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Algorithmic affordances for productive resistance

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Abstract

Although overarching if not foundational conceptualizations of digital governance in the field of critical data studies aptly account for and explain subjection, calculated resistance is left conceptually unattended despite case studies that document instances of resistance. I ask at the outset why conceptualizations of digital governance are so bleak, and I argue that all are underscored implicitly by a Deleuzian theory of desire that overlooks agency, defined here in Foucauldian terms. I subsequently conceptualize digital governance as encompassing subjection as well as resistance, and I cast the two in relational perspective by making use of the concepts "affordance" and "assemblage" in conjunction with multiple subjectivities and Foucault's view of power as productive as well as his view of resistance as an "antagonism of strategies" in his late scholarship on resistance, ethics, and subjectivity. I offer examples of salient modes of what I call "productive" resistance (as opposed to resistance by way of avoidance, disruption or obfuscation), and from a Foucauldian perspective I explain how each mode targets and subverts technologies of repressive power to produce new elements of the digital environment and construct new truths. I conclude by recognizing the agency embodied in resistance as an end in itself, but I also consider that modes of productive resistance can have extrinsic value as they affect the fluid interaction among elements of the digital environment, potentially disrupting the presumed structure of dominance and dependence, and opening our conceptualization of algorithmic life to hopeful possibilities for change.

Keywords

Affordance, algorithms, resistance, subjectivity, Foucault, assemblage

This paper targets a disconnect in the burgeoning field of critical data studies (Dalton et al., 2016; Iliadis and Russo, 2016). Digital resistance, although documented in wide-ranging case studies (e.g. Coleman, 2013; Irani and Silberman, 2013; Milan, 2015; Nafus and Sherman, 2014; Scholz and Schneider, 2017; Sobré-Denton, 2015; van der Velden, 2015), nonetheless is unaccounted for in overarching if not foundational conceptual frameworks of digital governance—how digital subjects are governed and govern themselves. These conceptualizations, variously encapsulated in terms such as "data colonialism" (Thatcher et al., 2016), "data grabbing" (Fraser, forthcoming), "algorithmic governmentality" (Rouvroy, 2013), "surveillance capitalism" (Zuboff, 2015), "soft biopolitics" (Cheney-Lippold, 2011), "hyperindividualism" (Lake, 2017), and "the black box society" (Pasquale, 2015), aptly explain digital subjection yet lack attention to resistance (see however Isin and Ruppert, 2015) or what media scholar Stefania Milan (2017a) has called "data activism." I draw attention to possibilities for proactive action afforded by algorithms that extend beyond firms and governments to digital subjects by conceptualizing digital governance as encompassing trajectories both of subjection and resistance, and moreover, casting subjection and resistance in relation to one another. This approach recognizes resistance as part of the apparatus of digital governance rather than peripheral or discrete.

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I first briefly engage *why* critical conceptualizations of digital governance such as those cited above are so bleak. I argue that they implicitly or explicitly share a view of desire articulated by Deleuze and Guattari (1983) that casts subjection in terms of unconscious desire, without possibilities for calculated resistance. My purpose is not to work through the logics of each study, but rather in a Kuhnian[1] sense, to identify general assumptions that underlie understandings of governance in the algorithmic age. The conceptualization I develop in subsequent sections extends the prevailing view to recognize possibilities for multiple subjectivities and agency that figure in resistance. I use "agency" here and throughout the paper specifically with reference to Michel Foucault's late scholarship on ethics. Towards the end of his life Foucault changed his focus from power to the subject (Foucault, 2000: 327) to explore how a subject can proactively resist subjection by critiquing and challenging governing rationalities and mentalities—"the art of voluntary insubordination, that of reflected intractability . . ." (Foucault, 2007a: 47)—and engage in calculated, ascetic practices to desubjectify herself, transform herself, self-govern, and proactively construct her subjectivity (Foucault, 2000, 2005, 2007b).

