily within the non-human characteristics and communicative elements of “objects.” I contend, however, the iPhone influences how writers enter into communicative acts—the soft and hardware of the tech demand people respond to its nature.

Our understanding of the rhetorical situation shifted when Richard Vatz (1971) commented on Bitzer’s theoretical treatment of rhetoric as a socially discursive and complex happening by placing the responsibility of the creation of rhetoric on the rhetor through discourse. Vatz’s position moves rhetoric from the domain of humans responding to external stimuli to ascribing individual accountability for producing discourse. However, I am somewhat skeptical of rhetoric’s location or nature defined through social and physical stimuli (Bitzer) or through epistemic means (Vatz) in light of the iPhone 6 example. By bracketing rhetoric and the rhetorical situation to terms and characteristics situated in the human domain of communicative industry, the ideological value of rhetoric becomes human-centered where human values and
beliefs become privileged above all other non-human objects and elements. This position leaves out investigation, through rhetorical analysis, of any characteristics or phenomena integral to invention, production, and distribution of any communicative mode that is not defined in rhetoric or Bitzer or Vatz’s rhetorical situation. This means that in later analysis and/or tracing through rhetorical analysis, the remains of any rhetorical situation become detritus and are positioned as unimportant actors or actants in the larger rhetorical theater. Not only does the elimination of such variables highlight ideological values of preservation and privilege, but also draws attention to the intersubjectivity of how rhetoricians methodologically privilege and focus on the human condition within the multifaceted historical, social, cultural, economic, political, material, and discursive networks of rhetorical situations. The ideological value of rhetoric then becomes about the pursuit of understanding people’s relationships with other humans and nonhumans, but not necessarily the other way around. This line of thinking is not to dismiss the importance of discussing how ideology shapes technology, quite the contrary. This project does give considerable effort toward the traditional definitions of rhetoric and the rhetorical situation in analyzing the ideologies in computer algorithms, and how those algorithms affect people in varying contexts. In greater service of rhetoric, in the chapters that follow, I try to establish a network that allows for a fuller theoretical position of rhetoricity and material rhetorics to draw scholarly attention to the remains of the rhetorical situation, while also positioning non-human objects and entities as rhetorical agents capable of persuasion. After building such a theory, the “built ecological network,” in chapter two, I turn to applying the theory in a case study of computer algorithms, and later discuss how educators may address algorithmic surveillance using critical literacy in chapter four. In positioning such a theory, I rely upon Margaret
Syverson and Bruno Latour for their theories of ecology and networks to understand how multiple contexts, entities, and relations function in a vast and changing network.

It is important to note that even in presenting a theory considering the overall rhetoricity of algorithmic surveillance in digital media spaces, people remain will influenced (through pathos) by the social connections certain platforms like Facebook and Zynga offer. As Dennis Baron (1999/2001) noted, people often are swept up in the excitement of new technologies, and I would add at the expense of understanding the range of affordances and constraints those technologies offer us. Newer writing tools such as applications, gaming environments, and social media are popular platforms that afford people spaces to share and connect with friends at the expense of data collection. Several Internet companies and application developers also use digital surveillance tracking technologies to record what people do in those spaces. Of course, each person has to ask himself how comfortable he feels with digital surveillance in online spaces, but because of the opaque algorithmic surveillance technologies many social media and gaming companies use, end users never really know the extent of the surveillance these companies employ. Nevertheless, the bubbling enthusiasm for social media—to write to others online—affords users with ability to lose sight of the “immediacy” of the virtual space because of the seductive influence of the interface tugging at end users desires for connection. People may seek out informational technologies because of the meaningful experiences these spaces offer, but the nature of these technologies, the ideologies embedded within their design and form have wider implications for rhetorical influence. Beyond the Cartesian nature of seeing technologies as tools to harness and use, people create tech to affect influence, and these technologies influence people through touch, sight, sound, logic, emotions, and ethics. Thus, this project considers how algorithms participate in a larger ecological matrix to illustrate the
constraints of surveillance and help bring attention to the pathos many Internet companies use to keep people engaged in their products while continuing to harvest their metadata and invade their privacy online.

In an effort to understand the rhetorical effects computer algorithms have in a complex ecological web; this project develops a theory of a built ecological network to position algorithms as composing entities in machine cultures. Algorithmic rhetorics have embedded significations that affect meaningful exchanges and give birth to algorithmic writing practices that influence how people behave, [re]act, and engage in online spaces. As rhetoricians and writing teachers, we need a vocabulary and framework for understanding the rhetorical properties of algorithms, and how they provide insight into the complex composing practices that both humans and machines reciprocally engage in during computing tasks. To realize these goals, this project addresses these research questions:

- What are the benefits and constraints of current theories that circulate within rhetoric and composition that illuminate our understanding of how humans and objects compose?
- What does bridging the gaps in the current theories offer us in terms of understanding the complex process of writing?
- How does this new theory give us more insight into the relations of human and non-humans in composing networks?

In order to answer these questions, I consider multiple current theoretical lenses from rhetoric, composition, philosophy, linguistics, history, architecture, science, and media studies to develop a rhizomatic built ecological network theory. By using concepts about both human and non-human subject and object positions that affect composing/writing practices, it is my hope to illustrate an interdisciplinary complex adaptive system—to borrow from philosopher Mark
Taylor (2001)—that promotes both manufactured and ecological actors, actants, and objects as unique and relational entities capable of generating action and discourse. What I am advocating extends Latour’s actor-network theory (2005) and even Margaret Syverson’s ecological matrix (1999) by accounting for non-human composing alongside human composing.

First, this chapter explores key terms and historical conversations of this project in *rhetoric & writing* and *computers & writing* studies, *algorithms*, and *surveillance*. The first section provides a historical landscape of literature in rhetoric & writing and computers & writing to illustrate how surveillance has been discussed in scholarship. The next section, algorithms, provides a descriptive overview of common definitions, while also extending current understandings of algorithms in ideological ways. The final section reviews literature from the field of surveillance studies to gain insight into how algorithms have figured in surveillance scholarship. By understanding, how both disciplines have discussed writing technologies, while also unpacking the terms used by scholars, engineers, and programmers, readers may gain insight into discussions and terminologies as a frame for this project.

**Rhetoric & Writing | Computers & Writing**

The rich scholarly history of rhetoric & composition and computers & writing, illustrate how people shape and are shaped by cultural and technological forces by investigating humans relations with technology. Charles Moran (1984) confronted the technological development of word-processing, for example, and its effects upon his cognitive development. He concluded with the realization that new technologies bring surprising and often unpredictable variables in writing processes because writers work within social contexts and have different attitudes towards working with technologies. Just a few years later, Andrea Lunsford (1989) reminded us that,
What we think of today as technology—machines mostly—are often simple extensions of the technology which is writing, though the new technologies are certainly affecting writing—blurring writing and reading and speech and hence changing the relationship between the spoken and written word. (p. 187)

In investigating the changing dynamic between people and computing technologies, writing studies researchers theorized new composing practices and espoused the benefits of these new technologies for invention, arrangement, and distribution of writing.

However, as writing instructors adopted newer computing technologies, scholars also began questioning and examining how technology complicated existing social and cultural issues in classrooms. Noticing a trend of only discussing computer technology’s benefits, Cynthia Selfe and Gail Hawisher (1991) argued that:

Along with becoming acquainted with current composition theory, instructors, for example, must learn to recognize that the use of technology can exacerbate problems characteristic of American classrooms and must continue to seek ways of using technology that equitably support all students in writing classes. All too frequently, however, writing instructors incorporate computers into their classes without the necessary scrutiny and careful planning that the use of any technology requires. (p. 55)

Their call was simple: Writing teachers must attend to the full range of experiences with computers, both the good and the bad. While several scholars and educators have taken up this call, many of the conversations in computers & writing and rhetoric & composition have, historically, focused on the tectonic shift from alphabetic literacy to multimodal literacy, and even cultural forces of gender, sexuality, orientation, class, race, and ability—and how political,
social, and economic powers shape influence people. In doing so, our field has attended to rhetoric’s domain of human-centered activity with discussions that have moved forward ways of knowing and composing with computing technologies.

Prior to World War II, the focus of composition instruction, as James Berlin (1987) reminded us, relied upon the current-traditional model of instruction—by focusing on the surface level matters of grammar and punctuation, writing instruction helped writers understand mechanics, but did little to encourage a broader meaning-making practices of writing, and the larger social fabric people were part of during the time. During the 1950s and 1960s, composition teachers began including national discourse into instruction—thereby allowing writers to engage in broader conversations. Since this moment, rhetoric and composition has had a rich history of examining ways people are shaped by various discourses; I find this movement fascinating for its undeniable stance that places, spaces, and language indelibly forms people’s motivations for action. At the same time, I have realized that with technological advancement comes affordances and constraints—and two such advancements that are just emerging within our field are digital surveillance and computer algorithms. I believe this area has been largely unnoticed because of the excitement bounded up, primarily, in the shift from a primary culture of alphabetic and visual literacies to a multimodal literacy through increasingly sophisticated composing technologies (the wax tablet, the scroll, charcoal, the pencil, the printing press, the typewriter, the microcomputer, smartphones, etc.). And, yet there are threads and early engagements with the shaping of people and writing processes and the examination of technology that this project takes root.

Nestled within Hawisher and Selfe’s 1991 article—a seed for future inquiry—laid a provocation to teachers to examine the surveillance and privacy practices that course
management systems (CMSs) afforded teachers. CMSs—later developed into repackaged learning management systems or LMSs that have more bells and whistles than their predecessor does—allowed instructors to deliver course content in virtual spaces to students in both distance and hybrid courses. Early CMS technology had built-in functionality, which allowed educators to track student performance within the system. Noting this technological advancement, Hawisher and Selfe warned teachers about potential problems with this tracking technology noting that, “Teachers who have easy access to students through a network can also ‘keep tabs’ on student participation, blurring the thin line between ‘evaluating’ contributions students make to electronic conferences and ‘inspecting’ conversations that occur electronically” (1991, p. 63). They further warned instructors about the way this type of tracking may shape students writing, Instructors inspecting electronic spaces and networked conversation have power that exceeds our expectations or those of students. In addition, many students who know a teacher is observing their conversation will self-discipline themselves and their prose in ways they consider socially and educationally appropriate. (p. 63) In many ways, this early investigation, that has not been taken up by scholars and researchers until technological advancements of tracking technologies like cookies and web beacons developed (and only then did surveillance came into conversation with plagiarism detection tools, CMSs and distance learning) represents one of the first discussions within rhetoric and composition about surveillance. Additionally, in that same year, Joseph Janangelo (1991) warned educators about the abuses of power and control in computer-mediated writing spaces because of the then surveillance techniques available to teachers through monitoring composing and computer time. Janangelo, and Hawisher and Selfe’s early work is compelling because it
concerns the emergence of digital surveillance as an acknowledgement of the ways digital surveillance can potentially shape a writer’s actions—knowingly, and unknowingly.

**Tracking Technologies**

Emerging scholarship in rhetoric & composition and computers & writing has discussed surveillance and privacy with respect to classroom practices, but not necessarily theoretical positions of surveillance or algorithmic cultures. Much of these talks move away from earlier discussions on surveillance practices of plagiarism detection tools like Turnitin.com or even the tracking abilities afforded to teachers in both course and learning management systems. In discussing potential for harm that digital researchers may face when collecting data for scholarly projects, Lory Hawkes (2007) discussed then-current digital surveillance and data mining practices and offered recommendations for privacy protection. In particular, Hawkes noted, “With online surveillance techniques, researchers’ personal information can be acquired and analyzed. Complied digital data records may be manipulated and disseminated by cyber exploiters, data providers, or the federal government without the researcher’s knowledge or permission” (p. 337). Hawkes additionally provided researchers with a litany of digital surveillance tracking tools from malware to discussion on provisions of the U.S. Patriot Act that has allowed the federal government access to private citizens’ records. While her work offers digital researchers a cautionary stance regarding protecting participant privacy and even researcher records, she positions her work as complications that digital researchers need to be aware of when conducting research that uses virtual spaces. Similarly, Estee Beck (2015) catalogs a brief history of tracking technologies from cookies to web beacons that companies use to cultivate information from people to use in predictive behavioral advertising—or as Google calls it “web personalization.” She claims that educators may have to attend to what she calls an
“invisible digital identity” that these tracking technologies generate about people, and how those shape ways people see information online, but she focuses on providing heuristics for pedagogical use in instruction.

In a 2011 article, Heidi McKee furthered conversation about tracking technologies by discussing data mining, government surveillance, and implications for changes in public policy—leaving the public with even less privacy protection. She called for teachers to educate each other and students about data-mining practices; however, the focus is upon education and advocacy for changes—which is an important call for those in our field to heed. I predict that data-mining and digital surveillance will become an increasing concern among digital writing scholars and teachers in the years to follow because of these emergent scholarly contributions, and with public attention on mass government surveillance. The theme of data mining has additionally been picked up by Jessica Reyman (2013) who presented a case for the affects data mining has upon intellectual property and agency on the web. She recommended that teachers who ask their students to use certain websites to find, perhaps, alternative spaces that do not engage in data-mining, so that students can continue with digital writing projects with little interference or infringement upon their intellectual labor or agency. Both Reyman and McKee’s contributions reflect ethical concerns with data mining and surveillance because of the responsibility and protection that educators bear toward their students. These concerns by both scholars intersect with Toby Coley’s (2013) ethical literacy that engages teachers to consider a “moral theory” that includes ethics and religious morals; an advancement of “moral development” through scaffolded assignments that prompt students to complicate their understanding of personal responsibility and use of real life scenarios to help students apply lessons learned in the space of a classroom. Incidentally, the fleshing out of this heuristic by
Coley provides an entry into discussing the ethics of surveillance systems in digital spaces with students, along with the nature and properties of computer algorithms. An ethical framework also nurtures students through learning how tracking technologies such as cookies and web beacons track students online, but also connected to concerns over potential violations of the Family Educational Rights and Privacy Act (FERPA) that protects students’ institutional educational records. Additionally, Angela Crow (2013) has illustrated the intersections of digital surveillance and big data connected to writing program portfolios, and concerns educators and students may have about disclosing real-life student identity in online spaces because of FERPA; however, the focus of this work is upon privacy concerns with students over legally protected data. While these works provide a turn toward digital surveillance concerning privacy, data mining, and identity, this project focuses on the theoretical positions of a “computer algorithmic surveillance,” and how to understand the rhetorics at play. Traditional surveillance employs actions of collection, analysis, and action upon individuals, groups, objects, and data. Computer algorithmic surveillance uses these same actions with the addition of computer algorithms to analyze data collected through surveillance methods.

Theorizing a computer algorithmic surveillance is a rather important step in the movement of examining technology and its effects, because as Cynthia Selfe recently noted during an interview:

I also think that people’s relationships to technology will continue to be important because technology is disappearing in terms of being naturalized. In a sense, technology disappears into the background. When the technology disappears, ideologies are working the most strongly. We must re-attend every time to technology, and how we use it in our endeavors. (Beck, 2013, p. 353).
In many ways, this message is similar to her powerful call to the field to “pay attention” to technology and literacy (Selfe, 1999), as she argued, “We have also relegated these [computer] technologies into the background of our professional lives. As a result, computers are rapidly becoming invisible. . . (p. 413). Her resonant message called for a warning to those in the field—that to ignore the shift of technology and literacy development, meant that some educators may have placed themselves in a state of “peril” through not paying attention to the technological, political, and social effects of computers. Her call helped educators bring into relief the invisible ideologies at play in technological systems. Nearly fifteen years after Selfe’s work, this project continues to “pay attention” to technology in ways that explores digital surveillance and the forces and powers at play by furthering conversation about tracking technologies connected with digital literacy as one of the proposed implications of persuasive algorithms.

**Surveillance Culture in the Internet of Things**

Some rich contributions have been made in disciplines connected to rhetoric & composition and computers & writing, especially with algorithmic surveillance, but also in the idea of the “invisible” nature of technology, and the profound effects that opaqueness has upon us. The idea that computing technology is rendered invisible from human experience is not a new concept. Indeed, software and computer engineers purposively design software so that people are not aware of the medium. Jay David Bolter and Richard Grusin (1999) described this unawareness best through their description of transparent immediacy. Using virtual reality as an example of immediacy, both noted:

Virtual reality is immersive, which means that it is a medium whose purpose is to disappear. . . All of these [virtual reality] enthusiasts promise us transparent, perceptual immediacy, experience without mediation, for they expect virtual
reality to diminish and ultimately to deny the mediating presence of the computer
and its interface. (pp. 21–22)

Computer software and hardware technology has developed in such a way that users no longer
experience or are actively aware of the medium that transmits content. Certainly, there are
benefits to the logics of immediacy, for example, Bill Wasik (2013) wrote about what he calls
the “programmable world” where everyday objects people use in households and office spaces
are linked through a digital network. His examples include ways that moisture sensors in the yard
can inform the sprinkler system to turn on or cars can predict potential collisions and alert
drivers. All of these objects operate from computer algorithms. Noting the potential of the
programmable world, Wasik claimed:

Once we get there, that system will transform the world of everyday objects into a
designable environment, a playground for coders and engineers. It will change the
whole way we think about the division between the virtual and the physical. This
might sound like a scary encroachment of technology, but the Programmable
World could actually let us put more of our gadgets away, automating activities
we normally do by hand and putting intelligence from the cloud into everything
we touch. (p. 143)

The belief that we can place our gadgets away, because they perform our tasks for us, helps free
us from being tied to screen life and technology, something that William Powers (2010) focus on
in Hamlet’s Blackberry. The push to make lives easy and to keep up with the pace and
advancements of contemporary life thrusts people to use technology in ways that do not
necessarily, at times, encourage active critical thinking about the embedded ideologies in the
technology. In some ways, Nicholas Carr’s (2010) argument that logics of hyperlinks on the
Internet lead to rewired neural pathways takes root herein. Not because of the implication that continued interaction with the web leads to decreased attention spans, but habits of surfing and sifting in software environments do not encourage active, sustained critique and engagement because of the logics of immediacy at play. In many ways, these conversations connect with Stuart Selber’s (2004) notion of critical literacy to help contextualize the contexts that technology carries in its interfaces, design, and code. It is the invisible nature of digital surveillance that is of the most concern to me because, as Selfe remarks, that is when “ideologies are working the most strongly” and our fields of rhetoric & composition and computers & writing needs scholarship that teases out the logics of digital surveillance and addresses the persuasive nature of objects. We need to understand better the operations and functions of tracking technologies, not for just the benefits of customization and personalization that certain sites like Google and Facebook afford, but also we need to examine the ways these surveillance tools constrain and affect user participation. Reasons for this include the seepage of privacy and anonymity or ways that customization then limits full participation in spaces because the computer algorithms present information that they “think” users only want to see and interact with online.

**Edward Snowden and the NSA**

One of the most striking moments in recent American history has been the revelations forwarded by NSA whistleblower, Edward Snowden by sharing the extent of the National Security Agency’s digital surveillance programs. With Snowden’s admissions about NSA surveillance into the cell phone records of Americans, first reported by Glenn Greenwald (2013) of the Guardian newspaper, and the subsequent reports of unconstitutional spying upon Americans, the rhetorical forces of surveillance, especially in rhetoric and composition
classrooms is remarkable in addressing contemporary politics, economic structures, and digital economies. Undoubtedly, companies, organizations, and governments have routinely engaged in surveillance practices for myriad reasons ranging from protection, personalization, and consumer marketing. However, because of Snowden’s disclosures, the public debate surrounding the NSA’s involvement in surveillance online has become more visible in public discourse, which provides content for students and teachers to examine in writing classrooms, but also how these surveillance techniques affect writing processes, if at all.

At the same time, public conversation on social media sites has shown that many people are somewhat familiar with the ways they are tracked online, but not to the extent that companies and organizations perform. In addition, online customization services that sites like Google, Facebook, Amazon, and even Zappos offers users with personalized links and advertisements for greater ease. Users, and by extension writers, may not fully realize the power relations and categorizations that shape the ways they see information online, and are potentially shaped by digital surveillance. Granted, people may have some awareness and even perhaps be vigilant about protecting their online movements. An example might be a person who is rushed for time, logs onto a shopping website that uses tracking technologies and quickly calculates the benefits of saving time over protecting privacy. However, exposing the levels of surveillance and tracking online is needed. Since scholars and teachers in computers & writing have encouraged fellow educators to work with the systems integrated in computers in composition classrooms for decades, the exigency to attend to surveillance is paramount not only in rhetoric & composition, but more broadly with our colleagues in the sciences, fine arts, and education, business, graphic arts, social media and marketing, and so forth. Digital surveillance affects all people who interact on sites that use tracking technology—not just writers within our field. Attending to how
surveillance affects all users of the web may well do more to open cross-disciplinary conversations and affect positive change in this area. Part of such an investigating means examining how digital surveillance works—and algorithms are a key part of such digital surveillance practices online.

**Algorithmic Ideology**

The term, algorithm, is widely used in computer sciences and studies, mathematics, and critical code studies, and while there is a generally agreed upon definition, there are some variances in scholarly discourse. Mathematician and professor at Massachusetts Institute of Technology, Hartley Rogers, Jr. (1987) defined an algorithm as a mode or method of expression of a finite list of instructions for calculating functions. Computer scientists Thomas H. Cormen, Charles E. Leiserson, and Ronald L. Rivest (1990) described algorithms differently:

> An algorithm is any well-defined computational procedure that takes some value, or set of values, as input and produces some value, or set of values, as output. An algorithm is thus a sequence of computational steps that transform the input into the output. (p. 1)

Critical theorist Andrew Goffey (2008) stated algorithms “do things,” and critical code studies theorist Tarleton Gillespie (Forthcoming) claimed algorithms are “encoded procedures” for transforming data for specific outputs. Many of these definitions describe algorithmic process from a detached and objective perspective or what algorithms do instead of theorizing the ontological and epistemological states of algorithms. Given that algorithms govern digitally mediated life for high-technology cultures, shifting attention to the more theoretical dimensions of algorithmic processes and procedures, as this project does in later chapters, helps people
understand the ideological freight embedded in the algorithms that govern digitally-mediated lives—and how such algorithms feed into digital surveillance culture online.

One such fruitful exploration of algorithmic theorization arises from the use of rhetorical theory. Where critics and programmers see algorithms as procedures or methods for shaping data for specific means, rhetoricians may see a correlation between algorithms and syllogisms. Indeed, as Kevin Brock (2013) has demonstrated elsewhere, algorithms reach as far back as classical Greece by illustrating how the enthymeme—a type of argument with omissions of premises from the logical sequence—is in its logical makeup an algorithm. If a syllogism, for example, has a major premise, minor premise, and conclusion, the syllogism is a method for calculating a type of logical function for certain outputs. Both the algorithm and the syllogism are types of logical language structures used to transform input data, whether it is words or 1s and 0s, toward some desired outcome.

Algorithms and syllogisms do not just ontologically exist for the purposes of the sake of themselves, but do so as part of complex ecological network with multiple actors and objects shaping the ebb and flow of data. For example, computer scientist Donald Knuth (1973) described algorithms as having five important features (finiteness, definiteness, input, output, and effectiveness) in his seminal multi-volume, *The Art of Computer Programming*. His descriptions provide an objectively vivid account of what algorithms do, as functions. However,

---

2 The five features Knuth described are available in the first volume of the series. For readers here, the five features define algorithms as such: 1) finiteness—“an algorithm must always terminate after a finite number of steps”; 2) definiteness—“each step of an algorithm must be precisely defined”; 3) input—“an algorithm has zero or more inputs”; 4) output—“an algorithm has one or more outputs….which may have a specified relation to inputs”; and 5) effectiveness—“an algorithm is … expected to be effective … the operations … [of] the algorithm must be sufficiently basic that they can be … done exactly … in a finite length of time by a man using pencil and paper” (Knuth, 1973, 4–6).
additional descriptions may be added to algorithms along a theoretical basis in conjunction with their relationships as part of rhetoric and a complex ecological network. First, algorithms can be a systematic way of processing and organizing information for persuasive means that logic aids in ordering how humans and machines experience the world around them. Second, algorithms are decisive in inclusionary and exclusionary practices of using or discarding data that does not fit the structure of the algorithmic model. In this sense, if an algorithm’s structure only allows for data collection from websites with over 20 hyperlinks, the websites with less than 20 links will be excluded from the dataset. Finally, algorithms are quasi-objective ideological structures, in that the creation of an algorithmic structure relies upon the knowledge and experience base of the creator(s), and ideological bias will always seep through in the creation of the structure for better or for worse.

Algorithmic processes.