Second, I develop a framework to conceptualize the dynamics of resistance, in a Foucauldian sense, to digital governance. I begin by making use of the concept "affordance" (actionable possibilities relative to the environment in which one is situated) in connection with the concept "assemblage" (a heterogeneous set of animate and inanimate elements, each of which can affect and can be affected by one another) to conceptualize possible affordances of the digital environment (qua "assemblage") for digital subjects as much as for firms or government, also elements of the digital assemblage. The concepts "affordance" and "assemblage" in combination, a feature of Manuel DeLanda's (2002, 2006) scholarship, extend digital governance beyond a constant state of subjection and unidirectional influence from firms and governments to digital subjects. Yet both "affordance" and "assemblage" address change in terms of flows and contingencies, without direct attention to calculated change on the part of specific actors. To bring a Foucauldian sense of agency into the conceptual field, I then draw from Foucault's late scholarship on ethics and resistance (e.g. Foucault, 1986, 1990a, 1997a, 1997b, 2000, 2005, 2007b). Foucault (1980a: 194) also engaged the concept "assemblage" using the term "dispotif" as well as "apparatus" to refer to the system of relations among elements of the dispotif/assemblage, although these and other concepts lack a presence in his late scholarship on ethics and resistance, which shifted direction and in many ways is inconsistent with his earlier work (e.g. Collier, 2009; Milchman and Rosenberg, 2005).[2] My interest is utilizing and connecting Foucault's disconnected arguments, and further, bridging Foucauldian insights with those of scholars who developed similar concepts (such as the sense of fluid interaction among elements of an assemblage, without, however, attention to agency in the Foucauldian sense). Foucault's early point that power is productive (e.g. Foucault, 1990b, 1995) and his later conceptualization of resistance in terms of an "antagonism of strategies" (Foucault, 2000: 329)[3] are useful in explaining how some strategies of resistance make use of, rather than reject or disrupt and obfuscate, the digital environment. *Productive* approaches to resistance, consciously or unconsciously as I will elaborate, target and subvert a particular strategy of subjection to serve digital subjects. One contribution of this study is to depart from a listing of possible resistance tactics by offering a broad classification of types of resistance, and to specify productive resistance as one of these broad types.[4] A Foucauldian approach to resistance—"productive" resistance—differs from the conventional understanding of resistance as efforts on the part of the powerless to wrest power from the powerful (a person or group in a high position in a hierarchy). From a Foucauldian vantage point, hierarchical relations exist but at the same time power is diffuse; it circulates and affords possibilities for resistance that may or may not materialize, depending upon wide-ranging contingencies. Bringing this view to the field of critical data studies, and connecting it with "affordance" and "assemblage," digital subjects may act critically on their freedom to challenge digital norms by making use of the affordances of the digital environment to produce new elements that serve their needs. In this way, digital subjects can construct spaces of resistance while also affecting other elements of the digital environment, and as I will suggest in the conclusion, possibly digital governance overall. I recognize and value other broad types of resistance to digital subjection, such as avoidance and disruption or obfuscation. However, I confine the scope of my discussion to wide-ranging "productive" modes that warrant critical attention.

Third, then, from a Foucauldian perspective I identify various modes of productive digital resistance. I explain which components of digital governance each of these modes of productive resistance targets and subverts, and subsequently I draw from the collective of productive resistances to elicit similarities and differences. I celebrate the agency embodied in productive resistance as an end in itself, but I also consider how acts of resistance can have extrinsic value as they affect the dynamics of digital governance. Accordingly, I conclude with thoughts about synergy between digital governance and productive resistance, a dynamic condition

that unsettles the presumed structure of digital dominance and dependence.

Why are conceptualizations of digital governance so bleak?

Research in critical data studies aptly has emphasized the eradication of privacy in digital life while also pointing to subjects' unconscious desire for visibility (Harcourt, 2015) and even measurement (Beer, 2016). Firms recognize digital subjects' desire, cast subjects as "dividuals" or disparate data points (Cheney-Lippold, 2017; Deleuze, 1992), and develop tactics to distract or attract them to habitually "click in" (Paasonen, 2016) to deposit a digital footprint. Firms then aggregate data from these footprints, code, and subsequently transform the data into algorithms that condition subjects' preferences and identities, thereby constructing and reconstructing trends to which subjects already have contributed through their web traffic (Cheney-Lippold, 2011), driven by unconscious desire.

The feedback loop indicated above pivots on desire. As theorized by Deleuze and Guattari (1983), albeit outside the context of a digital environment,[5] desire is unconscious and productively invested in a system that cultivates interests. "Interests" refer to aspirations for accoutrements of a social formation and are driven by unconscious desire, which is conditioned and constructed by the existing social formation. Accordingly, subjects become "slaves to themselves" (Deleuze and Guattari, 1987)—an apt description of the feedback loop that enables various aspects of digital subjection via data colonialism, data grabbing, surveillance capitalism, hyperindividualism, soft biopolitics, the black box society, and the digital regime of truth. Recognizing the feedback loop as integral to the digital economy, how then can we find possible spaces for resistance?