As a system of processing and organizing information, theorists might accept theorist Ippolita’s proposition that algorithms have certain processes to achieve different results, such as acceptability, possibility, and efficiency in culling through data (2013). Yet, Ippolita’s stance leaves off discussion of method, as stated, “algorithms are not necessarily a method to obtain completely detailed results,” in favor of focusing on the results instead of the processes by which the algorithm functions. Perhaps it is because algorithms in digital spaces, especially proprietary algorithms are opaque from end users that discussion of algorithmic methods is left off in literature. As Tarleton Gillespie (Forthcoming) explained, finding the ways particular algorithms operate, in order to cast critical evaluations of such methods, do not favor the commercial or political interests of creators of the proprietary algorithms. Learning the complexities of proprietary algorithms that Google, Facebook, and Twitter use for personalization and
monitoring of user actions becomes difficult for researchers and teachers interested in examining the methods by which the algorithms use to fashion data. These scholarly positions also leave algorithms positioned as symbolic actants that move matter, signals, and bodies into action because of the real inaccessibility of algorithms to most people without privilege and knowledge. Because of this reality, appreciation and discussion of proprietary algorithms in scholarly literature comes from understanding the opaque systematic processes of algorithms, without access, but also through the product or output of the algorithms.

Even without direct access to proprietary algorithms, one cannot deny the importance algorithms have on computational culture. Shintaro Miyazaki (2012) elevated algorithms as the basic blocks of informational technologies and suggested that the elements of speed, protocols, and operations in computational environments depend upon systems of algorithms working in concert to produce harmonious results. Elsewhere, Adrian Mackenzie (2003) argued of computer code (instructions for a machine) that “code runs deep in the increasingly informatically regulated infrastructures and built environments we move through and inhabit. Code participates heavily in contemporary economic, cultural, political, political, military and governmental domains” (p. 3). Undeniably, the view computational scholars take toward the systematic view of algorithms and computer code is rhetorical in that algorithms facilitate and function in complex acts for information exchange and retrieval across human life domains of thought and action. Because algorithms embody logical procedures for action, they have persuasive abilities in their systematic functionalities. The sequence of operations built into an algorithm leads a machine or human to perform and collect data that fit the parameters of the algorithm. Algorithms, like syllogisms, guide to human and machine thought to thought, action, and places. Algorithmic
persuasion is grounded in the procedures of algorithm, including how they include and exclude information.

**Algorithmic inclusion/exclusion.**

Along with algorithmic processes, algorithms have a design of inclusion and exclusion built into their command registers or, if you will, their linguistic structure. This orientation is somewhat different than Knuth’s description of input and output in his five descriptions of algorithms. For Knuth, input and output rely upon external data to fill the algorithm (input) and the quantities of data produced because of the algorithmic process (output). At an abstracted and primitive level, an algorithm is a stand-in for a function of inputted properties, e.g., in the mathematical equation below, the letters are representative for any number of numeral opportunities in basic algebraic mathematics:

\[ X + Y = Z \]

By inputting “3” for “X” and “5” for “Y” and adding the two numerals together from left to right, the output results in “8” for “Z.” At a linguistic level, this basic equation (which fits the definition of a basic algorithm) has predetermined rules of governance for its operation. The structure of the algorithm itself includes and excludes these rules because of the ways people have been taught to think about such a structure. It is given that the letters are abstractions for inputted data, and that the addition symbol represents adding one unit with another unit for a resulting new unit. People commonly accept this structure because of the associated mental properties, concepts, and ideas the equation introduces to the mind when present with such a problem. The structure of the equation may allow for any number of infinite variables for the letters; however, the representation of the addition sign suggests an exclusion of all other types of mathematical functions. This means the form for an algorithm simultaneously includes and
excludes criteria. Taken further, for example, in this algorithmic syllogism, concepts and ideas are included and excluded simultaneously:

- **Major premise:** All mammals are warm-blooded.
- **Minor premise:** All tabby cats are mammals.
- **Conclusion:** Therefore, all tabby cats are warm-blooded.

Included in this syllogism are mammals, warm-blooded, tabby cats and all other linguistic signifiers associated with the verb, adjective, and adverb. Excluded from this syllogism are all things that are not these concepts. Additionally, the rule structure associated with coming to the output of the conclusion implies a sort of addition of the major and minor premises, and all other types of functions (like subtraction, multiplication, division) are excluded. At the most basic levels, algorithmic logic operates to include and exclude by its very structure and functions for inputted data.

**Algorithmic ideology.**

The structure of an algorithm is quasi-objective in that the arrangement presents a representation of reality with a finite process for arriving at an output. Indeed, as computer scientist Niklaus Wirth (1976) argued, “the large amount of information that is to be processed [by algorithms] in some sense represents an abstraction of a part of the real world” (p. 1). He further acknowledged, “The data represent an abstraction of reality in the sense that certain properties and characteristics of the real objects are ignored because they are peripheral and irrelevant to the particular problem” (p. 1). The creator of an algorithmic structure relies upon their knowledge and experience in developing a process for computation. For example, the Knuth-Morris-Pratt (cf. Cormen, Leiserson, Rivest, 1990) algorithm is a linear-time string algorithm designed to reduce the running (search) time of a particular word in a string. Donald
Knuth, Vaughan Pratt, and James Morris designed this algorithm to speed up pattern matching in strings of text. Their design relied upon their knowledge and experience with algorithms that performed with higher running times, which privileges the belief that faster computation equals better efficiency and access to data. Since the Knuth-Pratt-Morris algorithm only shows cultural value toward efficiency and speed—, which are values prized within American culture—another example algorithm may help illustrate ideological bias more cleanly.

When Facebook developed its newsfeed feature in 2006, the computer scientists and engineers working with the social media company also created a method for ranking what posts a user would experience in their newsfeed more often than others rank. Facebook’s EdgeRank algorithm $\Sigma = U_e \times W_e \times D_e (\Sigma = \text{rank}; U = \text{affinity}; W = \text{weight}; D = \text{decay}; e = \text{edge})$ calculated data based on: 1) affinity—how close or many times users came into contact (the edge) with each other through viewing pages, commenting on posts, etc.; 2) weight—the rank of the type and frequency of contact from the edge; and 3) decay—the time from last contact on the edge. This algorithm allowed users to experience a personalized newsfeed based on measured criteria (or data) of friendship settings under the “notifications” drop-down menu, viewing other users’ timelines, hiding posts, the types of posts users “like,” and even the connection speeds from a user’s network and device type (McGee, 2013). Facebook engineers based these criteria on beliefs about experiencing contact that is more frequent with people along with calculating device information for the ability to view content in newsfeeds while on slower connections. On the surface, this type of personalization founded from ideological beliefs of relationships may seem beneficial to keeping connected to those on Facebook more frequently. As Internet activist Eli Pariser (2011) reported in his book, the *Filter Bubble*, this personalization creates more dissonance between users and perceptions about others because Facebook filters out content
from other users who may have dissimilar views or perspectives—perhaps as a result of the
affinity part of the algorithm working too well. The concern about this filtering rests with users
experiencing myopia of information where the potential for dissent and public discourse
becomes a lesser priority than uploading images of the family pet. Ideology works strongly
within algorithms since individuals create, order, and structure their design to parse data.

These three additional qualities, algorithmic processes, inclusion/exclusion, and ideology
are ways to seed a theory of persuasive algorithms—acting with agency—because the
algorithms’ structures are imbued as actants in rhetorical situations. The algorithms, in turn,
operate in tandem with digital surveillance via digital tracking technologies like cookies and web
beacons, and these affect, shape, and persuade people/writers. In chapters two and three, these
qualities play out by showing the conditions for which persuasive algorithms function as agents
of social control. This project ultimately contributes a critical perspective about digital
surveillance and computer algorithms, especially in chapter four, that will, simply, get people to
think about what they do online and why, and perhaps interrogate their current practices. This in
turn connects to writing studies and digital technology use because digital environments shape
writers (Porter, 2002).

**Surveillance Studies**

While scholarship in rhetoric & composition and computers & writing are just beginning
to address surveillance, the field of Surveillance Studies has been investigating surveillance in all
forms for over three decades. Researchers in this field believe that academics, policy-makers,
and the general public who are aware of the methods of surveillance from closed-circuit camera
and television monitoring to collecting clickstream data from users’ web habits help people think
deeply about human behaviors, attitudes, and beliefs about privacy, consequences, ethics, and
assumptions about human motivations. In our modern time, surveillance has become such a commonplace activity, standardized as a means of protection as well as intervention, that the boundaries between what is public and private have become blurred. For example, we recognize and accept that closed-circuit camera and television monitoring in consumer retail establishments deters theft, but also provides evidence in case a crime occurs where law enforcement can identify the perpetrator(s) as well as the victim(s) and swiftly act. Most people may not challenge the protection closed circuit recording offers the public, because it visibly offers a means to aid those who have been harmed in some act. However, as our lives have become more complexly mediated with online surveillance methods through the Internet, the invisible collection of data that classifies and segments users and populations for business, governmental, and organizational purposes has left not only the general public, but researchers with a quandary. More often, companies track user movements and sell that data to third parties for profit. Views about user privacy, ethics, and the real effects of data sharing have shifted not only in some consumers’ eyes to acceptance of constant surveillance, but also to apathy (Carey & Burkell, 2009). However, Surveillance Studies researchers, attorneys, and even news reporters are uncovering how deeply pervasive digital surveillance has become, and how it affects legal, social, and cultural statuses with individuals and populations. There is no doubt that digital surveillance affects all users of the web.

One of the most common metaphors invoked in Surveillance Studies or in news media treatment about surveillance is the notion of “big brother” watching over people, recording patterns of behavior, and seeking to suppress or dominate. Daniel Solove (2001) rejects the commonly invoked metaphor from George Orwell’s *Nineteen Eighty-Four* because he argues that it does not fully account for the privacy concerns and experiences people undergo in modern
day surveillance systems. Instead, he proposes that Franz Kafka’s *The Trial* as a metaphor to invoke the feeling of powerlessness people experience in surveillance systems. Solove illustrated Orwell’s big brother “employs a coercive power that is designed to dominate and oppress” (p.1414) with connections to Foucault’s metaphor of the panopticon as a disciplinary and coercive apparatus and how the metaphor does not account for the sense of powerlessness people may feel when their identity and power to keep their identity is stripped from them. In many ways, this metaphor is apt for digital algorithmic surveillance since so many people do not have access to the algorithms that control information exchange online. Solove argues that Kafka’s work presents a different metaphor for consideration in modern day surveillance, he noted:

> The power employed has no apparent goal. Nor is the power as direct and manipulative. The problem with databases and practices currently associated with them is that they disempower people. They make people vulnerable by stripping them of control over their personal information. There is no diabolical motive or secret plan for domination; rather, there is a web of thoughtless decisions made by low-level bureaucrats, standardized policies, rigid routines, and a way of relating to individuals and their information that often becomes indifferent to their welfare. (p. 1423)

This type of vulnerability, one that users experience when data is collected about them by companies and organizations without the users being able to analyze or alter the data, perhaps describes the state of current digital surveillance systems, better than “big brother.” This is especially true where an invisible digital identity is constructed and used without necessarily the user knowing about the portrait constructed and used.
Perhaps the most common thread in surveillance studies scholarship is the acknowledgement of Foucault as the forefather of the field; however, not all scholars believe that his theory on discipline and control of bodies through the internalization of disciplinary boundaries fully account for the types of power flows in online-networked spaces (see Majid Yar, 2003, for example). Debates about how to figure Foucault’s metaphor for Jeremy Bentham’s panopticon, and how it figured in the institutional and old media spaces of the 19th and 20th centuries—what Lev Manovich (2001) defines as “photography, film, the printing press, radio, and television” (p. 22)—as well as the role the panopticon should play in the networked new media spaces of the 21st century—or what Manovich (2001) defines as representation, distributed, modular, automated, variable, and transcoded—accounts for frequent engagement in scholarly conversations in Surveillance Studies. For example, in the comprehensive edited collection on Surveillance Studies, the *Routledge Handbook for Surveillance Studies*, edited by founders of the field, the first three chapters in the section focus on departures and extensions from Foucault. Relying upon Deleuze & Guattari’s notion of assemblages, Greg Elmer (2012) argues that Deleuze & Guattari’s work provides more expansion of Foucault’s panopticon through the study of the embedded relationships in the social networks of the system. William Bogard (2012) also works from another philosopher, using Baudrillard’s notion of simulation to describe how power operates through discipline. Ayse Ceyhan (2012) returns to Foucault’s early work with volume 1 of the *History of Sexuality* in order to theorize an extension of ‘bio-power’ an operant using biological means and persuasions to politicize bodies. These theories treat control and power in largely humanist terms, emphasizing the human subject-position as primary. The works do not account for the role that objects, especially algorithms, play in networked spaces, but the works do not have this account as a goal. Thus, this dissertation will
build upon these conversations and use object-oriented rhetoric to discuss the object position of computer algorithms connected to digital surveillance to open discussions about the persuasive, and perhaps power position, that computer algorithms play in shaping user experiences online.

One of the most visible and powerful extensions of Foucault’s work occurs through Kevin Haggerty and Richard Ericson’s (2000) article, The Surveillant Assemblage. Drawing upon Deleuze and Guattari, both Haggerty and Ericson make the argument that surveillance systems are convergences in assemblages of multiple surveillance states, and that an abstraction of the human body that is what they call a “data double” is assembled in surveillance states that resemble or mutate the physical body of the person. The data double body, as both argue, takes shape through Haraway’s cyborg because of the hybridity of the virtual body representing human flesh. The data double circulates through various digital systems, and is assembled in a rhizomatic fashion, through the ways the data double can grow, break, and grow again in multiple forms and places. Both conclude of this new form that, “the coalescence of such practices into the surveillant assemblage marks the progressive ‘disappearance of disappearance’—a process whereby it is increasingly difficult for individuals to maintain their anonymity, or to escape the monitoring of social institutions” (p. 619). This contribution, offered at a time during posthumanist inquiry in the 2000s, provides a path into further work with the digital data double, and is a figure that I draw upon in chapter 2 and 3.

Using research from the field of surveillance studies in this dissertation helps unite research and scholarship in the broader field of rhetoric & composition that speak to concerns that multidisciplinary researchers have addressed in surveillance scholarship. In using scholarship from this field, it is my goal to give back to this field through multidisciplinary means. While this proposed project has three goals rooted in rhetorical means and in computers
& writing scholarship, it is my hope that the theory that arises from this work will be of service to scholars in Surveillance Studies.

**A Note on Rhetorical Theory and Inquiry**

Composition pedagogy, classroom teaching practices, and clear writing on what works best for educators has long dominated Rhetoric & Composition scholarship. Pedagogues focus on blended pedagogies ranging from process-based pedagogy, expressivism, collaborative approaches, cultural studies, feminism, and even technology (see Fulkerson, 2005). Articles and books abound about the teaching of writing—especially first-year composition, which, arguably places rhetoric & composition, at times, depending upon the culture of the institution, as a service-oriented field to other disciplines. In contrast to the long arc of classroom practices and teaching writing that fills our journals and books, this dissertation maps out a theory for computer algorithmic surveillance. While I court this challenge, I am aware of tension of theory’s role in rhetoric & composition, i.e. the “new theory wars” are not too far in our field’s rearview mirror to ignore in light of this project.

In her 1999 article, Wendy Bishop claims an identity of writer-teacher/teacher-writer through a remix symbol of a circle with two embedded arrows on either side pointing in the same direction. She claims this identity as firmly footed as a teacher of writing and as a writer, but not necessarily as a theorist, historian, or critic. And with her pedagogical grounding, she inquires after a passage by Gary Olsen in which she lamented, “For me, this sentence, I realized, had no clothes, and no heart (no organs at all, no human substance) no place for the interested writer/reader/teacher in me to stand” (p. 26). She goes onto to note about the political freight of such writing, and wonders if there is a place for her persona in what she imagines will be the discourse practices in the flagship journal for our field. It was this very “wondering” in Bishop’s
terms, that Olson responded to a year later, and one that Kory Lawson Ching (2007) chronicled and discussed of the much public “new theory wars” in 2003 on *The Chronicle of Higher Education*, and within our field’s journals. Interestingly, Ching noted, “In composition studies, the value or worth of theoretical discourse is often measured by the degree to which it seems relevant to classroom practice” and later adds, “Composition studies has a complex relationship with teaching, since it finds both its origin and source of legitimation there. . .” (p. 452).

Similarly, Sidney Dobrin (1997) draws out the theory/anti-theory debate drawing largely upon Maxine Hairston’s responses that sparked the “theory wars” and divided a field. Dobrin smartly recalls Stephen North’s (1987) argument that a field needs all kinds of scholars, researchers, and teachers to have, what I would call a robust discipline. In contrast to the early theory wars within our field, this dissertation takes a blended approach in its form. While it is a largely theoretical project, because I tend to believe that theory allows an interrogation into complexity of our world, and to draw out assumptions and ideologies, this project will contribute toward providing educators ways to make sense and consider classroom practices connected with a computer algorithmic surveillance. By using this blended approach, it is my position to straddle both theory and practice within Rhetoric and Composition.

In working with this approach, I pursue in Latour’s methods, a tracing of connections through a rhetorical inquiry (Lauer & Asher, 1994) into the philosophical and theoretical positions of agency, actants, persuasion, and the relations that are bound up in the production, storage, and dissemination of computer code. While performing this inquiry, I also take on the task of defining and exploring a theory of computer algorithmic surveillance. Thus, for this dissertation, I have one guiding research question: How does digital surveillance function through computer algorithms in ways that shape writers in digital spaces. With this question, I
then read both scholarly and popular sources in multiple disciplines in areas to help answer this question, but also to build a theory and contribute to practice.

In developing this theory, I remix various theoretical positions to illustrate that not one current theory has the dimensionality needed to theorize a complex virtual surveillance state. I come to this project with several theories at and in play, [re]fashioning and examining the soil from which these theories emerge and intersect in a rhizomatic fashion (in Deleuze and Guattari’s sense) that create assemblages that break, tear, shape, and jut in response to physical and immaterial stimuli, i.e. the forces humans and computer algorithms exert when they dance upon the invisible codes embedded in motherboards and circuitry. The teasing out of these existing theories to fashion what I call computer algorithmic surveillance from what I term as an object-agency and transaction invention—both of which I flesh out fully in chapter 2.

This type of remix means drawing out aspects of specific theories to build what I call an object-oriented rhetoric. As composition-historian Jason Palmeri and Kevin Rutherford (forthcoming) state, “OOO theorists attempt to move philosophy away from a single-minded focus on epistemology by expanding the philosophical conversation to include not only questions of how we know the world but also questions of what the world is” (p. 1). Additionally, rhetoricians, James Brown and Nathaniel Rivers (2013) take up OOO for Rhetoric and Composition and argue that the field is, “increasingly concerned with understanding rhetoric and writing beyond the human-centered rhetorical situation” (p. 27). They both go on to poignantly note that Marilyn Cooper’s 1986 essay, “The Ecology of Writing,” Margaret Syverson’s (1999) The Wealth of Reality: An Ecology of Composition, Colin Brooke’s (2009) Lingua Fracta, and Byron Hawk’s (2007) A Counter-History of Composition all have concerned themselves, however secondary to the primary thrust of the main premise(s), with the non-human position.
Brown and Rivers argue that Rhetoric and Composition is “hospitable” to an OOO approach because, “A rhetor must attune herself to a complex ecology of humans and nonhumans” (p. 29). I share with others’ pursuits of infusing OOO into this project; however, since OOO is most concerned with the “beingness” of objects, and not necessarily their relations, a remix of a different theoretical stance is needed. Rather than focus upon the full relations of actors and actants in a network, ala Latour, I draw out the theoretical relations of objects to build an object-oriented rhetoric that positions computer algorithms as 1) “objects”; however abstract the equations are, and 2) persuasive through the relations between other algorithms and people, which I discuss in chapter 2.
CHAPTER TWO:
THE BUILT ECOLOGICAL NETWORK: WHAT MATERIALITY AND ECOLOGY MEANS FOR RHETORIC AND WRITING STUDIES

What follows is speculation, often far-fetched speculation, which the reader will consider or dismiss according to his individual predilection. It is further an attempt to follow out an idea consistently, out of curiosity to see where it will lead. –Sigmund Freud, *Beyond the pleasure principle*

Within rhetoric and writing studies, there has been a recent turn to study our field’s “missing masses” (Barnet, 2010). A promising inquiry into such an endeavor has been the development of object-oriented rhetoric—the theory of rhetoric being concerned with something other than humans. Object-oriented rhetoric (OOR) is appealing because the theory opens rhetoricity and accounts for a more inclusive network that figures objects as equally important—not subordinate—to humans. However, the challenge of adopting object-oriented rhetoric goes back to our field’s roots, where concerns about ideology and power continue to have profound influence in our everyday lives.

When rhetoricians turn to object-oriented rhetoric, many find that the concerns of the material become more prominent and the human is but only one figure in a complex and dense web of actors and objects. Some critiques leveled at OOR have included that the theory misses a sense of human vitality because the theory focuses on objects, and the theory does not fully account for the relations and energy exchanges between people and objects. At times it can be difficult to trace and understand all of the [inter]connections because of the sheer volume of objects, data, relations, and people, rhetoricians, however, should also consider a larger network,
along with what emerges in any given space, time, and context. It is simply not enough to speculate about the things that surround us but to consider them as both separate entities with their own masses and particles.

There is already precedence for such an interdisciplinary and complex theoretical development as Margaret Syverson has argued, “Our view of composing has been greatly simplified as a consequence of our methodological procedures. . . . We must also develop entirely new [inter]disciplinary ways of seeing, thinking, and sharing knowledge” (1999, p. 27, emphasis added). Syverson's ecological model for composing provides a dynamically rich dimensional map for composing; however, she also acknowledged that while she attempted to get to the heart of the “complexities of ecological systems” (p. 23) that the four attributes of distribution, embodiment, emergence, and enaction she discussed were not the only attributes in an ecological composing system (see p. 18). I contend that with the development of object-oriented ontology, the evolution of posthumanism and new materialism, we can extend Syverson's model to have a richer and more complex composing map of human and non-human composing habits and practices, and thereby more fully accounting for rhetoricity.

This chapter provides the characteristics and traits of a built ecological network theory, and explores what materiality and ecology means for rhetoric and writing studies. This theory considers how the theories I have previously mentioned have reflexive and reciprocal relations, which contribute to the theoretical stance of the built ecological system. Additionally, this theory presents a dynamic and rhizomatic network that reveals the material and ideological weight of human and non-human relations in composing and writing habits and practices.

Following this chapter, I explore the functionalities and abilities of computer algorithms in digital surveillance environments in a case study to illustrate how these non-human objects
have rhetorical agency, and at times, a type of persuasive ability. This case study allows me to speculate on how to apply the theory to digital rhetoric and literate practices, which follows in chapter four, and suggest implications for classroom practices and future research in chapter five.

**Theories Circulating within Writing Studies**

Much of the literature in rhetoric and writing studies has evolved from current-traditional rhetoric, employed largely up to the 1960s, shifting to cognitive studies in the 1970s, cultural studies in the 1980s, issues of diversity in the 1990s, and merging into digital rhetoric and the electronic medium of computers and mobile phone technologies from the early 1970s to today. Within each of these movements, pedagogy, empirical research, and theory have intertwined to cast the processes, conditions, and environments of which writers compose. In juxtaposition with these movements, theories of social constructionism, actor-network theory, and posthumanism, has transformed the terrain of writing studies by considering the role objects play in composing from the writer’s perspective. In light of this view, I shift attention to the intellectual contributions these and other theories offer writing studies, but the tensions between the theories. For example, philosophers who work with object-oriented ontology consider the theory to move past the social epistemic nature of language, which abuts upon those scholars who see value in the invention created in discourse. Through a reading of literature in theories of social constructionism, actor-network theory, posthumanism, object-oriented ontology, materialism, and ideologies of cultural and social rhetorics, I aim to show the affordances and constraints of each theory. I argue for building a built ecological network theory—to bridge the gaps between the theories as a way to position algorithmic surveillance.

Under social constructionism, rhetoric has been viewed as the domain of human composing and processes, which has allowed humanism to take the grand stage in rhetorical
studies. However, theories that are more recent recast language and humanism by allowing other philosophical positions to emerge. In the late 1960s, Robert Scott (1967/1998) declared rhetoric as epistemic—that knowledge and truth are created through inquiry—through direct interaction with those in a particular discourse community. In support of Scott’s contribution, Michael Leff (1978) argued that knowledge is rhetorical because of the ways discourse enters into transactions with others. The birth of social constructionism also marked the linguistic turn that Richard Rorty (1989) contributed to in the 20th century by constituting that language creates its own reality. These intellectual influences have also helped rhetoricians theorize, for example, the rhetorical situation in Richard Vatz’s (1971) response to Lloyd Bitzer (1968), and the nature of language and rhetoric in cognitive studies (Flower & Hayes, 1981). Working with social constructionism provides the affordance of privileging language, but adds the constraint of seeing the world constructed through language. Richard Vatz (1973), for example, in countering Lloyd Bitzer’s (1968) treatment of the rhetorical situation stated, “To the audience, events become meaningful only through their linguistic depiction” (p. 4). For Bitzer, and for other social constructionists who share in this perspective, meaning is only created through the exchange of symbolic gestures and means. This view then privileges meaning making practices through language, and as a result has the power to potentially exclude or limit any other meaning practices that do not engage in a lingual transaction. Consider, in contrast, philosophers Graham Harman (2002) and Levi Bryant (2011) who work with object-oriented ontology (OOO), a metaphysical movement that privileges both non-humans and humans equally. Both reject Kant’s idea of the Copernican revolution that “knowledge conforms to objects” (p. 24) and as a result, knowledge becomes self-reflexive. Bryant (2010) splits from Kant’s view of the world and objects because of this self-reflexivity, as he noted that through the “. . . world, objects, will now
become simple products of human cognition and philosophy will become a transcendental
anthropology that seeks to investigate the manner in which this cognition forms or produces
objects” (para. 2). OOO philosophers, especially Bryant, maintain that objects exist independent
from cognition and language. This tension between social constructionism and object-oriented
ontology tells us much about the orienting philosophical worldviews that have become anchored,
through scholarly import, in rhetoric and writing studies scholarship. One side privileges
language and the other privileges the external reality of the world. It is instructive to attend to
this tension because moving past the linguistic turn offers renewed attention to the weight and
masses of objects, and allows consideration into rhetoricity and how such objects enter into
rhetorical acts and composing processes. However, we are still left with considering language’s
mediating role in describing such objects. The medium and construction of language offers a
vehicle, through metaphor (cf. Nietzsche, 1873/2001), to help describe these acts. If in the end,
some might argue that language still creates its own reality, thereby holding fast to social
constructionism, then can this not be one reality among many? Might we also offer alternative
realities that consider, also, the reality of objects removed from human language?