Conceptualizing digital resistance in relation to digital governance: Bridging "affordance" and "assemblage" with agency, multiple subjectivities, and "the antagonism of strategies"

Affordance and assemblage

Towards envisioning how digital subjects might create spaces of resistance, it is helpful at the outset to establish conceptual ground for a relational view of digital actors (firms, governments, as well as digital subjects) and the digital environment, and to ask what *affordances* this environment offers any one of a number of actors. The noun form of the verb "to afford" was coined in 1979 by the ecological psychologist James Gibson (1979), who argued for a relational understanding of an animal in an environment, asking what affordances, what actionable possibilities, the environment offers an animal. Central to Gibson's relational conceptualization is the exteriority of possibilities for action in the environment (as opposed to being internal to actors) and the instinctual nature of actions. Numerous scholars have since reinterpreted the concept prescriptively in psychology (Jenkins, 2008; Norman, 1988) as well as in the relatively new discipline of human–computer interaction (Law and von Ahn, 2011) to reflect aspects of both Gibson's relational contribution and the prescriptive approach that has been useful in the design of software (Hartson, 2003; McGrenere and Ho, 2000).

My interest in "affordance" is close to the Gibsonian sense, but differs in two respects. First, affordances as a field of possibilities are considerably more complex in algorithmic life than in a Gibsonian environment–actor relation in which there is only one actor. The digital environment encompasses a wide range of animate and inanimate actors in addition to public and private-sector actors connected to them: consumers and workers as well as the material infrastructure of the internet (Hu, 2015; Pickren, 2018) and devices, platforms, and software. DeLanda's (2002) Deleuzian-inspired use of "affordance" encompasses the concept "assemblage" (DeLanda, 2006), which is useful in capturing the dynamics of the complex digital playing field.

In the context of critical data studies, the use of "affordance" with "assemblage" initiates inquiry into actionable possibilities open to wide-ranging actors by objective elements in the digital environment, such as algorithms. Algorithms are objective insofar as they inherently are neither pernicious nor benevolent; rather, it is how they are constructed and deployed that conditions effects (Beer, 2017). To date the concept of assemblage has been used in critical data studies via actor network theory (Latour, 2005) to show how platforms such as Twitter affect users while users also affect the platform (Bucher and Helmond, 2016). Actor network theory overlaps with DeLanda's (2006) Deleuzian-inspired assemblage theory, although one pertinent difference is DeLanda's emphasis on the mutability of the assemblage overall. Bringing DeLanda's framework into the field of critical data studies would move analysis beyond the fluid interaction among elements of the digital environment to the possibility of the mutability of digital governance itself. Therein lies the political promise of digital resistance, although DeLanda's assemblage theory linked with affordance entails change as a matter of flows and contingencies, without attention to calculated resistance. The absence of calculation in DeLanda's framework also constitutes a limitation of Gibson's approach, which focuses on

instinctual rather than designed action; attention to calculated agency in the Foucauldian sense thus constitutes the second way in which my conceptualization differs.

Bringing agency into the digital environment: Multiple subjectivities and the "antagonism of strategies"

Processes of digital subjection affect digital subjects differently. Some subjects may be relatively unaware of how and why they are subjected; their online practices flow from the unconscious desire referenced implicitly or explicitly in bleak conceptualizations of digital governance. Critically unaware digital subjects might understand themselves and their circumstances in any one of a number of ways, shaped in part by the continuous re/coding of trends (Cheney-Lippold, 2011) or the categories of eligibility used by firms seeking crowdsourced labor (Irani, 2015). At the other pole, some digital subjects are conscious and knowledgeable about their subjection, and some act on this agency to claim their rights to privacy, freedom, and citizen action (Ruppert et al., 2017). Between these extremes lie other subjectivities. Some digital subjects, for example, may be less critically aware of their situation in digital governance while signing on to resistance efforts by becoming relatively passive members of groups or making use of the benefits of resistance strategies forged by others. Some actors who are aware of continual monitoring, sorting, and evaluation might become frazzled, self-governed by one's fears and anxieties that are delivered through the algorithms constructed on the basis of so many unconscious and conscious selves participating in digital production and consumption. Yet recognizing multiple subjectivities is *not* about mapping individuals onto singular subjectivities across a continuum because each individual has multiple subjectivities (Isin and Ruppert, 2015). The continuum of subjectivities therefore describes individuals' fluid movements across subjectivities relative to contingent conditions and the intersection of the dynamics of a specific context with an actor's experiences over time and across space (Ettlinger, 2004). Apparently discerning, critically aware subjects may experience frazzled moments, and moreover, may have moments in which they overlook or avoid thinking about the tactics of digital governance that subject them because they lack the time and energy required to exercise their critiques.