It is also worthwhile to explore how posthumanism and new materialism theories have
offered benefits and constraints to rhetoric and writing studies and composing processes. When
Byron Hawk (2007) addressed posthumanism in terms of vitalism in the humanities, he sought to
show the dense network of relations and assemblages (cf. Deleuze and Guattari, 1987) of human
organisms and technologies. For Hawk (2007), posthumanism relies upon Edwin Hutchins’
notion of distributed cognition (1995), and Katherine Hayles’ position (1999) that both humans
and non-humans have capacities to “think” in distributed cognitive environments for goal-
directed activity. Hawk (2007) argued that posthumanism allows for human consciousness and
for what he calls “post-consciousness,” i.e., a dispersal of cognition into the environment (p. 178), which includes non-human technologies. Hawk strategically developed a posthumanist position that considered human agency, but through multiple networked relations with other humans and non-humans. Posthumanism begins with consideration of the human, and disperses to non-humans through relations, which offers the affordance of considering how non-human objects [re]act to human cognitive stimuli. This position also brings forth a constraint, in my reading of Hawk, of subordinating objects. Pairing his work with political science theorist, Jane Bennett (2010) considered vitality emanating from non-human objects. She offered:

   By ‘vitality’ I mean the capacity of things—edibles, commodities, storms, metals—not only to impede or block the will and designs of humans but also to act as quasi agents or forces with trajectories, propensities, or tendencies of their own. My aspiration is to articulate a vibrant materiality that runs alongside and inside humans . . .” (p. viii)

For Bennett, to begin and end with the human in any philosophical enterprise means to “escape from materiality” (2010, p. ix). Her work thus finds agreement with object-oriented ontology as she also offers a theory of “thing-power” which “gestures toward the strange ability of ordinary, man-made items to exceed their status as objects” (p. xvi), but also provides a perspective of posthumanist discourse within new materialism studies that are informed by materiality and matter. In connection with rhetoric and writing studies, both posthumanism and new materialism provide a way to cast our field’s scholarly net into materialist studies. Both theories have similar traits and desires to consider non-human objects in networked relations. However, it is important to keep in mind that Ian Bogost (2012) elsewhere argued, “posthuman approaches still preserve humanity as the primary actor. . . . Posthumanism, we might conclude, is not posthuman enough”
The issue at stake for a type of study concerning materials and non-human objects is one that philosophically and epistemologically considers both humans and non-humans as having equal ontological footing, which may result in non-human objects entering rhetorical acts. As such, my work herein synthesizes these various positions to theorize ways non-human objects, i.e. computer algorithms, enter into persuasive acts, and as a result gain a sense of rhetorical agency. While I attend to treatments of posthumanism in our field’s literature, I also keep a keen eye on the broader orienting frames theorists use because their treatment maybe in service of casting a specific argument.

In summary, the field of rhetoric and writing studies is recognizing (and has been for some time) non-human objects as important figures in the rhetorical situation and canon. There are many theories that offer approaches for considering non-human objects as key elements; however, we have to be careful to keep focused on matter and materialism since such a focus signals researchers and educators to the rhetoricity of events, contexts, spaces, and places where rhetoric happens. In speaking of object-oriented rhetoric and in searching of our field’s “missing masses,” Scot Barnet (2010a) offered a message to our field, and it is a message that I share in:

Rhetoric’s material realms have been under-theorized and thus call for our understanding while at the same time intervening to add additional layers and complications that call into question our field’s own purifying impulse which so often serves to cast the human as the biggest and most celebrated start in the rhetorical theater. (p. 2)

This alerts us to a broader landscape of rhetoric—one that considers non-human objects as entering rhetorical acts and engaging in composing processes, such as the inputs and outputs of computer algorithms in digital spaces. Given the constraints of the theories addressed, if we
combine the affordances of the theories into a richer theory of material and human rhetorics and composing, we attempt to sharpen rhetoric to account for the rich domains and modes both non-human objects and humans engage within in their everyday moments, especially digital spaces that use web personalization to deliver customized content to front-end users using computer algorithms.

**Built Ecological Network**

What does the term “built ecological network” mean? More importantly, what does this theory offer rhetoric and writing studies that other ecological and complex system theories do not, especially in light of Margaret Syverson’s (1999) groundbreaking theory of an ecological matrix? By built ecological network, I mean a manufactured and natural rhizomatic network full of spatial, temporal, material, social, and lingual energy layers that enter into reciprocal and reflexive relations. This suggested definition is dependent upon multiple modern theories that offer unique perspectives on relations, transactions, non-human objects, and discourse practices. The theory does extend Syverson’s ecological matrix by introducing new theoretical lenses and by considering how objects might enter rhetorical acts, gain agency, and compose. However, before we come to terms with the full weight of theory, we first need to understand the nature of the term “built.”

**Shaping people’s morals with the City Beautiful movement.**

I borrow from urban planning and architecture when using the term, “built.” Specially, the term is most often connected with “built environment,” which provides an explanation of the manufactured urban cities, neighborhoods, and recreational spaces engineered for human activity and consumption. Built environments have been in existence for millennia, reaching far back to
the Greeks. Known as the father of urban planning, Hippodamus of Miletus, created the lavish city grid of Piraeus. According to Plato, Hippodamus divided the citizens into a class system of artisans, husbandmen, and those of the military. Additionally, Hippodamus divided the land into three parts: sacred, public, and private (see Plato’s Republic, VIII). Hippodamus’ work inspired countless city planners, builders, and architects over the centuries, especially Daniel Burnham and Fredrick Law Olmsted who initiated the City Beautiful movement in the 19th century. This movement provides a fascinating perspective on the ways people believed material and physical buildings, materials, and manufactured recreational areas shaped people’s thoughts and emotions. According to Julie Rose (1996), Burnham believed the creation of beautiful cities would inspire “moral and civic virtues” among its citizens (para. 7). Largely made up of upper-middle class white men, proponents of the City Beautiful movement believed that pleasing aesthetics in urban spaces inspired and shaped inhabitants to engage in certain social and cultural practices that promoted well-being and prosperity versus seedy corruption in local governments and businesses or other socially undesirable actions and traits.

What is compelling, but also ideologically problematic about the City Beautiful project is the suggestion that altering a city landscape can shape moral and civic virtues in society. One captivating perspective is the thought that material masses in physical spaces have the ability to shape and influence social, cultural, and economic growth. Indeed, as historian William H. Wilson (1989) noted of middle- to upper-middle class progressives involved in the City Beautiful movement, “They believed that they could reform through successive approximations of their urban ideal—a clean, beautiful, well-governed city—and eventually achieve a heaven on earth, secular in form though imbued with Christen principles” (p. 41). Of course, the creation and promotion of material aesthetics in city landscapes sponsors ideological assumptions about
class, race, sex, gender, ethnicity, and ability. According to Wilson (1989), this has not escaped the attention of several historical scholars; he noted that the, “City Beautiful environmentalism involved social control; a subject over which a great deal of ink has been spilled” (p. 80). He went on to suggest carefully that the type of social control employed was not coercive in nature, but instead relied upon an “inward” connection with one’s manufactured and natural surroundings. This idea is not unlike the experiences people have when visiting memorial sites and witnessing the power, awe, and—at times—the sheer silence the surroundings refract to each individual. In focusing on a hermeneutic reading, the visual and material elements of the Civil Rights Memorial in Montgomery, Alabama, U.S.A., rhetoricians Carole Blair and Neil Michel (2000) demonstrate how the materiality of the memorial in its locative space and place offer symbolic representation to those who witness and experience the memorial’s mass. I might also add that such an “offering” is similar in scope to the “emotional contagion” of the Facebook study on end users because symbols—whether they are alphanumeric representations or objects full of mass—provoke internal responses within people. In defining rhetoric’s scope and nature, it is apparent that objects have symbolic value in rhetoric’s scheme of communication.

Perhaps most arresting about the City Beautiful movement is the effects of the citizenry if taken to the extreme. For example, the intricate and highly stylized planning of such a project has been additionally realized, albeit fictionally, in the 1993 film starring Sylvester Stallone and Wesley Snipes, *Demolition Man*. While the movie centers around Stallone’s character, John Spartan awaking from cryogenic deep freeze in a dystopian 21st century to catch a deadly criminal from his past, Spartan finds himself in a seemingly utopic non-violent *city beautiful*-esque “San Angeles.” With the moral guidance of the city’s (seemingly) pacifist leader, Dr. Raymond Cocteau, the fabricated city inspires citizens to stay within the mores of created social
control, including regulations on sex and childbirth, and limitations on human vices. Quite literally, the surface of the city creates an appearance that crime, poverty, and hunger have been irradiated, all the while resistance fighters called the “scraps” live in poverty and experience food shortages underneath the city.

What this example reveals—at the most extreme—is that despite methods of carrying out a City Beautiful project, with the hopes of shaping citizens to moral and civic virtues to promote goodwill and growth, social conditioning also illuminates the overwhelming resistance and reaction among community members. The power of manufacturing the shaping of physical spaces to influence psychological, spiritual, and emotional acts, beliefs, habits, and practices helps illustrate the profound belief shared among people that manufactured objects shape human activity. What we have here is an example of influencing and shaping peoples’ thoughts, needs, and desires by way of physical materials. This may also give scholarly credence toward the Facebook emotional contagion study in future research.

The sense of shaping human activity through material objects provides a reciprocal and recursive process by which humans create and adapt materials in spatial and physical spaces, and in turn, those materials—whether they be skyscrapers or city parks—are active material constituents in shaping goal-directed activities carried out by humans. Since the process of creating and transforming spaces through material means is a complex endeavor, we also have to consider how objects figure in such a makeup.

A Primer to Network(s) Theory: An Object-Oriented Strand

Several rhetoricians and scholars have recently noted (Barnett, 2010a; 2010b; Brown & Rivers, 2013; Hawk, 2007; Rivers, 2014) that object-oriented ontology, the study of the being or thingness of objects helps expand the rhetorical tradition, and even how we come to understand
writing processes and composing. By focusing on important intellectual contributions by scholars from the late 1960s to approximately the early 2000s, attention to historical remapping of rhetoric and writing studies “missing masses”—what both Barnett (2010b) and Rivers (2014) term, have powerfully called attention to the role(s) that non-human objects play in composing. With this renewed attention toward objects in our field’s historical literature, I also shift attention to non-human objects to illustrate ways they help shape both goal directed human (and non-human) activity. It is my aim to explore the deeper tensions between human and non-human composing, but also to redirect our field’s attention from the Cartesian dualism that is embedded in our theories of composing toward a new post-humanist theory that accounts for both non-human and human rhetorical activity.

Most philosophers (not necessarily rhetoricians or writing studies scholars) familiar with object-oriented ontology (OOO) will grant that rhetorical activity is not the primary driver of the theory, as the purpose of OOO, according to Levi Bryant (2011) is to move past the two poles of ontology and epistemology that philosophical thought swings between. However, Scot Barnett (2010b) and Alex Reid (2012) have argued that rhetoricians may import the theory into an object-oriented rhetoric, a theory that extends rhetorical activity beyond the human sphere into the non-human. Observers of object-oriented rhetoric have tended to agree that the theory offers an investigative inquiry into range of rhetoric’s force (Barnet, 2010a, 2010b; Bay & Rickert, 2008). In contrast to the development of object-oriented ontology and rhetorics, cultural rhetoricians like Kristin Arola (2014), have discussed ways OOO/R is related to indigenous epistemologies. I understand Arola’s work with indigenous epistemologies as a way to acknowledge the birthright and existence of non-human objects—not for their sole existence to help humans, but for their own unique attributes that humans must honor and respect.
Alternatively, like David Grant (2014) who offered that objects, like the Lakota Pipestone that is an assemblage of temporal, spatial, material, and spiritual legacies that play key roles in the everyday practices of the Lakota people. While cultural rhetoricians are concerned with the increased use of object-oriented ontology in rhetorical studies because of issues related to coloniality and ideology, what the conversation tells us much about is the importance of objects firmly planted in future rhetorical studies. The contributions of those who work in philosophy, rhetoric, and cultural rhetoric provide a fertile terrain of studies. Adapting rhetoric beyond modal discourse conventions, i.e. oral, textual, visual, and aural toward the shape of activity and influence that non-human objects emit in their relations with other objects and humans, especially computer algorithms and how they shape human activity, invites dense relational networks of study, meaning making practices, and contributes to expanding the rhetorical tradition.

For a moment, it is imperative to attend to the conversations surrounding object-oriented rhetoric in recent literature, especially concerning the efforts to uplift and shift attention to how objects have already been part of our field’s literature. Jenny Edbauer (2005) helped to show us that Lloyd Bitzer’s 1968 argument on rhetorical activity was a key moment in placing objects on par with human activity. For example, Bitzer (1968) argued of the rhetorical situation, “. . . as a natural context of persons, events, objects, relations, and an exigence which strongly invites utterance” (p. 5, emphasis added). Jenny Bay and Thomas Rickert (2008) argued that rhetoricians might grant rhetorical agency to objects, especially through the theory of object-oriented ontology. A most interesting and compelling historical reading, Jason Palmeri and Kevin Rutherford (forthcoming) re-read Ann Bertoff, whom they acknowledge is not of an object-oriented ilk, to explore how Bertoff encourages students to use everyday objects to
illustrate commonalities, relations, and assemblages necessary for invention, which Palmeri and Rutherford (forthcoming) link to philosopher, Levi Bryant’s (2011) notion of “flat ontology”; i.e., all humans and non-humans have an equal ontological status. To summarize, objects have been and are worthy of rhetorical study, and give us the grounds for reexamining issues of the rhetorical situation.

In particular, rhetoric has been within the domain of human activity since antiquity. Isocrates, in “Hymn to Logos” declared that persuasion offered people a way to escape “the life of wild beasts” thereby separating humans from non-human animals. Speech and intelligence for Isocrates guided civic and participatory action in Greek life. Discourse provided a means for greatness among humans—of a fit and just life. Aristotle also took up rhetoric’s scheme by providing the organizational pattern needed to isolate and define the varying functions of human discourse. Objects in rhetoric’s theater have been mere props in the grander stage of rhetorical literature throughout the centuries. To locate and discuss objects as rhetorical entities displaces classical thought of distinguishing humans from all other entities, both animal and non-human objects. However, rhetoric has already concerned itself with objects with the ancient Greeks, thereby demonstrating rhetoricity in a fuller view. The origin of memory within the rhetorical tradition offers us a glimpse with how objects have played important roles within rhetoric. The invention of mnemonics, credited to Simonides, as first referenced by Plato, who witnessed the roof of a home cave in and crush fellow dinner party guests, is the first mention of memory in the rhetorical tradition. Because of the sheer force of the cave-in, the bodies could not be identified. Simonides, however, was able to identify the bodies because he remembered where each person sat at the dinner table. This event illustrates how necessary memory has been to the formation of thought and action (human rhetoric); however, the account immediately privileges memory as
essential to human experience all the while subordinating the objects of the room. Since this account, memory has persisted as a notion of a storage box and process for recording information (cf. Mary Carruthers). However, an object-oriented ontological approach allows us to consider the architecture of such a place—the very material mass that figured in mediating Simonides memory mechanism.

Across time and space, some objects show external signs of wear, age, and distress. The architectural space, we might say, has its own type of memory, one divorced from human memory. The ontology of an intercolumnner space—such as the one at the dinner party—presents us with multiple sites of being that offer speculation. First, there is the material property of such a space, including computations of mathematical size, material properties, and particle makeup. There are environmental factors that may alter the external visage, and in some cases the internal properties. Water damage to a large vertical space may weaken the supports. Sun direction and pitch may recolor the external appearance. Soot and dirt from storms or human and animal [mis]use may also alter the properties. There are also unknown changes that occur over time not visible to the naked eye, or simply not known since we cannot really know the “real” architectural space. I consider all of these environmental or ecological factors a type of memory formation that “recalls” in object-form an implication of memory other than what rhetoricians have defined as memory within the rhetorical tradition. While rhetorical memory is not the primary consideration of this chapter, this example nevertheless provides an illustration that non-human objects have an ability to engage in the exchange of energy, alter other objects, and create a symbolic exchange that becomes open to human symbolic interpretation and allows for the bracketing of “rhetoric” to fall in light of the rhetoricity of the totality of the context or event.
This concept is especially important to consider in light of computer algorithms because the abstract mathematical operations work through energy/data exchanges in their algorithmic processes, alter other computer algorithms, and create symbolic events for human and object action through algorithmic inclusion/exclusion and ideology. Take, for example, the Dow Jones Flash Crash of 2009 when a large sell of Procter & Gamble stocks prompted computer algorithms to go on hyper drive. Instead of the algorithms working in concert with each other, as is usually the case with high-frequency computer trading, the algorithmic models predicted the large sell as an indicator of financial turmoil, and began trading stocks. While the event is dubbed as a “crash” because the Dow Jones plummeted by 1,000 points, the algorithms did exactly what they were designed to do at the time—take data to make predictions and protect financial assets at all costs. The algorithmic processes (actants that move matter, signals, and bodies into action) process and organize information by their design, but also in a manner of algorithmic inclusion/exclusion of certain data and operating within ideological ways—in this case economic exchange for fast processes of trades. Because these algorithms operated out of human control, they had a considerable impact on the financial markets, world governments, and security exchanges. This example illustrates the performativity of algorithms, moving beyond Donald Knuth’s five algorithmic traits of finiteness, definiteness, input, output, and effectiveness, and demonstrating the profound influence algorithms have upon machine and human events and processes.

It is within this type of non-human and human symbolic exchange that I desire to situate rhetoric, vis-à-vis rhetoricity. In this context, the scope of rhetoric becomes widened to accept symbolic action outside of human language, but also one of burden upon both human and non-human actors to interpret the symbolic exchange within their own modes of knowing (humans
and some non-humans, like animals) and accepting or bearing (non-human materials) of action. If rhetoric is seen as the symbolic means of communication, then this definition creates a space to consider objects and how agency operates within those objects, as Bay and Rickert (2008) proposed. Reconsidering rhetoric and the rhetorical situation as inclusive of objects moves our conception of discourse out of human agency and into a domain of objects, but also into the networked relations and energy, layers the objects emit.

**Reciprocal and Reflexive Relations in the Network**

Like Barnett, Brown & Rivers, and Reid, I propose a [hybrid of an] object-oriented rhetorical theory, but I move within different wheelhouses and mixtures of existing theories to arrive at a built ecological network theory. By crossing different theory streams—so that a powerfully blended and complex theory may emerge—I have come to view rhetorical theory[ies] as a rhizomatic structure of relations between humans and objects. By rhizomatic, I am imagining Deleuze and Guattari’s (1987) sense of the rhizome, i.e., the assemblages that grown, shape, jut, and tear into strange makeups and fashions in response to physical and immaterial stimuli like the forces humans and computers algorithms exert when they dance upon the invisible codes embedded in motherboards and circuitry. By relations, I am calling upon Bruno Latour’s (2005) actor-network theory, the ethnographic methodology that traces the relations of humans and objects in networks, but also sociologist Edwin Hutchin’s notion of distributed cognition (1995), and Paul Prior, et al.’s (2007) remediation of cultural historical activity theory (CHAT) in remapping the rhetorical canon.

For what I see as complementary intellectual contributions in the rhizomatic structure, in actor-network theory, distributed cognition, and CHAT is the reflexive and reciprocal relations that exert energy, move to action, and communicate via symbolic discourse (whatever that
discourse might be—human and even non-human). Traditionally, reflexivity denotes self-directed action, but the term tends toward complexity, emergence, and regress. In Katherine Hayles’ *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (1999), she defined reflexivity as “. . . the movement whereby that which has been used to generate a system is made, through a change perspective, to become part of the system it generates” (p. 8). In Jorge Luis Borges’ short story, *The Garden of Forking Paths* (1941), he creates a labyrinth of infinite measure with Ts’ui Pen’s garden that opens up multiple paths, sequences, and dimensions; with each emergence of a new path, the garden generates additional paths. While the garden continues to infinitum, the system itself falls back on itself and creates its own type of contained structural reality. Within a reflexive system, reciprocal relations take root. For example, when computer engineers imagine and input (give) algorithms into digital spaces, the computer system assumes the functions of the code, and in turn generates (gives) a new system of coded elements for computer engineers to consider in their goal directed projects. The reciprocal and reflexive relations in each of these theories involve a type of energy exchange. We might consider how rhetoric figures in this energy exchange through multiple layers of social, cultural, environmental, spatial, temporal, lingual, and *human and non-human* dimensions.

Consider for a moment, how these reciprocal relations operate through the exchange of a layer of energy. In Bruno Latour’s *Reassembling the Social: An Introduction to Actor-Network-Theory* (2005) relations are what drive the network, “Being connected, . . . interconnected, or . . . heterogeneous is not enough. It all depends on the sort of action that is flowing from one to the other. . . It’s the work, and the movement, and the flow, and the changes that should be stressed” (p. 143). In Edwin Hutchin’s *Cognition in the Wild* (1995) cognition is an occurrence of activity
between different social, environmental, and technological layers of relations. In Paul Prior, et al.’s *Re-situating and Re-mediating the Canons* (2007), cultural historical activity theory operates in “situated, concrete interactions that are simultaneously improvised locally, and mediated. . .” (p. 17). While actor-network theory, distributed cognition, and cultural historical activity theory offer three different perspectives on social and cultural theories of action and cognition, the common thread between the three is the flow of energy that occurs between and among relations, but also through multiple layers of activity that may be bounded up in specific temporal and spatial positions.

In Paul Prior, et al.’s treatment of cultural historical activity theory, we see how the remapping of the rhetorical canon into rhetorical activity accounts for layers of activity. For Prior et al., these layers of activity are a Bakhtinan concept of laminated chronotopes, which Paul Prior and Jody Shopka (2003) configured as “a fractured ontology—a complex fluid unfinalized and unfinalizable world—in which representational chronotopes co-evolved with embodied chronotopes” (p. 186). The laminated chronotopes are layered time-space representational and embodied elements that co-exist in what I consider a rhizomatic fashion. For example, when a writer sits to compose a project, he or she has an exchange with representational ideas (thoughts about what to write next) that are later moved into activity (typing) using objects (the computer keyboard, the mouse, screen, desk, chair, and so on) within the spatial and environmental surroundings. Several dimensionalities—temporal, spatial, environmental, social, and so on—are embedded within this example of the act of writing. As this example begins to suggest, a rhetorical situation emerges, but a distinction of what is rhetorical within the dimension layers is what is at issue for a built ecological network theory.
Rhetorical rhizome.

In Lloyd Bitzer’s (1968) argument about the rhetorical situation, he remarked that scholars needed to understand how rhetoric emerges from an event. Largely, his important intellectual contribution figures rhetoric as a human endeavor resulting from an external epistemological occurrence, i.e., in order to engage in any rhetorical event, an exigence must emerge from actors, objects, and environments for a goal-directed purpose to involve an exchange of language. His work highlights that rhetoric comes into existence through the external situation, but not for the sake of situation, but for another purpose. Interestingly, he noted of rhetoric that:

. . . it functions ultimately to produce action or change in the world; it performs some task. In short, rhetoric is 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. The rhetor alters reality by bringing into existence a discourse of such a character that the audience, in thought or action, is so engaged that it becomes mediator of change. (p. 4, emphasis added)

Bitzer’s approach to defining rhetoric as a human-oriented venture, as well as positioning rhetoric through discourse has its own affordances and constraints in the larger rhetorical tradition. Locating rhetoric as a human endeavor means that Bitzer is responding to the historical lineage of scholarship of rhetoric reaching back to the ancient Greeks, whereby rhetoric has been largely concerned with the symbolic meaning-making practices among humans. Bitzer locates rhetoric within discourse, a linguistic property that arises in connection to internal and external stimuli or the “situation” that gives way to thought, communication, and action. He does go so
far as to include objects within his definition of a rhetorical situation, as I mentioned previously, but it is within the domain of what I consider as ontology—a material weight that “invites utterance” from humans (Bitzer, 1968, p. 5). Thus, objects, for Bitzer, are part of the network of the rhetorical situation that aid in human discourse. The leverage of energy exchange between objects in the medium of space and place are what give exigence for a <human> rhetorical event.

I think it is important to consider the importance of Bitzer’s contribution, in terms of what the rhetorical situation signifies for human relations and actions. He does give credence to the matter of objects within the rhetorical situation as important material masses that figure in shaping discourse. However, what if objects figured more prominently within the rhetorical situation? We might then ask, do objects engage in rhetoric? This question may seem out of the ordinary to consider because rhetoric resides at what I call the human-lingual level of energy exchange, that is frequency of energy that exerts symbolic action at the linguistic level among humans, which I discuss in the next section. But, what if rhetoric can reside at a non-human lingual or physical level of energy exchange? What, then, does rhetoric look like? Object-oriented ontology offers us an alternative vision of Bitzer’s rhetorical situation; we might see the rhetorical situation as a complex interplay of both humans and non-humans who ‘alter reality by refracting the energy exchanged between objects. We may also consider rhetoric to include non-human symbolic events or gestures that lead to shaping or altering non-human masses, action, and human thought and action. This claim arises from the previously mentioned layers of activity, but also the “built” nature of manufactured objects, and how objects have figured in shaping human (and non-human) activity.

It is then within the rhizome that the rhetorical situation takes shape through the relations between objects and humans. The rhetorical rhizome is not easily illustrated. It is fluid, dynamic,
and constantly adapting to temporal, spatial, and material forces. It is nebulous; it is always fleeting. The rhizome does not have a beginning or an end, and the rhizome is non-linear in nature. This is precisely what the rhetorical situation embodies—a non-linear and chaotic network of multiple relations in different energy layers, i.e., physical, lingual, material, and so on. Imaginatively, the rhizome brings forth the relations between these energy layers, allowing the reciprocal and reflexive relations to come into being with each connection. The rhetorical rhizome is not representable by a grid, triangle, or an image of sorts because of its chaotic and non-linear nature, but also because the visual power of such a visual construction is a falsehood. A 2D image of the rhetorical rhizome will always appear to have a beginning or ending. The image will always appear to be linear in some fashion, even if it is jumbled-up roots.

Ecology.

Another facet of this theory is the notion of “ecological” or even ecology broadly conceived. Although the term “ecology” has been given its fair share of definitions and uses within our field, I have come to think of ecology as a study of relations of organisms to their natural or manufactured environments. This definition is not unlike Syverson’s explanation where she suggested, “ecology is a set of interrelated and interdependent complex systems” (1999, p. 3) or even Gail Hawisher and Cynthia Selfe’s use of “cultural ecologies” paired with literacy and technological development as an “attempt to signal the complex web within which both humans and computer technologies coexist, and all communication takes place” (2004, p. 644). Additionally, information and computer sciences scholar Bonnie Nardi and Vicki O’Day (1999) defined “informational ecology” as “a system of people, practices, and technologies in a particular local environment” (p. 49).
What is important about these three definitions is connection or the inter-relations that occur within systems, webs—or even networks (of any size). If we were to take a snapshot of a rhetorical rhizomatic event, we discover multiple energy layers that help us focus attention upon the various configurations of space, time, material, social, and lingual mediations. Some of these layers play a larger role than other layers, depending upon the fluctuations of the layers in response to stimuli.

In Margaret Syverson’s ecological matrix (1999), we see how the attributes of a complex adaptive system (distribution, embodiment, emergence, and enaction) along with attributes of such a system (physical, social, psychological, spatial, temporal) operate and flow within rhetorical events. Her work highlights a complexity of a rhetorical situation, one that she saw had “not been addressed by theorists in rhetoric and composition” and “why so many existing theories are so unsatisfactory and partial” because of the attention toward the rhetorical situation or canon, instead of the dimensions and attributes in an ecologically complex system (p. 23). The built ecological network theory, in many ways, picks up where Syverson’s work left off, only because at the time of her writing, she realized that “there ha[d] been surprising little attention directed to the physical, material circumstances of writing” (p. 25). By focusing on materiality and non-human objects, the relational theory of writing helps us consider the composing practices of both humans and non-human objects. However, I want to claim a transformative middle ground in developing this theory by considering how an ecological approach to technology can yield rich engagement.

Technological ethnographers, Nardi and O’Day (1999), clearly view the informational ecology theory as emanating from human activity and relations. In their ecological work, they carefully approach framing orientations and relationships to technology by turning to the
metaphor or tech as “tool,” “text,” “system,” and “ecology.” Nardi and O’Day (1999) noted that humans use the tool metaphor for goal-directed activity. By using a computer, for example, to communicate with loved ones over email, technology serves people in staying in touch with others. However, they also observed that technology gives way to “affordances” or features a person perceives a tool has embedded within the object.

Nardi and O’Day (1999) did not claim to dispense with viewing technology as tools, on the contrary, they asserted the tool metaphor helps us understand better the “utility, usability, skill, and learning” (p. 30) associated with the tool. They pointed out that this orientation helps people select technological tools based on certain social (or, what I would say, rhetorical) situations, and arguably, audiences and contexts. But, their discussion does not leave off with the tool metaphor, but extends into understanding technology as text or “carrier of meaning” (p. 31).

Because technology has the capacity to act as intermediary of human activity, but also be the medium of such transactions, the perspective of technology as text allows writers to theorize the relations between and among humans and the artifacts of technology. No longer is the technological tool of a smartphone, just a device to send text messages, but it is also a virtual carrier and avatar for the human, physical body, as Nardi and O’Day (1999) noted. The reading of technology becomes an integrated act, when the medium of message transmission across time and space also carry their own ideological assumptions about access, power, and privilege. Similarly, as Cynthia Selfe (cf. Beck, 2013) has reminded us, we have to pay attention to the ideological freight of technology—and distinguish between objects, people, action, and beliefs, especially in our composing and writing contexts. To use technology to type a report to meet a deadline is one matter, but to type a report in Microsoft Word versus Apache OpenOffice suggests ideological and social concerns about closed and open technological systems. However,
even more so what arises when millions of people privilege certain technological tools over others.

Of all the terminology to describe the relations among technological artifacts, “system” presented Nardi and O’Day (1999) with the most fertile, yet puzzling viewpoint. To say that technologies comingle in a system for Nardi and O’Day (1999) means to consider a large-scale technological network that is too unwieldy to analyze. By considering, a more hospitable approach that highlights all the actors and objects—such as ecology—provides a set of points and processes in a complex, and always shifting, environment.

Taken together, that is technology as tool, text, system, and ecology, Nardi and O’Day’s intellectual contribution offers rhetoricians and the larger scope of this project a sense of entry into the rhetorical, social, and cultural practices, actions, and associations of technology (1999). The leverage point for this project in particular lies in the dynamic and transformative potential technologies, such as computer algorithms, possess when viewed from multiple and intersecting energy layers. It may be that a computer algorithm is a tool to gather information about people’s habits online, but multiple computer algorithms in a social media site like Facebook, a part of a larger textual fabric with competing ideological factors and actors. More importantly, computer algorithms exist in a larger ecological networked system whereby whole transmissions and distributions of data participate in a wider circulation of influence and persuasion. For writers on the web, the participation in spaces that use computer algorithms has the potential to influence the behaviors and actions of the composer.
Energy Layers

To understand better the energy layers that are bounded up in reflexive and reciprocal relations, I offer six layers that make up the space, time, material, social, lingual, and dynamic components of a rhizomatic rhetorical event.

Spatial directs our attention to the very spaces that objects and humans take up. Space is the grounds upon which invention takes place. According to Derrida, space or *khôra*, concerns itself with negation and simultaneously the process of becoming. Space takes in information, but is also effaced and remains blank. Thomas Rickert (2007) noted that for Derrida, invention is *khôra*-ic in nature, “. . . it gives rise to discourse and withdraws from that discourse” (2007, p. 265). Space is the foundational layer of energy to any rhetorical rhizomatic network, and is additionally bounded up temporality.

Temporal involves the time-making properties that account for a linear flow of activities from a beginning to an end. All humans and non-human objects are bound to temporality, however gauged by various timekeeping practices or not. Syverson (1999) pointed out that there has been scant development in writing studies scholarship of temporal discussions beyond “programmatic assertions” (p. 21). She additionally remarked that such considerations, “. . . serve to flatten the real historical dimensions of any event, activity, state, or process” (p. 21). Building upon Hutchins’, Syverson explained that when a snapshot or singularity of a temporal event occurs, it diminishes all other complex temporal events lived and carried out by other humans and non-humans. However imperfect such a temporal selection may offer, the method of exploring composing over a period has given those in our a field a rich and nuanced understanding of writing development from such powerful contributions of Janet Emig (1971), Sondra Perl (1978), and Nancy Sommers (1978).
Material involves all of the matter and masses of non-human objects, and even humans as a type of material substance made up of flesh, muscles, and bones. Material accounts for the minutia of particles and stuff of atoms to the chemical bonds in water, copper, or dust and to the larger masses such as seashells, tree bark, graphite, glass, and plastic computer keys. These materials have the potential to shape other materials and humans through relations and interactions. Foregrounding the discussions of materiality in writing studies are projects by Jennifer Bay and Thomas Rickert (2008), Scot Barnet (2010a; 2010b), Jim Brown and Nathaniel Rivers (2013), and Alexander Reid (2012).

Social is the goal-directed activities that humans engage within in cultures and societies. This particular layer of energy flows through multiple social environments, including, but not limited to local and global governments, financial and legal systems, political and social justice movements, workplace settings, theological and spiritual engagements, familiar and friendly relations, and technological mediums like the Internet or the Darknet.

Lingual accounts for the symbolic meaning making practices of humans and non-human animals. This layer is somewhat similar to Prior et al.’s notion of “representation” where “discourse is entextualized in talk, text, and mind . . . [and] highlights semiotic codes, discourses, [and] genres” (p. 20). Considering that writers and composers use language practices to create meaning both internally and externally, this layer of energy provides a range of broad practices that writers engage including embodiment of language, entering into discourse communities, and sharing beliefs about language.

Dynamism provides a multidimensional perspective that joins Nardi and O’Day’s (1999) definitions of tool, text, system, and ecology (1999) in ways to illustrate multiple dynamic identities a technological or biological signified can carry in any given situation.
It is within this ecological model that we arrive at a problem for how rhetoric figures in the energy layers. As Prior et al. (2007) noted, “the prototypical scene of rhetoric . . . [is] grounded in a speaker and hearer, essential in monologue (even if turn-taking creates a chain of monologues)” (p. 9). For example, when a writer engages in typing words into a word processing software program, he or she is engaging multiple energy layers. First, he or she is engaging in space. A space that the writer inhabits physically, the space of the computer screen, the space of the computer’s short- and long-term memory as stored in temporary files and in hard drives. Second, the writer engages with temporal energy layers that spread across local and global passages where multiple events and people engage in transactions, including the writer sitting at the screen. Third, he or she is surrounded by and uses particular materials within the environment, including the surface(s) he or she rests, the objects in the space that serve as decorations or functional/useable objects for the writing process like a computer, voice-recognition software, a pen, and so on. Fourth, he or she might be engaged in an inter-personal social process of writing by sharing collaborative drafts with writing partners. Nevertheless, all of these layers do not necessarily find themselves within the traditional terms of rhetoric, as the final layer, the lingual layer, is synonymous with rhetorical design. For historical and traditional purposes, rhetoric is currently seated at the lingual and human layer of energy. And, yet with the contributions of actor-network theory that allow for the tracing of relations, the reciprocal and reflexive relations between humans and non-human objects, and object-oriented ontology, we may consider rhetoric also becoming part of another layer of energy, that is the material layer. Objects may enter symbolic energy exchanges that exert force as well as shape other elements and people as a result. Reconsider the example of the intercolumnner architectural space and all the elements that exert force and shape the physical properties of the space. Also, consider the
example of the City Beautiful movement, i.e. to create physical spaces of such aesthetic appeal that people’s morals become shaped by the environment. These are examples that help us reconsider how rhetoric is additionally something other than human discourse and language.

The energy layers that are outlined above are not necessarily concrete categorizations of flows and exchanges of energy, but are fluid and dynamic layers that intermix with other layers within the rhetorical rhizome. The dynamic level helps to account for this exchange since people and objects have multiple identities and makeups. Additionally, the energy layers listed are by no means exhaustive. I view them as partial and incomplete. The rhetorical rhizome constantly shifts and is adaptive to new stimuli. I also want to leave this theory open to future scholarship that may account for concepts not accounted for herein.

The theory of the built ecological network gives us more insight into the relations of humans and non-humans in composing networks, as well as how non-human objects enter into rhetorical acts, gain agency, and as a result enter into composing situations. It is precisely because the theory expands rhetoric’s philosophical and methodological scope to account for non-human objects. If we continue to discover all the actors and objects involved in a composing process, and if we come to respect and honor, in a cultural rhetoric sense, the very objects that surround us, we may also learn that humans are not the only ones who enter into goal-directed activities. Of course, the way we have figured symbolic nature of rhetoric may not end up being a respectful or honest descriptor of non-human rhetorical events and composing practices, but in the service of intellectual discovery, we do need to recognize the dynamic nature, traits, attributes, embodiment, and actions of all the objects that surround us on a daily basis.

In the chapter that follows, I explore how the built ecological network theory functions through a case study of computer algorithms, and I will look more closely at how these
algorithms that operate in digital surveillance environments have a type of rhetorical agency and engage in composing events. All the while, I keep in mind that the insight of this theory helps us consider the complexity of writing and rhetoric from a non-human perspective.
CHAPTER THREE:
PERSUASIVE COMPUTER ALGORITHMS: A CASE STUDY OF GOOGLE’S PAGERANK ALGORITHM AND THE DYNAMIC WEIGHTED ALGORITHM

Algorithms are becoming ever more important in society, for everything from search engine personalization, discrimination, defamation, and censorship online, to how teachers are evaluated, how markets work, how political campaigns are run, and even how something like immigration is policed. – Nicholas Diakopoulos

While computers were originally built to compute data and exchange information across distances, engineers quickly realized the potential to integrate persuasive technologies (Fogg, 2003) into computing machines. A persuasive technology is any type of human or machine behavioral, directional, or attitudinal change resulting from the interaction between humans and technology. More specifically, because of the design of the underlying architecture—the algorithms and databases of the computing technology—the algorithm may be able to encourage, influence, and motivate front-end users toward certain actions. Take for example the recommendations feature on Amazon.com. Amazon does not just process orders and mail products to customers, but the site—through algorithms—monitors and records clickstream data, i.e. items a user has clicked on, but not purchased, as well as recording purchases to offer recommendations of other products the user may be interested in the future. The simple act of a person engaging with a site like Amazon serves as a prime example of a persuasive technology in action: the design of the recommendations encourage and influence future purchases.

While persuasive technologies can now be seen just about anywhere—either in real life or in conceptual form—thanks in part to the “Internet of Things,” the movement briefly discussed in chapter one, to place censors in everyday objects like smoke detectors, thermostats,
refrigerators, even outdoor grills—the focus for this particular project remains with the persuasive technologies, i.e. algorithms embedded within online and mobile app technologies. Because there were over 204 million people connected to the Internet in the United States in July 2012, according to a Neilson (2012) report on social media use, the study of persuasive algorithmic technologies is of interest because it affects a diverse population.

In addition to the influence of persuasive algorithms, rhetoricians and writing studies teachers and researchers who interact with such technologies also must attend to the internal mechanisms invisible to end users of these products. This invisibility echoes what Bolter and Grusin’s (1999) “immediacy” or medium disappearance. People who engage in screen life, i.e. connected to things with screens—televisions, smart phones, computers, etc.—absorb immediacy every day. When shopping on Amazon, for example, the user may forget ze is interacting with a computer screen, mouse, and sitting in her or his office. The graphics and text on the screen engages hir to suspend physical engagement with the surroundings in favor of immersion into the reality the screen displays.

When persuasive technologies fade into the background, then that is where, as Cynthia Selfe (cf. Beck, 2013) remarked, ideologies work the most strongly. Rhetoricians and writing teachers are poised to understand and pull apart the critical apparatuses of persuasive technologies because we already have the rhetorical design and theoretical understanding of rhetoricity to recognize persuasion and influence. Through rhetorical inquiry and analysis, researchers can identify the persuasive strategies these technologies use, and even understand the systems architecture—the operating code and algorithms that influence machine operation. Moreover, researchers in rhetoric and composition are equipped to address the ethical concerns with persuasive technologies and argue for new research into the possibilities and constraints of
persuasive computer algorithms through algorithmic processes inclusion/exclusion, and ideology. In light of broader public and disciplinary calls to learn to read and write computer programs, rhetoricians and writing teachers must examine how computer code, including algorithms, read and write people through persuasion and agency, since high-technology cultures use computer technologies to write and communicate. While much of this chapter concerns itself with a case study of persuasive computer algorithms, I take up these concerns in the discussion section as well as in chapter four when I discuss the application to rhetoric and writing studies, specifically critical technological literacies and digital rhetorics.

In this chapter, I examine the built ecological network of Google PageRank, an algorithm designed to weight the importance of web pages in search engine results and a dynamic weighted algorithm used for web personalization. The results illustrate how the algorithmic architecture, design, and processes operate as part of a networked system. More importantly, how this persuasive technology results in a symbiotic relationship between the user and machine, and what this connection means for rhetoric and writing studies. First, I provide background on computer algorithms in general to help situate algorithms as a type of persuasive technology.

**Persuasive Computer Algorithms**

Algorithms need not be software: in the broadest sense, they are encoded procedures for transforming input data into a desired out, based on specific calculations. . . . We are subjecting human discourse and knowledge to these procedural logics that undergird all computation. –Tarleton Gillespie

Within computational culture, computer algorithms imbricate the association of object as machine operation and as actant operating with rhetorical agency. At the root of algorithmic structure, algorithms follow a logical pattern of “if_then” statements to capture input data to
process outcomes built into the algorithm. Tarleton Gillespie (forthcoming) noted in “The Relevance of Algorithms,” that computers are “algorithm machines—designed to store and read data, apply mathematical procedures to it in a controlled fashion, and offer new information as the output” (p. 1). The goal of algorithms is only to function within the parameters of their design, rather than to create alternative calculations based on social, cultural, and political choice. Algorithms do not have the corporeal consciousness to create new pathways deviating from their design, and yet the architecture of the algorithm asserts an ideologically bound proposition claiming discursive formations of social, cultural, and political systems of thoughts and beliefs, which allows a performative agency to manifest.

Drawing on a wider net of algorithmic definitions, it is important to note that algorithms transform data for information exchange. What is clear about algorithms is their underlying mathematical operation and structure—a set of instructions or coded processes; however, the seemingly objective definition and arrangement of algorithms elides the underlying ideological suppositions. Gillespie (2013) referred to the ideological computer algorithm as “producing and certifying knowledge” because “we are now turning to algorithms to identify what we need to know. . . as momentous as having relied on credentialed experts, the scientific method, common sense, or the word of God” (p. 2). Not surprisingly, computer programmers and scientists come to view algorithms as coded logic for processes of if \( x \), produce \( y \) (cf. Knuth, 1973). Wendy Hui Kyong Chun (2011) remarked upon this perspective in her book *Programmed Visions* by additionally calling attention to the work of media and culture theorist Alexander Galloway, who remarked:

> The material substrate of code, which must always exist as an amalgam of electrical signals and logical operations in silicon, however large or small,
demonstrates that code exists first and foremost as commands issued to a
machine. Code essentially has no other reason for being than instructing some
machine in how to act. . . . to see code as subjectively performative or enunciative
is to anthropomorphize it, to project it onto the rubric of psychology, rather than
to understand it through its own logic of ‘calculation’ or ‘command’ (cf. Chun,
2011, p. 22).

To view computer code and algorithms as commands that execute actions overlooks algorithmic
processes, algorithmic inclusion/exclusion, and algorithmic ideology and what Katherine Hayles
called the performative nature of code. Hayles noted, “code running in a digital computer causes
changes in machine behavior and, through networked ports and other interfaces, may initiate
other changes, all implemented through transmission and execution of code” (qtd. in Chun, 2011,
p. 22). On one layer, the execution of code causes machines to move—to act. Whether it is
robotic arms smoothly shifting directions at the press of the operator’s button or altering the
functionality of the computer at the command line, the underlying algorithms act with purpose
and agency to perform change. On the other layer, the algorithms perform such tasks through the
coded operations and instructions organized by computer scientists and programmers to fit
certain ideological orientations. The algorithms, residing in computer code, are reading and
writing data for certain functions. Whether it is ranking websites based on backlink data versus
ranking sites based on user database information for relevance, the performativity of the
algorithms functions as representative of the reality constructed by those who create the
algorithms for people. In other words, algorithms operate with a local agency, designed with
conditions set by programmers to structure the digital realities in online and webbed spaces—and
in a sense “code” humans to operate in narrowly defined ways.
Therefore, according to Latour’s assertion that non-human entities act with agency and ontology (1999), algorithms are languages that perform action and exist with inherent properties that mark algorithms as phenomena. According to Latour’s proposition, material objects do not exist solely in the consciousness of the human mind, but rather circulate in a network of human and non-human associations of actions. The phenomena of algorithms exist ontologically inside the silicon chip memory boards of servers across the globe, but also in interaction with database information stored in server spaces.

Furthermore, as algorithms perform actions, they take on performativity of embodying and rejecting both subject and object relations. They reject the Cartesian dualism of experiencing the world through the mind/body split, and serve as a prime example of rhetoricity in action. The algorithm as subject has its own type of command experience that distinguishes itself from other algorithms and materials. The code takes on the role of material actor—of the Daesin—that operates by taking in database inputs to perform actions. While the algorithm is not the autonomous subject a la the tradition of German idealists like Kant or Hegel, the posthuman position espoused by the likes of Katherine Hayles and the object-oriented ontology philosophy given by Graham Harman promote performativity of material objects—those that exist outside of human consciousness—as having ontological weight and epistemological status by the temporal, spatial, and material weights they bring to bear in a network of relations. In one sense, the algorithm embodies the subject by acting by its design—its own form of material conscious—to produce outcomes. In another sense, the algorithm is also an object that exists as separate from human consciousness and as a relation to human existence and action. Once an algorithm takes in input data, the algorithm functions as a performative through algorithmic inclusion/exclusion, in even rhetorically persuasive form that produces certain outcomes, and demonstrates a
rhetorical context and event. As observers and recipients of algorithmic events, users and rhetoricians have to consider the ecological and networked landscape of algorithmic functions to realize the different agent functions and discursive practices that fluctuate in an always-changing topography of temporal, material, and social systems.

The examination of algorithms and their performativity offer interplay between rhetoric and rhetoricity, thereby calling attention to the rhetorical event and all that surrounds in an ecological network. Rhetorically, algorithms interpret data to produce certain outcomes. However, if rhetoricians view algorithmic operation strictly as a rhetorical event, the vision conceals the rhetoricity of underlying mechanisms of the entire ecological landscape, including machine operation, information flows across networks, embedded ideologies in the algorithms, and even the spoken, gestural, and affective responses people have to algorithms & persuasive technologies. Through this project, and particularly the case study in this chapter, this work illustrates how a built ecological network taps into the rhetoricity of machine and human reading and writing practices with the embedded energy layers in mind.

On terms of a performative computer algorithm, persuasion plays an important role in the overall design and functionality of the coded processes of algorithm, which leads to understanding algorithms as functioning on a scale of social, political, and cultural biases thus further contributing to the rhetoricity of algorithms. The algorithms Google uses to rank websites—or what Google calls “relevance,” is a value-laden statement because the underlying design of the algorithms connect to the ethos of academic peer review as a reliable method of valuing work objectively. As Gillespie (2013) noted, “‘relevant’ is a fluid and loaded judgment, as open to interpretation as some of the evaluative terms media scholars have already unpacked, like ‘newsworthy’ or ‘popular’” (p. 9). Algorithms take input from people’s actions, and the
algorithms’ design operates when parameters within the data are met. Computer engineers, scientists, and programmers code those parameters, a process that allows bias to creep into the code. However, in evaluating relevance, Gillespie treats the value-position of the algorithm as relative to individual or collective human perception of what might fit given certain circumstances, because as he sees it there is no scientific method for discerning the most correct or truthful relevance of what the algorithms produce when weighting different data. He also noted that any accusation of bias constructed into the algorithm “implies that there exists an unbiased judgment of relevance available,” (p. 9) making it difficult to ascertain the merit and weight of relevance. While I appreciate Gillespie’s position on bias in algorithmic culture, I also see merit in positioning algorithms not as a biased/not-biased binary, but of a dynamic agnostic abstraction where some algorithms may contain more bias than others position. It may be that the biases contained in algorithms are or are not as noticeable to certain users because the outputs align with their ideological belief systems or it might also be that the algorithms lean toward more mathematical outputs that perhaps do not favor a biased approach to computation. This sliding scale approach reminds us that bias may be easily detected or embedded further in the algorithm. Regardless of the weight of the bias, researchers must attend to the persuasive algorithm to appreciate how the code influences political, social, and cultural lives, especially when trillions of bits of data are aggregated, indexed, and culled through potentially to make decisions that affect millions of lives.

The Broader Picture of Algorithms and Data Analytics

New technologies, especially algorithmic technologies, offer innovative ways of gaining insight into human behavior, which represents revenue for companies and organizations. Within the business community, data analytics has a reputation as a profit savior for companies by
gaining key insights into customer behavior by accessing vast quantities of what is called “big data.” Thomas H. Davenport, Paul Barth, and Randy Bean (2012) described big data as the clickstream data from the web, social media content (tweets, logs, Facebook wall postings, etc.) and video data from retail and other settings and from video entertainment. However, big data also encompasses everything from call center voice data to genomic and proteomic data from biological research and medicine. (p. 4)

Essentially big data are any data that can be collected, analyzed, and calculated for greater understanding about a topic, pattern, good or service. For companies looking for a competitive edge over the competition, big data represents a paradigm shift in managing: organization and employee labor; efficiency in manufacturing and computer processes; economic and political market trends; and observing and potentially persuading customer’s behaviors and everyday practices. Certainly, industry leaders are taking notice. In a data and analytics survey of more than 2,500 business executives, managers, and analysts conducted by MIT Sloan Management Review and SAS Institute (2012), the organizations found that 67% of the respondents reported a “moderate competitive edge” in their business practices by using data analytics. These findings additionally support an earlier white paper authored by James Manyika, Michael Chui, Brad Brown, Jacques Bughin, Richard Dobbs, Charles Roxburgh, and Angela Hung Byers (2011) from the international consulting firm McKinsey & Company that hailed big data as the next wave in competitive business practices to unleash greater revenue potential for companies.

Conversely, within the surveillance studies scholarly community, data analytics and big data practices are met with caution by scholars. The majority of messages companies deliver
about data analytics focus on projecting a pathos and ethos of helping consumers with better recommendations, when in reality the companies harvest terabytes of data for future revenue. Surveillance studies researchers remain suspect because the collection of such data comes from prosumer\(^3\) labor with little remuneration of fair market value of the activities people perform. Additionally, another reason surveillance studies researchers approach data analytics with suspicion rests with what Sara Degli Esposti (2014) called “behavioral manipulation,” which she defined as the “phase when ‘actionable insights’ gathered as part of analytical intervention are transformed into initiatives or artifacts conceived to modify people’s behavior” (p. 12).

Behavioral manipulation is emotionally neutral given that the shift in a person’s behavior can encourage perceived healthy and unhealthy habits; say print out checkout coupons for discounts on vegetables or, conversely, coupons for pizza and ice cream. However, the modification to behavior, in this case, results from the commodification of prosumer data by computing machines. For example, many grocery store registers and store loyalty programs have computer algorithms that execute programs from input data of a customer’s order to create personalized coupons for additional products and future purchases. By recording the customer’s activity and buying habits, the company transforms the energy the customer generates from physically shopping and purchasing products into monetary value. By providing a coupon, the grocer potentially persuades, through a discount on certain brands and products, to make a future purchase. The company that owns that particular brand profits if the customer makes the future purchase with the coupon, and so does the grocer if the customer purchases the product in the

\(^{3}\) A portmanteau of producer and consumer, the term first appeared in the early 1980s as an acknowledgement of the shift from a production-based economy to symbiotic producer/consumer economy where consumers provided feedback on goods. The term is now commonly invoked in connection with social media sites and the unpaid labor companies collect from the activities of front-end users. George Ritzer and Nathan Jurgerson (2010) have an excellent article outlining the prosumer economy.
store. From the point of view of the customer, what generally matters is the deal and the product, not necessarily all of the other behind the scenes mechanism and kickbacks. Because of the increasingly saturated culture of surveillance, customers and end users of websites may start to understand that habits and activities are monitored and recorded, sometimes with the express intent of changing behaviors. Nonetheless, these companies use algorithms as a mode of surveillance to collect data for revenue, all without compensation to prosumers.

While data analytics represents revenue for companies and concerns for scholars in surveillance studies, rhetoricians and writing teachers and researchers need to shift their attention to the underlying persuasive technologies embedded in data analytics. All too often, we write and communicate in webbed spaces that track our habits and shape the information content we research and write about in our projects. We risk a great deal by not focusing our attention on algorithms that track our writing research; these programs bear a great deal of ideological freight when providing personalization in our digital spaces. When the algorithms change behavior and alter the flow of information that writers and composers in our field use for research and teaching, then we must, in the words of Cynthia Selfe (1999) pay attention to the underlying social, political, and cultural systems at work beneath the interface, but more importantly to the rhetoricity of the ecological network algorithms are part of.

**Working With and Without Access to Proprietary Algorithms**

While part of this project seeks to understand the mechanisms and structure of computer algorithms in order to discuss the operations of them more fully, full access to Google’s PageRank algorithm is limited to what is available through Larry Page and Sergey Brin’s 1998 article, which I will discuss more fully in the following sections. With this said, I am also sensitive to the argument Gillespie (2013) made about criteria for evaluating algorithms—that
such criteria is “hidden” because the algorithms are hidden from users, still proprietary algorithms must also be hidden because to open the algorithms to public scrutiny risks a company’s revenue stream. This means there is a tension in choosing an algorithm that is proprietary and not fully available.

I selected Google’s PageRank algorithm for two reasons: The mathematical equations at the base of the algorithm are available publically thanks to a research paper authored by Larry Page and Sergey Brin; and the algorithm and supporting textual elements connect to the canons of invention and arrangement, to logos and ethos, and most importantly to the built ecological network. However, the algorithms Google uses today for their search engine rankings extend well beyond the initial PageRank algorithm that uses over a previously reported 200 signals to weight pages (Sullivan, 2010), and PageRank is only one of those signals. While Google will not release the proprietary algorithms on all of the signals used, the equations in the early Page and Brin article illustrate the command structure of the algorithm. More importantly, the textual evidence supports a rhetorical orientation toward organizing and structuring a digital system that allows the algorithm to rank websites and engage in a form of persuasion.

Additionally, I chose to analyze an algorithm created by K.R. Venugopal, K.G. Srinivasa, and L.M. Patnaik (2009), in their book chapter, “Algorithms for Web Personalization,” because the algorithm is readily available in the chapter and their results claim that the algorithm provides better website results than Google’s PageRank algorithm. Their chapter also provides textual support for how algorithms operate as a web personalization method, which offers background evidence into the persuasive mechanisms of such an algorithm.
Background on Google PageRank and the Dynamic Weight Algorithm

Larry Page and Sergey Brin (1998) first developed Google PageRank while students at Stanford University to rank the “relative importance of web pages” in an “objective” manner (p. 1). Their argument positioned the World Wide Web as an unorganized hyperlinked frontier, prime for digital architecture and orders to help “inexperienced users” (p. 1) retrieve relevant web pages faster through search engine results. Contrasting the quality control of academic citation analysis to the rise of easy-to-create webpages, Page and Brin positioned PageRank as an ethos-baring evaluation method for ranking webpages on the web. By creating the connection to the ethos of academic scholarly citations, the creators ideologically positioned PageRank as an objective measure of assessment for “search, browsing, and traffic estimation” (p. 2).

PageRank works by calculating a numeric value and assigning it a page to rank the page’s importance on the web. It is a type of voting system, where the more votes cast means the more important the page. When PageRank ranks a page as important, the webpage shows up in the upper levels of search results. The implications for having a higher ranked page in the world’s leading search engine have been well documented by industry experts and academics, and are not the primary discussion of PageRank herein. Suffice it to say, PageRank and the other signal factors Google uses to evaluate and assess webpages can significantly financially impact businesses.

The equation of the original PageRank works by calculating the number of outbound links on a webpage and adding a damping factor (a probability calculation that a web surfer eventually stops clicking on hyperlinks). From here, PageRank figures the “share” of hyperlinks between pages, with the more shares between pages resulting in a higher ranking because the
equation, and resulting computer algorithm, assumes relative importance based on the number of shares or connections between webpages.

The language within 1998 publication promotes PageRank as an objective and conventional way to assess the importance of webpages and to organize the web in a search engine for inexperienced web users. The following passage illustrates an ideological position for the efficiency and application of PageRank:

Using PageRank, we are able to order search results so that more important and central web pages are given preference. In experiments, this turns out to provide higher quality search results to users. Th [sic] intuition behind PageRank is that it uses information which is external [sic] to the web pages themselves—their backlinks, which provide a kind of peer review. Furthermore, backlinks from ‘important’ pages are more significant than backlinks from average pages. . . . Overall, our experiments with PageRank suggest that the structure of the web graph is very useful for a variety of information retrieval tasks. (p. 15)

This passage positions PageRank as a method for evaluating, assessing, and ordering web pages as a type of academic peer review by way of sharing hyperlinks between what is deemed important webpages. Additionally, this example passage leaves little doubt of the persuasive nature of positing PageRank as an ethos-bearing method for organizing information on the web because of the peer review function of having backlinks as webpages. Even while this tightly bound passage advances PageRank as an objective method, the passage provides a good example of energy layers in the built ecological network.

At the surface level, the lingual layer leaves little doubt about how Page and Brin appealed to the scholarly ethos of the audience of academics reading this paper, by situating
PageRank as a scientific and objective method for ranking the importance of web pages. The passage provides evidence to this by linking “peer review” to PageRank, thereby easing concerns about the integrity or quality of such a method—since a community of webpages provide the standard for review. The entire article provides additional textual evidence to support this ecological theory, and will be examined in the following sections.

Choosing Google PageRank as an example of a persuasive computer algorithm seems a likely pursuit given Google’s market dominance and commitment to innovation with data tracking algorithms since 1998. In the *Googlization of Everything*, Siva Vaidhyanathan (2011) noted of Google’s PageRank algorithm, a method for sorting and ranking vast amounts of information for search results, that the algorithm itself operates from user consensus of what sites are worth seeing ranked higher in search results because of popularity or content within the site. Google always seems to be on the edge of pushing technological boundaries, and certainly, there are other influences to how Google shapes content on the web, including the Google Book project that has led efforts to establish the computational language literacy algorithms required to produce organized and fluid lingual patterns in search results. The pursuit of organizing information using algorithmic methods of ordering processes provides those in writing studies and rhetoric with a sense of how machines construct and order writing and engage in persuasive acts.

Moreover, this case study addresses the dynamic weight algorithm created by K.R. Venugopal, K.G. Srinivasa, and L.M. Patnaik (2009) because the creators claim their algorithm presented more relevant webpage results than Google’s PageRank algorithm. But, more importantly, the authors made available the equation and algorithm in their study, thus providing material for examination herein. Additionally, Venugopal, Srinivasa, and Patnaik document the
operation of their algorithm within the article, which illustrates how it works in a built ecological network.

**Application of the Built Ecological Network**

In this case study, I approach the textual materials using the built ecological network theory as a lens to examine the artifacts herein. Part of this research seeks to amplify and discern how the algorithms and other textual elements surrounding Google PageRank and the dynamic weighted algorithm perform persuasive functions in order to serve the larger goals of this project: to show how the built ecological theory brings to light the complex relations of human and non-human composing in technological spaces.

In applying the theory to the textual elements, I performed a textual analysis of artifacts using variables created from the energy layers of the built ecological network. The goal for me in this application helps uncover how the lingual elements of the artifacts describe and represent the built ecological network in material, ephemeral, and abstract terms. The aim of the analysis, then, is to illustrate the overall rhetoricity of the artifacts and characterize the elements under examination within the built ecological network as both situated and displaced in temporal, spatial, and material environments. The approach also allows me to situate myself as a participant within the built ecological network by coming to know the discursive strategies and rhetorical appeals the authors of the artifacts use to position their work for their primary audience. By recognizing that the researcher is an actor, to borrow from Latour, in the built ecological network, the methodological approach encourages researchers to examine the networks and ideologies they bring into the research. Of course, this type of analysis means the researcher actively engages in interpretation of the communications based on their own social,
cultural, and political ideological beliefs. However, I argue that given the attitudes and values, a researcher brings with hir into a project, both the researcher’s position and hir analysis may allow for thick descriptions of the materials and motivations for an increased understanding and appreciation for the dynamics of discourse.

**Method**

Since this qualitative case study did not include human subject participants, this project did not require institutional review board approval. In the section that follows, I describe my research questions, discuss the background of Google PageRank and the dynamic weighted algorithm, describe data collection, coding, and provide analysis. I do so with the direction of providing a rich description of the methods used during the study (Smagorinsky, 2008)

**Research orientation.**

In creating a theory that bridges the gaps between the current theories circulating within rhetoric and composition on human and object composing, testing the theory is especially important to tease out the relations between humans and non-humans in composing networks. The overall project questions provide the broad strokes for investigating how algorithms read and write in material spaces, but also how the algorithms perform—goal directed activity, thereby influencing people’s actions and behaviors.

**Google PageRank and the Dynamic Weighted Algorithm Study**

For one month, I studied the PageRank algorithm and the dynamic weighted algorithm materials to come to a rich understanding of how they operated. During the study, I consulted secondary source material by computer programmers and scientists who have written about
Google PageRank to understand better some of the technical language contained within Page and Brin’s article since I do not have a computer science background.

**Data collection.**

Data collection occurred during the month of May 2014. I collected both articles in early May, and consulted secondary source material during the middle of May to develop a rich sense of how the algorithms operated. I additionally collected data on the digital networks connected to the articles to understand the ecological network embedded in the presentation and delivery of the articles. Because the algorithms and equations are represented in a static article form, and I did not witness or observe the algorithms in operation “behind the scenes,” there is no personally identifying information available that could potentially present risk to any living human or business.

**Data coding and analysis.**

During the first phase of the data collection process, I collected the data and quickly skimmed each article for an observational assessment of the density and presentation of the language and mathematical equations. I also partially traced the networks of the articles by viewing the source code. Moreover, I performed a field note entry during the first phase, chronicling my observations about the data and the network tracing.

During the second phase of the process, I read both articles and performed an open analysis (Strauss & Corbin, 1998) of these articles. I did so in order to allow a close reading and interpretation of the textual elements before imposing variables driven from the research questions and built ecological network theory to allow a full representation of the data. I realized during the skimming of the articles that there could be multiple interpretations of the data, and by
performing an open analysis, I could identify different meanings from the variables I would later impose upon the text. In the open analysis, I arrived at 68 open codes from the Page and Brin article, and 59 open codes from the Venugopal, Srinivasa, and Patnaik article.

In the third stage of the data collection, I applied the assigned variables, derived from the overall project questions contained in the introduction, the case study questions within this chapter, and the energy layers from the built ecological network. I created these variables as connection points to the larger theory of the built ecological network to demonstrate its functionality as both a theory and methodology for examining phenomena. The variables are as follows:

1) Composition and operation: How do algorithms and humans compose (broadly construed), and how do they work?
2) Network: What insight can researchers gain with the relations between humans and technology?
3) Persuasion: How do the algorithms persuade?
4) Ethos: How is credibility embedded in the algorithms or surrounding textual elements?
5) Spatial, temporal, & material: Where do the algorithms reside; how do they function in time, and what are the material conditions of the algorithms?
6) Social: How do the algorithms bring people and technology together?
7) Lingual: What are the patterns of discourse? What is the rhetoric of the discourse? and
8) Dynamism: How all the energy layers come together and intersect at intervals.

When applying the variables to the articles, I found that variables connected to the open analysis coding I completed earlier, in that the variables were broad enough to encompass the smaller open analysis units. Additionally, in order to analyze and attempt data triangulation, I tested the
variables between the documents to see if one code would apply to a similarly coded object in the other document. I was able to discern that the codes I developed fit contextually. Finally, I acknowledge that due to the nature of this project, a constraint of this coding process arises with validity. I did not engage a second rater to code the data; thus, I am aware that the codes I developed and the variables I assigned to passages are open to interpretation and may be open to validity examination by other researchers.

**Findings**

What does a theory of a built ecological network show rhetoricians and writing teachers and researchers about computer algorithms and human-social interaction? How does it advance understanding about the processes of writing in composing networks with persuasive capacities to change human and machine behaviors and actions? I believe this theory offers an avenue to enriching composition practices, rhetorical persuasion and agency by folding persuasive technologies into the rhetorical and writing studies landscape. Computing technologies have advanced beyond calculation, retrieval, and storage; these technologies have emerged as central gatekeepers and access points to information, influencing front-end users to make important decisions that affect several social, cultural, and political domains. Accounting for persuasive computer algorithms helps shed light upon not just what algorithms do to enrich people’s lives, but provides authentic engagement with the operations and compositional structures of algorithms in creating and ranking information, tracking habits and behaviors, and persuading other algorithms to action. Ultimately resulting in implications on how algorithms read and write us.
**Composition and operation.**

The composition and operation of the PageRank and the dynamic weighted algorithm were impossible to ignore when coding the artifacts during the study. The compositional practices—the skills needed for communicative needs—of the computer code illustrate fully self-sufficient algorithmic phenomena capable of handling input and output for weighting webpages. The authors of both articles chose to explain the both the composition and operation of the algorithms in detail in the articles as ways to establish the rhetorical appeal of ethos of the algorithms. Further, they invoked algorithmic composition as efficient and capable of complex calculations, thereby strengthening the overall ethos of the algorithms for readers.

For all authors (and machines), composition involved both human and machine composing practices. First, the authors developed high-level equations in their native language that was later translated into a programming language and compiled into machine-readable form. From there, the machine took over the algorithms, in conjunction with databases and other material structures like server space, fiber optic wires, and silicon chips, to perform the functions of the algorithms. The nod to the material conditions the algorithms function within support the overall rhetoricity of ecological network of the algorithms. While the algorithms may rhetorically function to influence and persuade through the output of data, they do so as part of a larger network of temporal, spatial, and material energy layers. For example, Page and Brin (1998) noted that the compositional practice of PageRank resulted in creating a database of indexes of the links as the crawling of their 24 million web page repository. This reveals that the algorithms, as a compositional practice of invention and arrangement, performed a rhetorical event with the outcome of indexing a sizable section of data for later use. The example also suggests that the practice included temporal dimensions of allowing for time necessary to make
the compilation, accessing and depositing the data spatially in a server, and materially occupying
the physical spaces of computers, servers, fiber-optic cables across different spaces and places.

Beyond the compositional arrangements given by the authors, the operations of the
algorithms illustrate the experience and functionality of the algorithms. For example, the
algorithms’ primary functions are to crawl the web and index hyperlinks available on webpages
to rank the page on relevance to a query in a search engine. However, to arrive at web
personalization, computers use other variables. For example, in their article, Venugopal,
Srinivasa, and Patnaik use a global variable “Relative_Search,” to record all of the searches by a
particular user, and “Domain_Search,” to track user profiles. These records are stored on a server
and “maintained by the system” (p. 220). The use of other variables of stored user information
reveals how the algorithms perform persuasive functions, such as targeting specific results to
users based on saved database information, but also assigning values to keywords to rank what
might be more useful to users.

The compositional practices and operations of algorithms are structured not only to return
data to people, but also to enable people to access “relevant” data that aligns with their search
parameters, which forms a rhetorical event of persuasion. The algorithm provides results that
prompt the user to action with the information the algorithm provided. While there is a type of
collaborative exchange taking place when people input data into computers and mobile
technologies, the algorithms, relying upon multiple variables, refract the information online for
personalized results. As soon as a user [re]acts with those personalized results, she or he has
engaged in the influence of the algorithm to suggest and recommend content. The process shows
a co-construction of human and machine experiences, but also more significantly the power
algorithms have in providing content for users.
Network.

The network is an emergent and fluctuating energy layer in an ecological system that provides multiple layers and access points for users. At the level of the user, ze joins in the network with expectations for accessing information in a search engine network. By relying upon the algorithms of the search engine to crawl through hundreds of millions of web pages to provide the most relevant content based on keywords and other database information the search engine has stored on the user, the user has certain beliefs about the connected nature of the network—it is accessible; it’s fast; it’s efficient; and it’s complete. The user does not have to think about what is happening beneath the interface because the algorithms are part of the immediacy of the screen. On another layer, the algorithms operate on the network by crawling, rather quickly, through webpages to index information for later access by users. Take for example the following passage by Page and Brin (1998):

> While estimates vary, the current graph of the crawlable web has roughly 150 million nodes (pages) and 1.7 billion edges (links). Every page has some number of forward links (outedges) and backlinks (inedges). We can never know whether we have found all the backlinks of a particular page but if we have downloaded it, we know its entire forward links at that time. (p. 3)

In this brief description, the authors call attention to the underlying action of the algorithmic method of ranking, by having the algorithm crawl the web to capture the backlinks (the links to other pages). This example infers that the algorithm is able to exist at the machine-readable level and communicate and collect information from sources.

It is important to keep in mind that while the authors position the algorithms in terms of their ability to communicate and crawl through a network, in terms of the built ecological
network, we have to be aware of the relations the algorithms forge with users, other algorithms computer code, websites, backlinks, fiber-optic cables, servers, routers, computers, mobile technologies and other human and material connection points in the network. It is not just that the algorithms communicate within a network, but rather they are part of a network that is always changing with different vantage and access points.

**Persuasion.**

Because all authors are presenting results from testing and experimentation from the algorithms, persuasion—an attempt to change thoughts, attitudes, beliefs, and behaviors of others—operates at both the lingual and algorithmic levels within the articles. At the lingual level, most of the persuasive language originates in building ethos for the algorithm and the work conducted by the researchers. For the Page and Brin article, persuasion is most pronounced in the “Introduction and Motivation” section. They describe the challenges of retrieving information off the web by acknowledging the problem of sifting through a vast amount of data. By aligning the algorithm with an existing structure, the academic citation system, Page and Brin are able to persuade readers to be receptive to their work. Further, when Page and Brin provide results from the PageRank algorithm, they persuade readers to believe that organizing and ranking structure of the algorithm is objective, efficient, and relevant to those who use PageRank. Yet, at the algorithmic level, persuasion operates in a unique role with algorithmic ideology.

The PageRank algorithm, while created through the design of Page and Brin, performs the procedures of its architecture; however, embedded in the design of the algorithm is an ideologically based method for organizing and ranking information from the web. The design of the algorithm includes a logical and structural belief that PageRank computes information for human and social interaction, and that by inhabiting the structuring elements of the returned and
ranked results, that the information is objective, true, and credible, thereby persuading the users to shift their beliefs and attitudes about information on their screens as relevant and important. But the algorithm does so by relying upon backlinks of webpages as its own system of peer review.

This embedded persuasive algorithm is seen further in the work of Venugopal, Srinivasa, and Patnaik when they pair the dynamic weighted algorithm with other signals that capture user ID information and keyword search history as an anchor to present personalized information to the user. In their example, they display how using variables that capture user keyword history and other identifying information helps provide information that is more “relevant” to the user.

For example, as a search user, let us say my search history—stored in a database—had the following search terms: adult cats, shorthaired cats, how to clip nails, and feline oral care, and, I then searched for “redness of gums.” Based upon both the ranked webpages and the keyword database information about me, the algorithms would more than likely return webpage results on feline gum disease with a high amount of backlinks embedded in the webpages instead of human gum disease. As a user, if I then click on the first few results and act upon the information contained within those pages, I have been shaped by the information from the webpages and ultimately by the algorithms and signals, thus eliminating the need to investigate further into other websites through algorithmic inclusion/exclusion. The algorithms persuade and shape users through their operations that output information that users act upon in their screens. This complex operation suggests that a rhetorical event takes place with the outcome of influencing the user to explore certain websites over others. In terms of the built ecological network, this example shows the rhetorical relations between humans and machines, with algorithms operating within machines to function as persuasive entities.
Object-agency.

Persuasive computer algorithms have abilities to determine the flow of information on a front-end user’s screen. These algorithms have the ability to act, to express—albeit in programming language—outputs that effect other algorithms, machines, and people. In a sense, a computer algorithm has a type of agency because of these abilities. While rhetorical agency has generally been accepted as the actions of a free agent or subject who is capable and in charge of their discourse habits (cf. Geisler, 2004), rhetoricians might think of the ability of the algorithm, to alter computers and machines, to shape the behaviors of people, and determine there is an object-agency. I define an object-agency as an object’s ability to act, on a transactional basis, with the ability and possibly intention of changing or shaping other objects and people’s experiences, mass, and even behaviors. Traditionally, agency has been viewed as invested in people, as Robert Scott (1975) declared, “To take the speaker as active and the audience as passive is quite traditional.” (p. 440). Elsewhere, Michael Leff (2012) summed up the rhetorical definition of agency as, “The technical apparatus is informed and organized from the speaker’s perspective, and the humanistic rhetoricians construct the orator as a cultural hero and celebrate the magnitude and apparent autonomy or oratorical power” (p. 215). However programmed and narrowly calculated by computer programmers, this object-agency recognizes the design of some computer algorithms as designed to influence and persuade, thereby altering behaviors and activities. As the compositional, operational, and even the persuasive content of PageRank and the weighted dynamic algorithm shows, there is an object-agency at play. The algorithms compose and arrange data for certain needs and provide an outcome to users that allows the intent to persuade users to access the information given by the algorithms.
**Persuasive computer algorithms redux.**

If it is computer algorithms’ ability to shape experience, then I assert they have persuasive abilities. Certainly, persuasion comes under the umbrella of rhetoric being within the domain of human endeavors, but broadly construed, persuasion is an ability to get another person—and object—to do something based upon the communication—or data—conveyed during the transaction. The discipline of rhetoric is certainly no stranger to persuasion. Indeed, in antiquity, Aristotle declared that rhetoric is the discovery of all the available means of persuasion. Cicero affirmed that rhetoric is speech designed for persuasion. While definitions that are more contemporary move away from using persuasion, and instead focus on the transactional relations between multiple actors, persuasion has long been connected with the transactions that occur through the rhetorical situation of sender, receiver, and text. However, models of the rhetorical situation—that would account for the transactionality or instance of persuasion—do not account for the materiality of objects in detail.

Bitzer (1968) analyzed the basic rhetorical situation model and concluded it does not consider external elements, and thus helps inform how materiality and even algorithms may be already part of the rhetorical situation. He noted, “Typically the questions which trigger theories of rhetoric focus upon the orator’s method or upon the discourse itself, rather than upon the situation which invites the orators application of his method and the creation of discourse” (p. 2). Bitzer goes onto to argue of the rhetorical situation as “a natural context of persons, events, objects, relations, and an exigence which strongly invites utterance” (p. 5). For Bitzer, the rhetorical situation is rooted in external conditions—even objects—and to enter into discourse from such a situation is to render language as an act of human discovery, not necessarily a persuasive act—but a situation that may allow that may allow the potential for persuasion to
occur. I argue that the PageRank algorithm and the dynamic weighted algorithm enter into persuasive acts by their compositional and operational design and through their interactions in the built ecological network. The rhetorical situation need not be limited to a theorization that accounts for human perception, but also factors in persuasive computer algorithms. I believe the PageRank and dynamic weighted algorithm for web personalization illustrate the transactionality between algorithms, technology, and people with the underlying notion to shape people, to shape writers and composers who use the web and mobile devices to certain actions. Thus, this case study also helps inform rhetorical scholarship on persuasion and the rhetorical situation by providing a theory and evidence of how a non-human actant can inhabit a rhetorical context and enact persuasive techniques, thereby expanding rhetorician’s understanding of rhetoric in the modern age.

Ethos.

The authors of both articles build credibility for their algorithms and methods using ethos. In the Page and Brin article, ethos figures rather prominently throughout the article, especially in the introduction, “link structure of the web” section, and in within the “searching with PageRank” section. Page and Brin connect, and at times compare, PageRank to the academic citation method as a type of peer review and more importantly a type of control measure for validity and reliability of source material. The ethos building Page and Brin perform is a comparison of a new system to an old, established and reliable, system to demonstrate efficacy of the PageRank algorithm, while also establishing claims that the PageRank algorithm produces more accurate, reliable, and quicker results than the academic citation system. In the Venugopal, Srinivasa, and Patnaik article, ethos is not as pronounced as it is in the Page and Brin article, and ethos is more directly tied to the operation of the algorithm, as a type of closed-
system. This approach allows the ethos of the algorithm to stand on its own as a credible and reliable method for ranking and weighting websites. However, Venugopal, Srinivasa, and Patnaik do compare their dynamic weighted algorithm to Google’s PageRank in the discussion/conclusion section by declaring the algorithm performs better at providing relevant webpages than PageRank, yet do not have a section discussing the comparison.

While ethos works in favor of building credibility of the algorithm and corresponding textual presentation, a section in the Page and Brin article possibly casts a shadow on ethos building provided earlier in the article, which is as follows:

The benefits of PageRank are the greatest for underspecified queries. For example, a query for ‘Stanford University’ may return any number of web pages which mention Stanford (such as publication lists) on a conventional search engine, but using PageRank, the university home page is listed first.

To test the usefulness of PageRank for search we implemented a search engine that used only the titles of 16 million web pages. To answer a query, the search engine finds all the web pages whose titles contain all of the query words. Then it sorts the results by PageRank. This search engine is very simple and cheap to implement. In formal tests, it worked remarkable well. As can be seen in Figure 6, a search for ‘University’ yields a list of top universities. Listed within Figure 6 in the article is Stanford University as the first entry on the search results. It is entirely possible that the dataset both worked with during the testing of the algorithm contained more referential data that favored Stanford University as a higher search result in the index. However, because Page and Brin did not make the PageRank calculations available in this...
article to illustrate how the university they were enrolled in at the time of publication showed as the first result in the rankings, all readers of the document may reflect over the results listed in the document with intellectual curiosity.

Another manner in which the authors of both articles display ethos occurs through discussing the operation and performance of computer memory during the testing of the algorithms. Venugopal, Srinivasa, and Patnaik presented how the storage system works with the domain and file location in the directory tree within the operating system. Page and Brin review the allocation of memory in every webpage along with the operational precision of the algorithm and databases during the process of ranking webpages. Both articles conclude that the memory and operation of the hardware and software are sufficient to handle the functions of the algorithms, thereby supporting a reliable algorithmic method for ranking webpages.

**Spatial, temporal, and material.**

The textual elements and algorithms are spatially bound to the spaces they inhabit, including the server space(s) where the articles are coded, the human-readable interface where the document appears, and the 8 ½ x 11 formatted page once printed. They move throughout fiber optic networks over long international distances; they are archived for future use. Because the textual documents are accessible through online and mobile devices, the physical embodiment of the documents at first feels immediate as the flickering screens quickly present the articles for people to read. However, underneath the interface resides a complex coded and embedded network of programming languages and machine-readable code that transform the accessible documents into ones and zeros. To access the documents, a person has to first position himself in front of a computing device, and use key entry or voice commands to enter the desired input in a search engine. Spatially, the computer has to request access through firewalls and
ports, and it relies upon the algorithms of the search engine to produce the relevant results for the person at the interface. When accessing the portable document format (PDF), the user does not see the programming language and interpreter—PostScript, a language used to compress and flatten graphics and text—used for the document. All of these spatial layers occur beneath the interface without necessarily the end users’ awareness of the complex operations occurring rapidly behind the flickering screen.

We may tend to view these documents as static virtual (and later physical, if printed) materials, and it is true that they are stored in silicon chip memory banks on server space(s). Yet, temporal changes occur when the files are in operation, with accessing, viewing, and engaging with the materials. In addition, when files need to be reorganized on server spaces, the files are shifted temporally to new directories to free up space elsewhere. The algorithms discussed in the articles additionally, when in operation, exist temporally by creating complex and microsecond calculations through hardware and cables across vast distances. The point is that these elements flow with the standard of time, embodying the conditions of temporality. These temporal and bounded spaces and places speak to the rhetoricity of the built ecological network. It’s not just the rhetorical event of algorithms persuading users to certain actions, but all of the elements conjoined in the event that allow for the event to occur. Without temporal, spatial, and material elements, the rhetorical event may never take place because the rhetorical context needs more than just speaker, audience, and context, but it is also constituted of space, a place, a time, and even material objects as embedded actors central to the formation of a rhetorical event.

Additionally, the very presence of certain material objects, places, or spaces may shift or change the user or algorithm’s intentions because both account for the dynamics of material environment as well as audience expectations.
Social.

The social relations of the algorithms and the corresponding textual materials are woven in the engagement of reciprocal and reflexive relations—people connect with the knowledge presented through the structure and organization of the algorithms, but the algorithms also persuade readers that the underlying organization structure is a reliable and credible method for ordering information on the web. At the heart of the research, the authors muse upon the connections the algorithms forge in finding ways to strengthen and make explicit information with ease and speed for people. As the algorithms continue to provide data—the common social feature is the reciprocal shaping of people and algorithms—, which leads to transformations and personalization of data. For example, in Venugopal, Srinivasa, and Patnaik’s work they noted, “The precision of the search engine increases with the addition of relevant keywords, otherwise, the precision suffers because of [sic] broader search” (p. 224–225). While this sentence speaks to the lingual and compositional & operational layers, it also implies a certain social dimension through the relationships between recording keyword searches to increase precision in the results, and describes the dynamism present in the complexity of the system.

The value of the social energy layer within the algorithms appears when they crawl the web to index information by forging relations with other webpages and links. When the algorithms crawl through the web, they do so with certain operational functions to account for broken links, dangling links, misrepresented material, links embedded in webpages for search engine optimization to increase a webpage’s rank in search results, and other such outliers. At a structural level, the creators of the algorithms engineered the code to account for both positive and negative variances that potentially skews the resulting data that people may access through search engines. This kind of social engineering in algorithms, in other words, mirrors the
dynamics of human-social relations by accounting for multiple modes of behavior, including how humans react to machine composition and operation as well as the interact with the content the algorithms provide through the search engines.

**Lingual.**

Both articles and algorithms reside at the lingual layer; indeed, they embody the energy layer completely. The semiotic codes and genre of the articles highlight a highly technical and scholarly discourse. Indeed, as a reader outside of computational languages, I found that reading into the specialized discourse of both articles presented unique tensions of understanding. However, on a rhetorical level, the authors of the articles use such language to reach readers who also inhabits such textual layers, which share certain beliefs about objectivity and credibility about knowledge. Obviously, the authors do so to establish a credible ground with readers to present their work with the algorithms. While the articles do not provide the machine language to illustrate the processes the computing technology undergoes when operating the algorithms, the equations in textual form help readers visualize the operation and practice the algorithms undergo when compiled in machine-readable form.

**Dynamism.**

In the final layer, the textual form illustrates the multidimensional plane of text, systems, and ecology by forging connections and clarifies the intersections of all of the other energy layers embedded in the article and the algorithms. To account fully for all of the energy layers and connections, I would have to consider a complex visual arrangement of the connections; however, in drawing up such an illustration, the connections would be a snapshot representation taken in time. Additionally, the snapshot would be a creative imagining of such relations and
would leave out connections because of the vast interlaced and invisible network not accessible through a researcher’s eyes because of computer codes and programs across the world that interconnect with these materials. What are significant about the dynamism within each of the energy layers are the connections forged through the sharing of spatial and material environments, for example, or even composition and operation—all closely wedded and interconnected through similar, yet divergent properties.

**Human and Machine Writing and Rhetorics**

Following the theory of the built ecological network, and claiming that computer algorithms have agency and the ability to persuade, there are implications for writing. *Computer algorithms*, in a sense, *write us*. While computer programmers write computer algorithms, once the algorithms are “live” and performing functions and computations, the algorithms have abilities to write from the data inputted. Yet, the writing computer algorithms perform are invisible to billions of Internet users because the algorithms are, in some cases, proprietary to web companies, and also reside at a code level that is not apparent to the consumers of the coded product.

New media theorist Friedrich Kittler (1997) positions code as a process of writing, but an invisible process that can even evade programmers. He noted,

> Programming languages have eroded the monopoly of ordinary language and grown into a new hierarchy of their own. This postmodern Tower of Babel reaches from simple operations codes whose linguistic extension is still a hardware configuration, passing through an assembler whose extension is this very opcode, up to high-level programming languages whose extension is that very assembler. What remains a problem is only recognizing these layers, which
modern media technologies in general, have been explicitly contrived to evade perception. We simply do not know what our writing does (p. 48).

Our attention at this complex level of detail quite possibly leaves out the very materials that make up the ecological-rhetorical situation. In terms of the theory of the built ecological network and through case study analysis, this helps us examine the algorithms of our lives. In relation to computer algorithms and writing, this theory entails sensitivity toward examining the agency and power algorithms have in writing what people see on their computer screens. This is especially important to consider because computer algorithms remain elusive and complex, but we can also recognize the sheer force algorithms have in our material worlds by applying the methodology of the built ecological network to different algorithms to uncover the relations and rhetorical agency and persuasion taking place.

A second and engaging implication of the object-human writing model is the emergence of computer algorithms shaping the perceptions and actions of people and other objects through writing. Of great significance here is the sense that a computer algorithm has the agency to perform a language-oriented task that hugely influences how multiple human and non-human actors respond to information and digital environments. From the perspective of proprietary computer algorithms, we may never know the true complex operations computer algorithms undergo, but we can speculate through artifact analysis. What I want to emphasize here is that computer algorithms have agency and abilities to perform writing processes—that algorithms exist ontologically, but once they enter a writerly transaction, a possibility of epistemological meaning making occurs from a material object.

Taken together, computer algorithms are powerful objects that write results and hardware into action, as well as provide data to humans for action and consideration. This opens rhetorical
inquiry and scholarship into the political and ideological foundations of computer algorithms, agency, and persuasion, as well as the effect upon writers and composers in online and mobile spaces, which I take up more explicitly in chapter 4. The built ecological theory suggests that humans also are not the only actant worthy of study, and that computer algorithms have a profound influence in our everyday lives. Because algorithms are also invisible to billions—and only accessible by those who create, monitor, and tweak them—algorithms are somewhat of a mystery to front-end users. Even though they evade most of human perception, the algorithms nevertheless shape other coded objects and people into action through writing acts.
CHAPTER FOUR:
SUSTAINING CRITICAL LITERACY IN AN AGE OF ALGORITHMS

The opening sentence in Jeff Rice’s “The Search for Billy the Kid” (2013) offers a compelling provocation for those whose work aligns with new media scholarship within the digital humanities: what unites writers and readers in new media environments is “search.” Certainly, a common fiber among the everyday practices of information technology users is search, for without the indexing power and logic of the database, the ordering and cataloging of digital files would be rather scattered. From the perspective of rhetorical theory, Rice imagines “search” as a new media literacy that includes rhetorical invention and implores those in the digital humanities to consider how rhetoric informs literate practices and pedagogical research. Rice’s perspective is productive, since digital humanities scholarship and teaching covers a breadth of disciplines. Although Rice claimed that search is a new media literacy for digital humanities, rhetoricians and computers and writing specialists may also extend his work and provide theories and heuristics that account for the critical apparatuses needed to unpack the underlying ideologies in digital spaces, such as this chapter does later. This theory of search literacy also affects all educators and students, not just those in the digital humanities since “search” is a large part of what students do for coursework across disciplines. For a moment, however, consider Rice’s framing of “search” as a literate practice:

I am more interested in the activity of linking and clicking through keywords that seem to have no end, that allow query to relate to other queries, that transform a given archive or set of archives into a search-based writing, and that, following Berry, allow for pattern and narrative. I am, in essence, interested in rhetorical invention as a contemporary literacy practice. In particular, I am interested in
posing search as a type of practice we might call new media literacy because of how it allows writers to generate, arrange, and deliver ideas in online environments in ways we have not previously encountered. (p. 3)

Grounding the argument in Gregory Ulmer’s exploration of invention in *Electronic Monuments* (2005), Rice contextualizes search as “endors[ing] narrative” in favor of argumentation. The interplay between concepts and ideas within a given space allows a person to assemble a narrative from query, from curious engagement with what “x” means to the person and to others online. Search, as I understand the way Rice intends the term, is a figurative and material space where a person, with a certain knowledge of how search works in digital spaces, enters keywords into a search space to involve tagged and indexed websites. From this engagement, the person then assembles their own narrative of information, gathered from sites, to make sense of their own perceptions or share their findings with others. This type of inventional practice, as Rice aligns search with, favors the pastiche of social practices from the domain of an algorithmic and programmed technological life. The rhetorical forces of invention and arrangement are important in developing compositions; however, arguably, the most important perspective of a “search” literacy lies in exploring the underlying ideological values embedded in metadata and algorithms since such elements have the abilities to influence and persuade information exchange.

Often under the term of literacy, researchers’ associate literacy as a set of social practices (Street, 1984) embedded in the ideologies and areas one is situated within at a given moment. In *Situated Literacies*, David Barton and Mary Hamilton (2000) presented six propositions for a social theory of literacy, suggesting literacy as reciprocal and networked to material and social conditions, with several types of literacies associated with any number of domains: life, work, school, and home. These literacies may also involve different media, technologies or systems, as
Barton and Hamilton shared. Acquiring different literacies, as James Paul Gee (1989/2001) noted, occurs through the “enculturation into social practices through scaffolded and supported interaction[s]. . .” (p. 527). Acquiring skills to live purposively in technological spaces is no exception to this definition. What distinguishes Gee’s work and Barton and Hamilton’s research from each other are processes and abilities for how literate skills manifest (Gee) versus a theoretical frame for perceiving the social dynamics involved in literacy events (Barton & Hamilton). Taken together, literacy acquisition happens through socialization, as Gee wrote, and it is a socialization involving multiple actors, actants, and objects (to borrow from Latour) assembled ecologically with a network.

If, as Rice proposes, search is a literacy acquisition, one that has become interiorized by the technology of search and results in a narrative production, Rice’s contribution illustrates a method of narrative, but leaves off discussion of how the acquisition of search happens with individuals. Perhaps this is because Rice is concerned with calling attention to search as a literate and inventionary practice to colleagues in the digital humanities—as an identified rhetorician and writing scholar. While he does not reference literacy scholars from rhetoric and composition in his work, I do see a connection between Rice’s call for search as literacy from a theoretical frame and Barton and Hamilton’s theory for defining literacy. Many literacy researchers are interested in the social dynamics involved literacy acquisition. However, more discussion about how the acquisition of a “search” literacy would be helpful in fully understanding the processes involved; thus, future research in this area is needed. Nevertheless, the main implication of Rice’s work is that those in the digital humanities whose work focuses on critical apparatuses for investigating ideological biases within texts, must also attend to the inventionary practices individuals assume when constructing a narrative about a particular topic. I join with Rice in his call because literacy
acquisition and development with new technologies is an important conversation in rhetoric and writing studies, and I see extensions from his work in two key ways. I believe all educators who work in digital spaces, whether it is in communications, rhetoric and writing, education, the sciences, and the arts, would benefit from learning how search literacy forms and informs research online. Thus, I do not see search literacy as being exclusively under the domain of digital humanities researchers, but all researchers and educators whose work intersects with online spaces and literacy acquisition. In addition and more directly involved in this project, educators must also attend to the logics that drive search within the interface, through the study of algorithmic cultures (algorithmic processes, inclusions/exclusion, and ideology), computer code, the architecture of the web, and the built ecological network. For researchers and teachers of rhetoric and writing, this means discussing literacy in context of algorithms, figuring out the ideological structures embedded in code, and developing a pedagogical plan for teaching students about algorithmic literacy.

In this chapter, I discuss the historical conversations of critical literacy and how those conversations help inform students with critically literate practices in computer technological spaces. I begin with a background discussion of critical pedagogy and then move to talk about how critical literacy has been developed in computers and writing over the past twenty years. I then address how algorithms occupy an ontological status and as a result have an algorithmic agency, which is important for students to keep in mind when analyzing algorithms in virtual environments because algorithms will adjust to data inputs thereby engaging in a dialectic exchange with people. In the last section, I provide heuristics from three theoretical perspectives, thus allowing students to approach critical examinations using different lenses for different contexts. These heuristics extend Selber’s work on critical literacy by including algorithmic
design, but also call attention to how algorithms affect literate practices and what educators can do to teach students about these modes of communication.

**Critical Literacy Background**

Critical literacy takes root in work of Paolo Freire, Ira Shor, and Henry Giroux, and the work branches into discussions of liberation from oppression, empowerment to change, and engagement in social and political actions. Freire’s *Pedagogy of the Oppressed* (1970/2007) planted many seeds in critical engagement, which asked how the oppressed can participate in a liberatory pedagogy from oppression, while being part of the oppressed because of political systems of power. In the oft-cited chapter on the “banking concept of education,” Freire outlines what such an oppressive system looks like in education, with students being “empty vessels” waiting to be filled by those with knowledge and power. He actively worked to distort this perspective and presented a method of critical consciousness teachers can guide students toward to help peel apart the political, social, and economic systems that shape them, so students can see how those systems ultimately don’t rule their lives. Likewise, Ira Shor (1980) analyzed the system of education in community colleges in America for exploiting the narrative of the American dream by encouraging students to enter vocational schools for skilled labor, while students at elite universities received training for decision-making professions. Henry Giroux (1987) joined in the critiques of education set forth by Freire and Shor by calling attention to the ideological and social scripts universities promote in educating students and teachers, thereby endorsing socially acceptable modes of knowledge over others. Taken together, the thrust of critical pedagogies, and ultimately critical literacies, creates an apparatus for analyzing, evaluating, examining, and observing the socially constructed nature of power structures in
societies and to create or envision alternative ways of knowing, action, and responsibility for democratic systems.

The trick to critical pedagogy, in the words of Ann George (2001), is “to enable students to envision alternatives, to inspire them to assume the responsibility for collectively recreating society” (p. 97). This means that educators play important roles in helping students to see the power structures in social, political, and cultural systems and to find ways to subvert and transform such systems in ways that liberate instead of oppress expression and identity. An example of such movement occurs in the work of communications and gender scholar, Safiya Umoja Noble. In 2012, Noble reported, in Bitch magazine, the results of Google search for “black girls.” Instead of results highlighting positive websites that embraced black identity and provided role models for young black girls, the top result in Google was SugaryBlackPussy.com. While she may not consider herself a critical pedagogue, Noble brought these search results to her students year after year to show the power structure of search processes in Google. By bringing this example into the classroom, she called attention to the values Google replicated in its search results and discussed how to subvert those values to promote more equitable and diverse results for black girls and women. What is interesting about this case is in what Google claimed about their search results: they were “computer-generated.” As reported by Noble, the company denied it had control over how the algorithms offered results to users. However, in a public appearance at Bowling Green State University in the summer of 2013, Noble reported after the publication of this story in the magazine, the search results for “black girls” in Google radically shifted to reflect sites with empowering messages about young black girls instead of pornography sites. In examining and making space for dialogue about the practices inscribed by Google in the classroom and in a national feminist magazine, Noble’s pursuit for political and
social justice yielded positive results and an excellent example of critical pedagogy in action by analyzing algorithmic features in search engine spaces. Additionally, her work helps position Rice’s call for investigation into “search” as new media literacy since Noble’s research directly involves both “search” as practice and critical pedagogy with students.

Just as critical pedagogues examined embedded power in social and cultural systems, rhetoric and composition educators have also analyzed how power operates in information technologies. Much of the analyses have occurred because of the shift from alphabetic to multimodal literacies within rhetoric and composition (Ball, 2004; Baron 2009; DeVoss, Cushman, & Grabill, 2005; Selfe, 2009; Selfe, 2007; Selfe, 1999; Shipka, 2005; Wide Research, 2005; Wysocki, et al., 2004; Yancey, 2004). Many of these contributions offer ideological examinations and attention to technology use and development, which springs from the foundation of critical literacy. Stuart Selber (2004) and DeVoss, et al. (2010) positioned critical literacy as having awareness of the social and political intersections that digital tools bring, and how those shape meaning, but more importantly, what is gained and lost by these cultural ecologies. As such, Selber (2004) called attention to the neglect of critical literacy in computer literacy programs by writing teachers and administrators because much of the teacherly focus had been upon “reflective approaches” of technology. In developing critical literacy framework for educators, Selber relied upon multiple humanistic traditions, and in doing so, Selber positioned a sustained technological critical literacy capable of accommodating multiple perspectives of social, political, and cultural interests. His heuristic for a critical technological literacy gives educators multiple pathways into uncovering and understanding power dynamics in information technology spaces. These entry points allow students to reflect and engage in
critical consciousness and find how political and social systems online shape their interactions, but ultimately do not define their identity or actions.

In computers and writing, Cynthia Selfe and Richard Selfe (1994) explained the politics of the computer interface and warned educators about the power of interfaces assuming and controlling raced and classed boundaries that reinscribe political and social norms of hegemonic systems designed to oppress marginalized populations. Part of Selfe and Selfe’s work drew upon an earlier narrative that computers and networks would function as utopic spaces free from the ideological constraints of real life, and complicated the narrative by discussing how electronic spaces were anything but free from ideological scripts. In extending Selfe and Selfe’s work on electronic contact zones, Kristine Blair (1998) drew attention to student participation in online spaces and how online conflicts between students from diverse backgrounds aided in critical literate practices of difference among people. To this end, online spaces allowed people to engage in critical discussion because the space promoted a type of public and civic discourse composed of rhetorical discourses, contexts, and actors accommodating diverse perspectives in both online and offline spaces. As such, Donna LeCourt (1998) examined how a critical pedagogy in communication in computer-mediated environments allowed students ways to consider how their discourse practices in local and broader contexts politicized writing spaces. LeCourt suggested teachers help students recognize their own and others ideologies in virtual spaces as well as resist social frames that sought to oppress their perspectives. What these early conversations in computers and writing have addressed are the effects discourse has in online spaces at a time when the virtual was considered a liberatory space for expression. These discussions not only teach educators methods for investigating critical practices with students but
also frame larger research and teaching projects, such as the models provided later in this chapter, to continue examinations into critical issues facing students today in digital spaces.

Continuing the conversation, Barbara Blakely Duffelmeyer (2000) asserted that “critical literacy is awareness of the forces that affect the micro- and macro level conditions within which we acquire literacy and of how we view the uses and meaning of literacy” (p. 290). While Duffelmeyer’s study focused on first-year writing students’ cultural perceptions of computers, the results revealed students offered nuanced critiques of technology in ways that reinforced their own worldviews, which is not an uncommon practice critical pedagogues see routinely in classrooms. However, the takeaway from her project asks educators to develop “new ways of thinking” that help students challenge their worldviews and develop a critical literacy that deliberately leaves students rethinking their own perspectives ideologically and within computer mediated environments. This call is complimentary to sustaining critical literacy in an age of digital surveillance when computer algorithms develop and promote content to people based on a host of factors not always known by end users. But, also, part of the work left to be done by writing instructors and researchers is uncovering, examining, and negotiating embedded social, political, and cultural stances that perhaps seek to oppress or control access to information online.

More importantly, these discussions afford an entry into critically examining human discourse patterns and features in online spaces. But, these works also teach rhetoricians and writing teachers to attend to the embedded power dynamics in computer programs, code, and algorithms. Even when people acquire literacy skills in technological spaces, educators must also account for the ideological forces beneath the interface, and how those forces shape and persuade people in virtual pages and apps. By extending an investigation into the ideological forces of
computer algorithms that make up the architecture of the Internet, educators create new ways of
interrogating the underbelly of virtual life and addressing the oppressive practices computer
algorithms engage in when promoting personalized features for people.

New Ways of Thinking: Algorithms and Critical Literacy

Thus far, I have presented an overview of critical pedagogy and literacy within various
disciplines that call for educators to prepare students to analyze and create alternatives to
oppressive systems of control that flatten democracy. Within rhetoric and computers and writing,
there are additional avenues for thinking about critical literacy by building upon the scholarship
of Selber (2004), Selfe and Selfe (1994) who offer compelling research into processes of
acquiring and sustaining literacies, but also consider how algorithms in surveillance cultures
affect reciprocal relations between people and machines. Computer algorithms have enormous
potential to inspire and shape discourse activities of people, but these algorithms do so at the
expense of cultivating economic, political, and social scripts designed to persuade citizens
toward certain pathways of thinking and action.

A recent example occurred during the collective reporting of citizen activists during the
police shooting of 18-year old Michael Brown in Ferguson, Missouri. Taking to Twitter, millions
of people expressed opinions about the shooting and the later real-time events of the police
militarization of the town outside St. Louis. Many tweeters reported that the Ferguson hashtag
(#Ferguson) dominated their Twitter streams, while news on Facebook focused on the ALS Ice
Bucket Challenge (Amyotrophic lateral sclerosis), a media campaign event whereby participants
dumped ice water on their heads and bodies for donations to ALS research. Because Twitter does
not use algorithms to curate tweets on the Twitter stream, and instead allows for real-time tweets,
the events in #Ferguson on Twitter helped keep the spotlight on racial inequity and use of police
force on peaceful demonstrators in the town. However, because Facebook uses complex algorithms to curate news items on newsfeeds, many tweeters reported that Ferguson received hardly any attention within Facebook and pointed out that the ALS ice bucket challenge dominated their newsfeeds. The political and social outpouring on Twitter since the shooting of Michael Brown illustrates the algorithmic manipulation within Facebook. Journalist John McDermott (2014) argued that the implications of this algorithmic disparity between Facebook and Twitter are considerable given the reliance of the sites to provide information to millions as he argued:

The implications of this disconnect are huge for readers and publishers considering Facebook’s recent emergence as a major traffic referrer. Namely, relying too heavily on Facebook’s algorithmic content streams can result in de facto censorship. Readers are deprived a say in what they get to see, whereas anything goes on Twitter. (2014, para. 3)

Not only is censorship a concern for all that use Facebook, but the algorithmic practices of the social media space also affect people’s attention toward certain social and political issues over others at the expense of cultivating civic responsibility and action. If end users are unaware of this type of algorithmic persuasion occurrence in Facebook and in other websites, information literacies efforts lead by librarians, for example, become hindered because people are unable to access, evaluate, and use diverse knowledge bases to form a more democratic digital and real-life society. Therefore, shifting attention to an algorithmic critical literacy helps loosen some of the scripts and allows citizens to assert control in less democratizing spaces online.

As an approach to sustaining critical literacy, it is my position that a critical technological literacy for the algorithmic times of today must incorporate not only the built ecological network,
but also be fluid enough to account for the full social and cultural relations that constantly change as a result of encountering one another during a literacy event. Shirley Brice Heath (1982/2001) defined a literacy event as “a conceptual tool useful in examining within particular communities of modern society the actual forms and functions of oral and literate traditions and co-existing relationships between spoken and written language” (p. 445). Here, I would also add visual, bodily, and machine languages—really any type of symbolic system used for communication (cf. Burke, 1969). Just as Heath described the rules, functions, and interpretive clues surrounding oral and written literacy events, so also, there must be an understanding for the type of communication machines, and here I refer to machines in the sense of computers, perform in information technology systems. In taking in the contours of a literacy event, including the ideological discourses, bodies, materials, spaces, places, and temporalities, I also take into account the algorithmic procedures that produce virtual spaces because these algorithms fix how sites and apps operate, including the human experience of interacting with those apps and sites.

**Algorithmic Agency**

End users of information technology systems, i.e., computers, apps, smartphones, and so forth have tended to view these technologies in service of human needs. The metaphor of the computer as a tool has become so engrained in our cultural consciousness that to think of machines being other than tools humans can functionally master becomes difficult to consider. This is so because information technologies developed in the mid-20th century as, what Selber (2004) argued, “material products of human activity and agency” (p. 86). In what ways, though, might the tool metaphor limit our conception of machines? Have computing technologies evolved to a state where computers have their own agency and activity? If so, do computers have
a type of literacy? This section responds to these questions by examining theoretical and practical discussions of algorithmic procedures in computer technologies, and how these algorithms yield results that indicate non-human agency and persuasion.

While I agree with Selber that viewing computers as products of agency and activity encourages critical examinations of the political, social, and cultural dimensions, I also believe that such a view subsumes a larger cultural fetish of human desires of power and discipline. In some senses, discussing power and control contribute to the overall matrix of the built ecological network because institutionalized discourse and activities sustain digital network creation and use. These practices of soft- and hardware management reinforce and enact an organization of techniques and power over machines. Reminiscent of Foucault’s theory on discipline and punishment (1975), the techniques of control humans derive from their relationships with machines enforce a system of domination whereby humans control the inputs and outputs of information in computing technologies. As such, this view feeds the ego of the human agent and asserts hir authority over object. What makes this position troubling is the way human agency, in this case, asserts domain over computers. The danger of this position may lead to a type of myopia, where in assuming power and control, the agents focus on maintaining such beliefs at the expense of learning the practices, abilities, and literacies of the machine. Said in another way of software, new media theorist Wendy Hui Kyong Chun (2008) argued that we “valorize the user as agent” and that “the belief that users run our computers, makes us vulnerable to fantastic tales of the power of computing” (p. 300). Chun went onto claim, and I join with her on this remark, that we need to examine carefully and critically the logics of software, and for the purposes in this chapter, computer algorithms as agents with persuasive abilities. By refiguring our relationships with computers, we break free from assuming control and power over
computers, and instead imagine computers and the algorithms inside as cooperative agents executing actions in a networked system.

For Chun, (2004) software is a function of ideology—fulfilling, in her examples, a false consciousness (from the movie trilogy the Matrix) to Louis Althusser’s ideology as “representation.” She noted that software transmits imaginary relationships to hardware, where the icons, images, and designs of the software “interpellates a ‘user’” (p. 43). This reminds us that software is not neutral or free from ideological scripts, but that software is loaded with identities that users gravitate or distance themselves toward online. The designs intentionally provoke ideological scripts to shape users into using certain products and softwares, but in ways that allow users to relish in a false belief that through functionally learning how to use these tools that they control and have power over these technologies. This position renders users into a position of accepting software and technologies as tools instead of separate machines, with complex programming languages and algorithms that shape human activity.

Media theorist Friedrich Kittler (2009) has synthesized historical thought passed down from Aristotle to Heidegger in order to address an ontology of media—a crucial perspective for imagining algorithms as agents. He pointed out that in Aristotle’s work there was an absence of the discussion of media, and Aristotle believed any discussion of being was secondary to form and matter. The perception of the form and matter, for Aristotle as Kittler traces it, resides in the separation of air, water, fire, and earth from human’s perception of the eye and the ear to the object in distance—“In the case of hearing, there must be air between the thing and the eardrum as well as between the eardrum and the cochlea” (Kittler, 2008, p. 28). However, in the philosophical update of Heidegger, Kittler pointed out that Heidegger allowed beings to distinguish themselves ontologically through distance and the temporal dimensions of traveling
through space and time. What is crucial about this distinction is distance allows Heidegger and
Kittler to position media ontologically in the dimension of distance—that the transmission of
media elements is its own ontological position. More importantly, the transmission occurs
through a continual feedback loop within a network of reciprocal relations of humans and
computers, materials, and language. What makes computer algorithms an ontologically viable
theoretical position is the transmission (or, more importantly, the action) of data that flows
through inputs and output networks. As such, transmission is the first step in realizing computer
algorithms have agency.

Although transmission has relatively modern roots in media studies with information sent
across distances, the concept has much earlier roots than contemporary theories and helps
provide a foundation for discussion. Specifically, Plato’s *Phaedrus* provides a recognizable
scene of transmission that acts as a forerunner to the dynamism in the built ecological network. If
dynamism is the collective force that binds multiple energy layers together, then dynamism acts
as a transmitting body, similar to the locusts Socrates and Phaedrus see as the two sit outside the
city along the riverbank discussing differences between knowledge and belief. The story of the
locusts and their activities provide a remarkable example of transmission. Socrates shared how
the locusts came to be—that in another time and form, the locusts were muses, who delighted in
merriment and forgot to eat, drink, and sleep and died. Transformed into locusts, they were
always busily singing and dancing. Socrates told Phaedrus if they both engaged in talk and did
not bestow attention to the siren songs of the locusts, the creatures may report to the Gods and
Socrates and Phaedrus might gain favor with certain Gods. The importance of this tale helps
realize two key concepts: 1) transmission of distance by intermediary bodies (locusts), and 2) an
algorithmic procedure by syllogism: If Socrates and Phaedrus engage in the pursuit of
knowledge, ignore the siren calls of the locusts, then the Gods will give favor to the two men.

While there may have been an absence of a discussion of media in Aristotle’s works, and perhaps explicitly through Plato, transmission does interpretatively appear *Phaedrus* among organic non-human beings. The locusts act as literate beings, able to read their surroundings, and communicate back to the Gods. As such, I believe this is an early example of rhetoric appearing outside of human domain, and in non-human beings, especially since the Ancient Greeks (Isocrates, Aristotle) and since passed down through the centuries, believed rhetoric circulates among humans only. What this scene in *Phaedrus* also shows is an example of an algorithmic procedure—one written, not in mathematical language, but in language itself, using the available means of communication—or rhetoric—to impart this information to others.

Just as the locusts read and write so, do computer algorithms. For example, computer algorithms read data from databases and write output to direct immediate movement. Not only do the algorithms exist within the built ecological network, as shown in chapter three, but they also have an ontological state of transmission of media, and an epistemological position of creating information exchange that affect machines, materials, economic, legal, financial, educational, medical, social, and cultural systems. While computer algorithms might not enjoy the full benefits of agency in the way rhetoricians have tended to define agency, it is through transmission, reading, writing, and execution that the algorithms do have agency. Here I consider the recent work of Marilyn Cooper (2011) who argued that agency is “neither conscious intention nor free will” and that while “agents do reflect their actions consciously . . . their agency does not arise from conscious mental acts” (p. 421). She did argue that agency is “an emergent property of embodied individuals,” and it is within this definition that this project branches. Computer algorithms are emergent properties, and the networks of computers,
softwares, cables, and servers are the embodiment of algorithmic procedures. In addition, as Adrian Mackenzie (2006) argued, algorithms as computer code extends agency of machines, people, and systems. While the very code that runs technological systems is largely invisible from people, the algorithms that run through the processes do engage in action, and are to a large degree in Latour’s terms, an actant in the world around us.

Since there is a distinction between human agency as also having conscious abilities to process multiple stimuli and the command line forms of algorithms, I use the term “algorithmic agency” to separate the two areas from each other. Certainly humans can engage in algorithmic thinking and practices and enact agency in relations with others, situations, and materials. However, I think there must be a clear term to distinguish human agency from the agency algorithms engage in because of a more focused direction of activity and actions. Therefore, I define algorithmic agency as the coded processes that transmit, enact, and embody computing technology with the design to process and exchange information. In a sense, algorithms are Plato’s locusts, always abuzz with activity, ready for action.

**Critical Literacy and Algorithms**

If rhetoricians and writing teachers begin thinking that algorithms have agency and persuasive abilities (as discussed in chapter three), then educators must also tend to the critical literate practices involved in algorithms. In some sense, algorithms enter into a type of dialectic exchange with the data given by people. Additionally, once students understand algorithms as agents with persuasive abilities, students may develop nuanced social and political frames and find ways to subvert any harmful algorithms, especially algorithms used in web personalization or to surveil and monitor users online.
Where Jeff Rice (2013) and Stuart Selber (2004) argued for developing heuristic over algorithmic approaches in their works, I find merit in considering both in the frame of critical literacy. Given the ways heuristics sparks new ideas, Janice Lauer (1970) explained how such frames would be helpful for rhetoricians in developing new modalities of invention for composition. Indeed, what makes heuristics appealing are the meta-theoretical developments that lead to new methods of discovery. Meanwhile, in discussing theorist Siva Vaidhyanathan The Googlization of Everything (2011), Rice remarked that Vaidhyanathan argued critique “is our best tool for overcoming search manipulation” (p. 2)—this search manipulation coming from computer algorithms and information in databases. Yet, Rice remains suspect over critique being the best tool for people to develop critical literacy to subvert the power in such online spaces. Rice relies upon tags in search engines to help construct his narrative. Implicit within Rice’s construction of the narrative is some type of heuristic device, as he did not offer one for search literacy, but indicated the following:

To make up one’s mind, so to speak, one would need some sort of catalog to search through. There exist events, moments, people, and texts to navigate and consult in order to address a given political story. The writer’s task is to identify them in various archival places and to use them for composing. Narrative can serve as that compositional space. (p. 4)

In this passage, I read from Rice an internal heuristic he developed to guide him through search to help develop the narrative he wrote about in the article. Rice may have initially relied upon a broad internal heuristic to guide his search, but once he began organizing his narrative, heuristics no longer allowed for the discovery or invention practice, but instead for an algorithmic
arrangement gave him a method for organizing his narrative argument. Meanwhile, in his chapter on critical literacy, Selber (2004) remarked on algorithmic approaches in the following manner:

As opposed to algorithmic approaches, which are precisely defined and structured, heuristic approaches provide a suggestive framework that can help students systematically probe the contingencies and dynamics of the author-to-readers intention structure, including the rhetorical situation. Whereas algorithmic approaches set down fixed rules for organizing an argument, for instance, heuristic approaches help students determine the most effective organizational pattern given the particulars and complexities of a specific communication situation. (p. 90)

I agree that heuristics are sound practices to help rhetors to pinpoint a communication strategy most effective for a given rhetorical context, but I also think that algorithmic procedures are employed at a later stage in the preparation of the communication. Heuristics are worthwhile for invention, whereas algorithmic approaches are important for arrangement. This chapter does not offer algorithmic procedures because such procedures are contextually dependent upon the rhetorical situation at hand. Given that Selber and Rice argue against algorithmic procedures, it is worth commenting on why they are important in addition to heuristics.

Heuristics are important for invention practices, i.e., to help students generate ideas and material. However, once students have ideas, what next? For the inexperienced writer or the writer who has not had access to certain educational settings, lock-step procedures and formulas help students enter into writing their projects. In no other case has formula writing been as popular than in the bestselling book in writing studies, now in its third edition, *They Say, I Say* by Gerald Graff and Cathy Birkenstein (2014). Graff and Birkenstein break down how to
structure arguments, provide templates, and advice on how to arrange, *rhetorically*, elements in academic writing. Certainly as David Sheridan (2010) pointed out elsewhere upon the differences between algorithmic rules versus heuristic rules, algorithmic rules, “tends to be rigid, authoritative, and limiting” whereas a heuristic rule, “tends to be flexible, open ended, and generative” (p. 86). Of course, the concern with algorithmic procedures rests with students thinking the procedures will fit every rhetorical context; however, if teachers structure discussions on algorithmic procedures as context dependent, providing such procedures may help students learn how to make academic moves earlier in their educational careers rather than struggling through for years.

Pedagogically, I am interested in a heuristic approach that places students as discoverers of knowledge through a critical frame of social, political, and cultural matrices. Such an approach must also follow a critical pedagogical frame of positioning students as curious provocateurs of ideological systems á la Freire, Shor, and Giroux, but also with ways of perceiving the social dynamics involved in reciprocal relations between humans and computers via Barton and Hamilton (2000). This method also allows students to examine their internal beliefs while analyzing the sociopolitical ones embedded in computing systems. Once students are then ready to move into forming argumentations or ordering information along a narrative, algorithmic procedures become helpful for figuring out the best communication for the rhetorical situation. I also do not see discovery and arrangement as distinct stages, but fluid movements students engage within throughout the entire process of composing.

Where Selber (2004) relied upon theories from Bryan Pfaffenberger to inform his critical heuristics, which are extremely useful for considering how power moves in technological systems, the heuristic and algorithmic procedures I use come from information literacy and
theories of writing center and multiliteracy center pedagogies. Because the relationships among teachers, librarians, and administrators in such centers help promote curriculum building across the university using multiple disciplines, developing heuristics that infuse information literacy into the curriculum also support efforts in the digital humanities, which currently works with metadata for textual analysis. However, I also contribute my own views to such heuristics informed by the built ecological network theory. Not only do students need to consider the dynamic and transformative relations among energy layers within the network, they also need to develop ways to critically examine how algorithms affect the larger complex adaptive system of on- and off-line lives. Material, spatial, temporal, social, and lingual energy layers are as much of the rhetorical ecological situation than the rhetorical canon or Paul Prior et al.’s reassembling the canon using actor network theories. When analyzing the functions, agency, and persuasive abilities of computer algorithms, students must take into account the entire rhetoricity of the network (or, as much as possible) to understand the dense relations of materials, people, and ideas. Acquainting students with ways to sort through the network also means relying upon information literacy practices and initiatives developed by librarians.

**Information Literacy**

One of the most valuable relationships educators in rhetoric and composition have is with librarians because much of the work writing teachers perform includes ways to search for information. Not only are librarians trained to access, maintain, and archive information sources, librarians have training in metadata—the tagged entries that allow categorization of information in databases and in physical stacks in the library. Librarians are also trained to help people use information resources like online databases, catalogs, search engines and indexes to sort through the larger network of information to find specific results.
Librarians work within a larger practice of information literacy, which will become increasingly important with advances in search engine practices and with scholarship in the digital humanities. According to the American Library Association Presidential Committee on Information Literacy (1989), developing skills to find and use information in various contexts and with different tools is critical to the advancement of knowledge in societies. The report indicates that educators play an important role in helping students with information literacy by,

Producing such a citizenry will require that schools and colleges appreciate and integrate the concept of information literacy into their learning programs and that they play a leadership role in equipping individuals and institutions to take advantage of the opportunities inherent within the information society. (para. 3)

The committee report also recommends that library infrastructures will play a key role in developing information literacy, but that educators in K-12 and in colleges and universities will need to integrate information literacy within their curriculums with lectures, activities, and workshops.

An early adopter of information literacy in rhetoric and composition scholarship was Irene Clark and her *Computers & Composition* article, “Information Literacy and the Writing Center” (1995) wherein she argued that writing centers were ideal locations to help students learn the skills needed for information literacy. Clark suggested computers as necessary access points for students to acquire information literacy skills with a tutor’s guidance. As such, she argued that writing centers that made information literacy a focus would also allow for relationships with librarians to develop. Since the 1980s, knowledge workers, administrators, and tutors in writing centers have focused on curriculum building for multiple disciplines (cf. Hobson, 2001). Not only do tutors guide students with developing strategies for the writing
process, but also in developing information literacy skills needed for research because the goal of writing center work is to change the writer, not the writing (North, 1984).

**Writing Center, Collaborative, and Technology Pedagogies**

By encouraging students to turn to how political, commercial, and cultural interests regulate online spaces from various ideological forces, students can become critically literate in how technologies shape people, and how to subvert and make alternative decisions relying upon a critical pedagogy approach to democratic action. Having a foundational center that promotes programs and practices of critical literate and information literacy curricula help foster university-wide support for students in all disciplines and training for educators in literacy initiatives. The grounding pedagogical practices of such centers rely upon, according to Eric Hobson (2001), individualized instruction, collaborative learning, and technology. These systems and methods of learning aid students in discovering the social dynamics involved in acquiring critical literacy. For example, in Barton and Hamilton’s chapter on literacy practices, they mentioned some literate practices are more visible and influential than others. This may be because of students’ own ideological beliefs and practices or access to certain technologies and/or comfort with individual or collaborative learning. Regardless, the writing center site and the accompanying pedagogical practices support student development of literacy acquisition.

Faculty unfamiliar with writing centers may often view the site as a place where students go to have grammar “fixed” in essays; however, according to Diana George (1988), the writing center is a place where individualized instruction and “non-evaluative” approaches encourage literacy development in student writers. In college and university settings, having a site where one-on-one instruction occurs outside of the classroom walls may also help students overcome any impediments by talking with a trusted tutor on their concerns with research, writing, and
technology use. The idea of equalizing access of educational sites for all students has been pointed out by Eric Hobson (2001), who noted that writing centers may also serve as a place for students “who have not had the benefit of the best secondary educations” because of “funding inequalities, class discrimination, racial discrimination, and countless other factors” (p. 170). Thus, writing centers, through individualized instruction help fulfill the critical pedagogies espoused by Henry Giroux and Ira Shor.

The individualized instruction in writing center pedagogy is one of the first principles guiding the heuristics in table 1. Even in a classroom setting, instructors still may create time and space for peer-to-peer interactions or even student-to-teacher interactions for individual instruction. By making individualized instruction a focal point in pedagogical practice, students may learn to acquire, sustain, and examine further critically literate investigations on a variety of socio-political concerns, but for the purposes of this research, the forces in computing systems and algorithmic surveillance. This flexible practice also allows students to engage and grow within the comfort levels they and the instructor see fit.

Individualized instruction through peer tutoring provides flexible and adaptable sites of inquiry between students and tutors, but so does collaborative learning between the participants. While collaborative learning is a widespread practice among all disciplines, Kenneth Bruffee (1984) brought collaborative pedagogies to the forefront of composition instruction. Bruffee argued that “thought is internalized conversation” (p. 639) and that writing is a form of internalized social engagement, but also that learning collaboratively codifies social knowledge through exchanges in cultural groups. Providing suggestions for how to implement collaborative writing in composition classrooms, Rebecca Moore Howard (2001), illustrated how to scaffold and sequence collaborative pedagogical projects throughout a semester; tailoring projects to
collaborative work; leading discussions on how to collaborate productively; preparing for student resistance; giving groups autonomy for decision making; and making way for dissent. Since working with algorithms from a critical apparatus may lead students toward discomfort, implementing collaborative pedagogies that reinforce social support systems during learning exchanges can help ease tensions individually and within groups. Feminist computers and writing scholars Christine Tulley and Kristine Blair (2002) echo this perspective in discussing how pairing students in collaborative “buddy groups” help them feel more comfortable learning new technologies.

Part of individualized and collaborative exchanges in writing center pedagogy includes discussion on computer technologies because of the informatics and computer technological culture saturation students find themselves within today. As Charles Moran (2001) pointed out, there is not an explicit pedagogical practice connected with technology; however, teachers and peer tutors must include guidance in their discussions with students. Despite the fact that there are a plethora of computer technologies with various software programs from basic word processing to advanced design programs that teachers and peer tutors do not have necessarily have the time, training, or even institution support to learn, educators must keep up with technological advances. While the need for training for such technologies institutionally is beyond the scope of this project, David Sheridan and James Inman’s edited collection Multiliteracy Centers: Writing Center Work, New Media, and Multimodal Rhetoric (2010) provides educators with a collection of chapters from computers and writing specialists working at the margins of writing center research and practice by redesigning and theorizing writing centers and sites that include peer instruction with multiple modes of communication (written, visual, audio, graphic) in different software packages for students in an array of disciplines.
However, David Sheridan’s chapter “All Things to All People” (2010) outlined heuristic approaches to technological literacy and infrastructure needs that are worth commenting upon briefly. Sheridan provided a set of practices needed for a multiliteracy center that included certain material conditions like computer networks, servers, and operating systems along with rhetorical, cultural, and graphic questions to help tutors lead discussions with students.

Taken together, individualized instruction, collaborative learning, and technology represent the foundations of writing center pedagogy that may also be mapped over into classroom instruction, especially with relationships with librarians to foster information literacy instruction with students. These pedagogies are also broad enough for all educators to use, regardless of disciplinary alliances and training because the focus is upon student development. To those who want to incorporate these pedagogies further in their instruction, the tables listed below will help in areas of teaching students the kinds of frames and orientations needed for theoretical and methodological approaches to examining computer algorithms underneath interfaces as well as other cultural, political, and social ideological values embedded in virtual spaces.
<table>
<thead>
<tr>
<th>Table 1</th>
<th>Individualized instruction</th>
</tr>
</thead>
</table>
| Consultation | • What are the various needs the student writer needs given the assignment but also their long-term growth as a writer?  
• What is the student’s learning style, and how will that be accommodated in teaching?  
• What are the psychological needs of the student? Does s/he need encouragement, firm support, and distance?  
• What accommodations do students need for success?  
• What information literacies does the student need to grow as a critical thinker? |
| Instruction | • How do the parameters and context of the assignment aid or inhibit student learning?  
• What considerations for understanding and skill are needed to help students become self-sufficient learners?  
• In what ways may the student set the agenda for instruction?  
• How do formative assessment practices aid in helping students progress? |
<table>
<thead>
<tr>
<th>Table 2</th>
<th>Collaborative learning</th>
</tr>
</thead>
</table>
| **Shared language** | • In what ways does collaboratively engaging with students foster a reciprocal exchange of everyday language for all involved?  
• How do participants exchange ideas to solve problems and engage in healthy debate using social and cultural common languages? |
| **Participants** | • How might we reach consensus on knowledge, practices, and assignments?  
• Who else might participate in collaborative learning? Other students, teachers, administrators, community members, librarians, social media commentators? |
| **Transmission** | • How is collaborative learning transmitted to participants and through what mediums?  
• What historical, cultural, and material knowledge(s) help build upon current practices and form new ideas? |
<table>
<thead>
<tr>
<th>Table 3</th>
<th>Technology</th>
</tr>
</thead>
</table>
| **Equipment** | - What computers, software, and classroom space are needed for technology?  
- How can students make available technologies work for them? |
| **Infrastructure** | - What network configurations, server space, computers, software programs, storage space, and rights and privileges are needed?  
- Who are the decision makers for technology initiatives? |
| **Learning** | - How do we approach learning new technologies?  
- How might a buddy system or collaborative learning environment help students learn technologies?  
- What strategies will students need to address uncertainty when using technologies?  
- Upon mastery, in what ways do students teach peers technology? |
| **Information literacy** | - How does metadata figure in teaching students about information literacy?  
- What search and database practices do students need to evaluate and analyze source material for research? |
| **Website, search, and algorithmic literacies** | - What information is this website or app asking to collect?  
- Why does this site need this information?  
- How will the site or app use data information?  
- How do public or proprietary algorithms affect screen culture? |
In the final section of the heuristic, “Built ecological network” (Table 4) comes directly from the theoretical position I outlined in chapter two and may be more student-oriented instead of teacher-focused. Since algorithms are positioned within an ecological network, it is important to pay attention to the different energy layers while engaging in any critique, examination, or observation critically. In practice, the theory of the built ecological network helps students examine the dynamic and rhizomatic network of material and ideological weights of both human and non-human relations in composing spaces online. Additionally, the theory helps students uncover how non-human objects have agency and enter rhetorical acts (if at all). Please note that while I am using the theory in service of critical literacy, the built ecological network has broader applications than what I demonstrate here, which include analyzing privacy and data use policies on websites and apps, personalized advertisements, recommendations, and design and accessibility features of websites and apps.
<table>
<thead>
<tr>
<th>Energy layer</th>
<th>Description</th>
<th>Heuristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial</td>
<td>Directs attention to the space objects and humans occupy</td>
<td>In what ways are the material networks that make up computing technologies occupying spatial positions that are political, cultural, and social in nature? What are the affordances and constraints to such spatial dynamics?</td>
</tr>
<tr>
<td>Temporal</td>
<td>Linear time with multiple time lines for people, spaces, places</td>
<td>How does temporality affect regulation online? Why do time constraints affect computing technologies?</td>
</tr>
<tr>
<td>Material</td>
<td>Matter and masses of non-human objects</td>
<td>What are the political, social, and cultural attitudes and beliefs towards the materials of computing technologies? How do those beliefs contribute to algorithmic culture?</td>
</tr>
<tr>
<td>Social</td>
<td>Goal directed human activity</td>
<td>How does the social figure in information technologies today, in social media spaces, in information exchange?</td>
</tr>
</tbody>
</table>
Lingual Discourse | What are the various discourse layers online and in app technologies? How do these contribute to persuasion online?

Dynamism Multidimensionality | How do multiple energy layers compete and work together in any given situation for a given purpose?

There are multiple approaches for applying these heuristics with students, including scaffolding and sequencing activities and major assignments that include engagement with one-on-one instruction with peers or the teacher, collaborative group work with learning a new technology or analyzing a website, and/or learning a new software for an assignment. Some sample assignments include having students examine search engine practices in Google, similar to Sofia Noble’s work with her students on searching for “black girls.” Or, having students analyze the dynamism in software products like Microsoft Word or other types of word processing systems to see how the temporal, spatial, lingual, and material energy layers connect with each other into a unified whole. Teachers may also focus on the social, political, and cultural views embedded in software design and structure or even in the personalization that social media sites offer, like Facebook, through creating faux accounts and inputting false data to learn what types of personalized content appears on within their Facebook accounts. From these heuristics, however, students are able to engage in critique and analysis from multiple theoretical lenses, which may help with discovery and invention.
Conclusion

As Kristine Blair (1998) stated in her concluding remarks in her investigation of difference in the electronic contact zone, “For students to experience liberation, empowerment, collaboration, and community building, it is vital that we examine the existing electronic spaces that do or do not allow for such goals to flourish. . .” I see such a statement as true today as it was nearly twenty years ago (p. 326). Technologies have rapidly advanced to the stage where the medium of delivery has all put nearly disappeared in the minds of users because of flashy graphics, and provocative textual arguments, but also the collection of data from algorithms represents a type of surveillance where people are no longer the users of products, but are the products. Educators must attend to the algorithms under our interfaces and discuss with students how these rhetorical structures persuade and shape people into action, beliefs, and attitudes that not only affect virtual lives, but real, physical lives as well.

Where Selfe and Selfe (1994) realized that computer interface is a “linguistic contact zone” where students have to abandon their own narratives in favor of the enculturation of the “middle-class, corporate culture, capitalism and the commodification of information, Standard English, and rationalistic ways of representing knowledge,” (p. 494) the interface where computer algorithms originate and operate to deliver such information is under scrutiny here. These algorithms generate such narratives, graphics, textual elements, and constructions of cultural norms that privilege certain groups over others. It is no longer enough for writing educators to analyze the visible symbols on the interfaces. Instead, teachers must go beneath the interface and learn about computer code and algorithms, to understand their affects, designs, and executions.
New media literacies, whether they focus on developing search literacy, visual literacies, or web 2.0 literacies, involve a host of political, social, technological, and cultural conditions across several domains of life. The acquisition and sustainment of theoretical and process-oriented social literacies support larger societal goals of democracy and freedom from oppression. Certainly learning how to identify, analyze, and possibly subvert structures of power can enable critical consciousness, and sustaining critical literacy in digital spaces is further needed as computer programmers and engineers continue to find ways to build a more personalized web. Educators play important roles in teaching students such literacies through information literacy curriculum building, but also in publically sharing research to both popular and academic readers about the skills students and the general population need in today’s digitally driven information environment. This means that educators will have to extend critical literacies to account for algorithmic movement online to illustrate the importance of analyzing and safeguarding how algorithms persuade people through the interface.
CHAPTER FIVE:  
PATHWAYS TO PRACTICE: RESEARCH, TEACHING, COMMUNITY BUILDING

“While the Internet has the potential to decentralize knowledge and control, in practice it’s concentrating control over what we see and what opportunities we’re offered in the hands of fewer people than ever before” –Eli Pariser, p. 218

Connecting and sharing content online provides ways for people to enrich their interactions with others when physical constraints limit engaged participation. Mainstream websites and applications like Google, Facebook, and Twitter lead user engagement with slick interface design and unrivaled content delivery. Many of these popular sites and apps also use digital algorithmic surveillance to capture data from end users. Admittedly, I use many mainstream websites and applications, partly out of professional necessity, personal convenience, and curiosity. As a researcher, I know many of these sites use tracking technologies and collect an immense amount of data from me. This does lead me to feel uncomfortable about what information Internet companies have about me. Yet, as a private citizen, I still use these sites; I do so, however, with additional privacy measures like blocking and do-not-track-technologies. Perhaps, then, central to discussions of digital algorithmic surveillance in website and mobile app technologies is the emphasis upon the overall rhetoricity of the algorithms in the larger built ecological network, with ways to critically examine and interrogate practices that exploit instead of empower. Thus, in this final chapter, I consider the implications for digital algorithmic surveillance and the impact they have upon new media literacy, information exchange, and composing in digital spaces. Such discussions reflect upon historical scholarship
in rhetoric and writing that encourage teachers to integrate technology, social media, new media literacies in classrooms to inspire students to become reflective and critical practitioners of websites and apps. My findings suggest students and teachers may continue to work within such spaces that use digital algorithmic surveillance in meaningful ways that allow for protection of privacy and data from Internet companies. Additionally, building and sustaining curricula that reinforce information and digital literacies in multiple disciplines helps bridge the gap between passive user to informed activist who opts-in to sharing ways companies track and surveil, and what the everyday person can do about it, if desired. This means such scholarly attention extends outside of our classrooms and even professional journals and into public discourse through social media, publications in popular presses, and activities that rally people to talk to policy makers, Internet visionaries, and even organizations like the Electronic Frontier Foundation (EFF) and the American Civil Liberties Union (ACLU) about leading efforts to increase awareness and make productive changes online. Thus, this chapter concludes with proposals for scholarly and public engagement of digital algorithmic surveillance in online spaces.

First, what does a built ecological network theory, as discussed in chapter two, offer teachers in rhetoric and composition in terms of understanding how digital algorithmic surveillance affects the processes of writing? The built ecological theory provides a broader landscape of rhetoric by integrating non-human objects into discussions of agency and persuasion. This theory affords a methodology, as outlined in chapter 3, into describing how a non-human object, like a computer algorithm, engages in rhetorical acts that influence and persuade both humans and non-humans. Thus, the energy layers help create a dynamic rhizomatic portrait of mixed transmissions, materials, and connections the ebb and flow with inputs and outputs. Using these layers as variables, as shown in this project, helps researchers
realize the influence of any one object in relation to so many others in the network. In the case study of Google’s search engine computer algorithms, some of the implications discussed included performativity, agency, and persuasive abilities. While some theorists and programmers may think of computer algorithms as command structures inputted into code, the algorithms are more complex than just a set of procedures. They enact performativity by working without the direct intervention of humans, and take on tasks that influence other algorithms and people. In many ways, this places control with algorithms and not with people, and limits the potential of open access to information online.

Shifting focus towards digital algorithmic surveillance and its connection to the built ecological network, it is important to keep in mind how algorithms alter people. This is an interesting concept to consider because when we sit in front of our screens and interact with sites like Facebook and Google, we may not be thinking of how the algorithms are influencing the way we think. However, computer algorithms do filter content in ways that alter our cognitive frameworks, as Eli Pariser (2011) reported in his work on the filter bubble. Pariser cautioned readers on the abilities of filtering by noting:

personalized filters can upset [the] cognitive balance between strengthening our existing ideas and acquiring new ones. First, the filter bubble surrounds us with ideas with which we are already familiar (and already agree), making us overconfident in our mental frameworks. Second, it removes from our environment some of the key prompts that make us want to learn. (p. 84)

The concern with these cognitive shifts as Pariser remarked rests with the invisibility of the filters and the inability of end users to control how the filters present content through the screens. However, if algorithms reinforce our views and discourage our intellectual growth, then this
form of social engineering provides a stark example of how control and power operate in the hands of the few instead of the many people who use online spaces.

For writers, who engage in various practices in social media and use search engines like Google to find information quickly, this type of filtering presents concern. The filters, which are made up of computer algorithms, control access to information. Partly this occurs because of international government regulations that forbid citizens access to certain content (Goldsmith & Wu, 2006; Kalathil & Boas, 2001). It also happens that the filters work to promote commercial and economic interests over others. For example, when searching for maps in Google, the first result is Google Maps. Of course, Google prioritizes their own products over others in their search results. However, on Facebook, the computer algorithms specifically promote certain keywords and posts over others that reflect the values Facebook deems appropriate. As one Facebook user reported, by using specific keywords like “baby,” “new job,” “I’m engaged,” and “marriage,” Facebook places posts with this content higher in newsfeeds (Moss, 2014). Posts that reflect positive life changes appear higher in results, thereby reducing other content further in the newsfeed. All too often, this type of digital social engineering can have real effects upon people, as the Facebook emotional contagion study, as discussed in detail in the introduction. This leaves writers and composers in a precarious position because there are real benefits to engaging with social media and with Google products, but these spaces are engineering personalized results so that access to information is completely different for each individual, leading to a myopia of information and changing the behaviors and thoughts of people.

Additionally, working with the theory of the built ecological network and with digital algorithmic surveillance, educators gain insight into the relations between humans, the data they input, data collected from their habits, and the algorithms that direct their attention in online
spaces. Google, for instance, collects log data, website history, location data, and other factors that holistically drive what content a person experiences on their screens. Digital algorithmic surveillance will not be going away anytime soon, so learning how to work with these algorithms to lessen some of the tracking helps. Some of the heuristics discussed in chapter 4 help identify and subvert algorithmic surveillance online by providing students and educators with starting points to destabilize such surveillance. Teachers may also embed instructional components of reading privacy and data use policies to learn what data sites collect, and how those sites use that data. Other activities may include running browsers in “private” mode with do-not-track browser ad-ons, using Virtual Private Networks (VPN) to mask IP addresses to distort the location data sites and apps collect and use for advertisements and personalization. The EFF provides resources for educators on their website as well that help frame discussions on surveillance and privacy online. However, the most important impact educators can have when educating students and using the heuristics on digital algorithmic surveillance is the integration and promotion of a sustainable network, where students educate their friends, family, and co-workers on the effects on surveillance online. Teaching students to change their habits and behaviors online is only one part of larger educational goals. Educators are in a unique position to encourage students to engage in critical consciousness and participatory action in regards to digital algorithmic surveillance.

**Scholarly Import and Contributions to Digital Practices**

If you have spent any time walking around an American college campus these days, you might have noticed students walking, head bent down, with their hands grasping a Smartphone, busily texting or reading the latest news. This phenomenon is not limited to just students—goes to nearly any public place, the mall, supermarket, bookstore, and you will see adults in similar
postures. Indulging in mobile technologies, which allow for interactions with websites and apps, gives companies access to a person’s data and habits. The engagements—that also include tablet, laptop, and desktop connections—magnify the built ecological network many people write within today. No longer are texts, images, essays, video compositions just mediums, distributed along networks, but they are tagged with metadata, which allow websites and apps to track the transmission across networks. Not only are businesses capitalizing on metadata through projects involving “big data” to glean insights into customer behaviors, but researchers in the digital humanities also use data sets for visualization and curation projects. However, the creeping algorithmic gaze of surveillance persists. Many sites, especially Facebook, use data to shape how we receive content on our screens, influencing our behaviors and actions. Thus, teachers and researchers must consider how such practices afford and constrain communication in the Technological Revolution.

Completely opting out of mainstream sites and apps that use digital algorithmic surveillance will not eradicate or lessen usage of such practices by Internet companies. Considering that economic, political, commercial, and social exchanges occur every day on mainstream sites, opting into education, awareness campaigns, and sharing research from this project will help citizens make decisions on how and when to share data with websites and investigate the curation practices of spaces that use personalization to shape behaviors and beliefs. Raising awareness is only part of the process, as this project shows in early chapters. The main contributions from this project work with existing scholarly conversations in rhetoric & composition (Baron, 2001; Brooke, 2009; Porter, 2003; Reyman, 2013; Selfe, 1999; Selfe & Sefle, 1994) and computers & writing (Beck, forthcoming; Blair, 1998; Janangelo, 1991; LeCourt, 1998) with discussions on digital literacies (DeVoss, Cushman, & Grabill, 2005;
DeVoss, Eidman-Aadahal, & Hicks, 2010; Selber, 2004), net privacy and surveillance (Crow, 2013; Hawkes, 2007; McKee, 2011, and with curriculum literacy building (Coley, 2012; Hawisher & Selfe, 1991). These conversations have been instrumental in placing a foundation for discussing digital algorithmic surveillance because they are all concerned with digital rhetorics and technologies, broadly conceived. This project honors the scholarship of so many by speaking back to the continued importance of critically examining and supporting technology use in writing curricula. However, this project also contributes to discussions in communications and media studies, as well as surveillance studies, by considering the overall rhetoricity of digital algorithmic surveillance with its impact on people, machines, institutions, and cultures across time and space. In many ways, this project is positioned as an emerging study, building upon existing work with digital rhetorics, surveillance, and literacies, but pointing to a new direction for exploration—one that affects all users of the Internet and mobile app technologies.

Continued investigations, like this project, into digital algorithmic surveillance and the critically literate practices needed to infiltrate such systems will become increasingly necessary for scholars to address. Certainly, so many rely upon mainstream digital spaces for information sharing and retrieval, and this project demonstrates how algorithms play an important role in information exchange. While this project does not go in-depth with algorithmic examples—especially since so many in mainstream sites are proprietary—this work does illustrate ways to examine how algorithms influence communications online. Future research in this area might explore algorithms more closely, in partnership with mainstream companies, to learn the methodologies behind such designs—if such relations can be forged productively.

This project is also positioned within a scholarly conversation of digital ecological studies as a way to show dynamic relations among multiple actors and actants. Admittedly, much
of this project focuses on the conditions of algorithms as an extension of Margaret Syverson’s work, and leaves off discussion of gender, race, sexuality, ability, and other important factors worth considering in context of digital algorithmic culture. The decision to focus on such a narrow concept represents a path toward building future work with collaborators in cultural studies and rhetorics, gender and sexuality studies, and race and class studies. The combination of digital algorithms and embedded ideological values cannot be understated here. Programmers code algorithms with cultural and social values in mind, which ultimately impact ways end users work within websites and apps. Partnering with scholars in postmodern studies to uncover ideological algorithms and their impacts represents another path for algorithmic study within several humanities-based disciplines.

Pathways of Practice: Sharing, Teaching, Learning

Additional connections with this project involve curricular initiatives with information literacy and digital literacy that inform policy, research, and grant work. Partnering with academic librarians, colleagues in communications, media, business, computer science, and the arts offers rich sites of inquiry for projects involving the digital humanities and even social science and humanities focused relations. Perhaps integrating digital algorithmic surveillance discussions into existing curricula is one step forward, but working with a network of professionals with various skill sets also, helps inform ways to address tracking technologies online. Even within and surrounding the classroom, performing teacher-based research (Nickoson, 2012) within this area may spark further inquiry into perceptions, beliefs, and practices of students, who begin to work with information and critical literacies in connection with the larger theme of this project. Such research may spur work with grants for funding of
equipment, labs, and software needed to perform additional analyses of digital algorithmic surveillance,

Additional projects may include online and offline partnerships between community members and students to create awareness campaigns of algorithmic surveillance through public service announcements. Using the heuristics from this project, along with historical practices from computers and writing to encourage multimodal compositions, students and community members may create apps, websites, videos, posters, and even tweet or post on Facebook with information on how to subvert algorithmic surveillance. By becoming critically aware and literate citizens of what is happening beneath the interface, our students and our neighbors can help redirect Internet company practices productively.

Foregrounding future work with algorithms and surveillance within rhetoric and composition will take time and effort to legitimize as an area worth attention in classrooms and in journals. Of course calling for educators to investigate algorithms and computer code, especially writing teachers may lead to calling up conversations about faculty commitment, time, and labor at a time of increased budgetary awareness, especially at state universities. The commitment it takes to learn about programming and how algorithms work is certainly a pursuit that will add to a faculty member’s workload. However, I also wonder what is the expense faculty will really carry when we do not take the time to teach our students about critically literate practices that radically shape our ideologies and actions on and off-line. While addressing faculty workload concerns is beyond the scope of this project, the Wide Collective’s 2005 webtext in Kairos provides multiple areas of consideration about teaching the digital along with addressing concerns faculty members may have about time constraints.
In a recent publication concerning implementing social media in curricula in scientific and technical communication programs, Alice Daer and Liza Potts (2014) discussed ways to integrate such use strategically in programs. While their focus is discipline-situated, in reading their work, their contribution extends across disciplines for any program wanting to adopt social media practices and teaching in curriculums. Daer and Potts provided rich examples for educators to consider when adopting social media, which include tool familiarization, maintaining an active presence, online curation, exercises for practice, not mastery, displaying positive uses of social media, describing differences between social media and networking, and allowing for ‘throwaway’ accounts. In providing this information, the authors illustrate methods of integrating one component of technological advancement in classrooms with considerations for the myriad situations within a built ecological network. While their article does not specifically address computer algorithms and surveillance per se, their contribution offers continued encouragement for teachers to initiate conversations with campus administrators and colleagues for curricula support. With a foundational focus on integrative technologies, advancing conversations with digital algorithms and surveillance may occur and enrich teaching practices.

Finally, a continued conversation from this research that I predict will circulate for some time is how do we train writing teachers who have little to no background in computer code, algorithms, and surveillance to address these concerns in classrooms. After all, time, money, and resources are sometimes luxuries on many state university and community college campuses. Of course, there are several underlying causes to such a complex issue, but there are also several solutions: Sign up for and read postings by the EFF and ACLU on issues of privacy and surveillance, and find ways to embed discussions into existing curricula. Such an example may
be discussing the pros and cons of reading a data use statement or even installing an application, like Ghostry, that provides brief abstracts of websites and apps’ data use statements. Continue networking with scholars who conduct research in this area. Because this is in many ways an emerging conversation in rhetoric & composition and computers & writing, reading from journals from Surveillance Studies like *Surveillance & Society* or even theoretical works from *Media, Culture, & Society* may help frame current scholarly discussions for classroom use.

However, these are small steps. Larger scale projects that require time, money, and equipment may include a training program for faculty members to learn about algorithmic surveillance. Partnering with librarians, who are trained in information literacy and metatags, to offer workshops or series may be of service to faculty and even graduate students. Another project involves grant work for funding of a research center, where faculty across disciplines along with graduate students, may work on issues concerning digital literacies, surveillance, and algorithmic cultures. Of course, such projects also have to be integrated into existing structures of release time, tenure and promotion decisions, and funding support. What we need to recognize is digital algorithmic surveillance is so pervasive online today that it is not going away, and if we encourage students to use sites that surveil, then we have an ethical duty (McKee, 2011; Coley, 2010) to teach students about what is happening underneath the interface in ways that our curricula, departments, and institutions will support.

From this research, it is my hope that researchers and teachers will continue working within this area in rhetoric & composition and computers & writing; I hope we find ways to challenge and subvert surveillance online, and prepare our students to do so as well. Extending and sustaining digital literacies and rhetorics also means addressing the opaque and invisible elements within our interfaces to learn how they are shaping our experiences online. Pathways to
action in learning, research, and public service include discussing computer algorithms as persuasive agents to learn how to address and subvert the overall rhetoricity of algorithmic surveillance online to democratize access to information for all populations.
REFERENCES


[Reprinted from *Spoken and written language: Exploring orality and literacy*, 1982]


http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.01.0144%3Asection%3D8


Manyika, James; Chui, Michael; Brown, Brad; Bughin, Jacques; Dobbs, Richard; Roxburgh, Charles; & Hun Byers, Angela. (2011). Big data: The next frontier for innovation. Retrieved from http://www.mckinsey.com/insights/business_technology/big_data_the_next_frontier_for_innovation


Palmeri, Jason, & Rutherford, Kevin. (Forthcoming). “The Things They Left Behind”: Toward an Object-Oriented History of Composition.


Rutherford, Kevin, & Palmeri, Jason. (Forthcoming). The things they left behind: Toward an object-oriented history of composition.


Condit, & Sally Caudill, eds., *Contemporary rhetorical theory: A reader*. New York:
Guilford.

Sheridan, David M. (2010). All things to all people: Multiliteracy consulting and the materiality
of rhetoric. In David M. Sheridan & James A. Inman (Eds.), *Multiliteracy centers:
Writing center work, new media, and multimodal rhetoric*. (pp. 75–108) Cresskill, NJ:
Hampton Press, Inc.

work, new media, and multimodal rhetoric*. Cresskill, NJ: Hampton Press, Inc.

Press.


associated with cookies, flash cookies, and web beacons. *Journal of Internet Commerce,*
10, 1–16.

and experienced adult writers*. Dissertation. Boston University School of Education.

Smagorinsky, Peter. (2008). The method section as conceptual epicenter in constructing social


Sullivan, Danny. (2010). Dear Bing, we have 10,000 ranking signals to your 1,000. Love Google. Search Engine Land. Retrieved from [http://searchengineland.com/bing-10000-ranking-signals-google-55473](http://searchengineland.com/bing-10000-ranking-signals-google-55473)