Recognizing multiple subjectivities, which suggest possibilities for the expression of agency, I focus specifically on how digital subjection can be turned on end to *make use of* elements of the digital environment. Far from the devastatingly dominated subject positions of Black Mirror[6] characters or Deleuze's (1992) "dividuals" governed by hyperindividualistic governance (Lake, 2017), the calculating as well as reflexive subject might self-satisfy through vigilant, self-informed, prudent navigation of their role in production and consumption. Critically aware of the ethical quandaries of algorithmic life (Mittelstadt et al., 2016), ethical subjects might strategize to thwart dispossession[7] from within the digitized system, expressing agency to claim their rights by identifying specific, repressive mechanisms and calculating how to target them to produce an alternative regime of practices. Such mechanisms often are algorithms, which can afford possibilities for resistance as much as for subjection.

Foucault's late scholarship on ethics and resistance offers a useful frame for conceptualizing what we might call "algorithmic resistance" in reference to productive use of elements of the digital environment such as algorithms, which can be used to resist various problems posed to digital subjects. Foucault declared that:

> . . . the target nowadays is not to discover what we are but to refuse what we are. We have to imagine and build up what we could be to get rid of this kind of political 'double bind,' which is the simultaneous individualization and totalization of modern power structures. (Foucault, 2000, 336)

Subjectivity conceptualized in terms of Foucauldian ethics pertains to how people understand themselves relative to the system of governance that subjects them, as usefully encapsulated by the phrase "relational externalizing," coined by feminist and Foucauldian scholar Helen O'Grady (2004). Per Foucault, critical awareness requires self-discipline[8] to govern oneself and one's desires by identifying and cogitating the material and discursive tactics—the "technologies of power" in Foucauldian terms—that interpellate one's subjectivity and by which one is governed.

Foucault's approach to agency follows from critique and refers not to strategies among the powerless to wrest power held by the powerful, but rather to the practices of power, the means by which ordinary people without extraordinary resources navigate formidable constraints by targeting mechanisms of domination, and in the process claim a right to critical thought and/or action. Foucault (2000: 331) captured the ethos of productive resistance: "... the main objective ... is to attack not much such-or-such institution of power, or group, or elite, or class, but, rather, a technique, a form of power." The method of resistance therefore is "an antagonism of strategies" (Foucault, 2000: 329) whereby ethical digital subjects craft tactics to counter those that repress.[9] Crucially, as Foucault (1996: 387) argued, "... resistance is a part of this

strategic relationship of which power consists. Resistance really always relies upon the situation against which it struggles.'' Resistance from this vantage point is not imposed on algorithmic governance from ''the outside;'' rather, possibilities for resistance are immanent.

As social power in the digital era often is found in algorithms (Beer, 2017), manipulation of these elements of the digital environment also can be the means by which digital subjects resist by targeting precisely that which subjects them, and subverting the technology of power to serve digital subjects. By ''antagonism of strategies'' in a digital context, I do not necessarily imply a war strictly of algorithms because algorithms are pivotal but not singular elements of the digital assemblage; rather, productive digital resistance is algorithmic insofar as algorithms can be used as tools to enable digital subjects to develop new elements of the digital environment (e.g. apps, software, websites . . .) that target and subvert strategies—technologies—of repressive power, which may or may not be constructed with the aid of algorithms.

Actions flowing from ethical critique may not produce immediate system-wide change but nonetheless can affect individual lives, and cumulatively, possibly can bring about changes, even if not structural, in the system of governance. Digital subjects cognizant of their entanglement in the various trajectories by which they are routinely dispossessed of the fruits of their implicit labor via online activity possibly can produce different outcomes. Some actors critically situate themselves in digital governance, identify repressive technologies of power, and target them to forge new, digital trajectories of resistance that subvert tactics of subjection to serve counter-publics; many others may align themselves with these trajectories relatively passively. In any environment, including the digital, not everyone in practice has the time, energy, skills, or inclination to resist in the Foucauldian sense of ''relational externalizing.'' Yet irrespective of varying subjectivities, Foucault's late conceptualization of resistance offers a useful means to interpret strategies of productive resistance constructed and developed by those ethical subjects able and inclined to identify, target, and subvert technologies of power.

Other modes of digital resistance also exist in the relative infancy of the digital environment. Avoidance, for example, is a matter of rejecting digital life or parts thereof—withdrawing wholly or partially, for example, from social media, email, online shopping, purchasing and other accoutrements of the digital formation (Fraser and Kitchen, 2017). Another mode of digital resistance aims to disrupt or obfuscate digital processes of subjection; groups such as Anonymous have become well known for this mode of resistance (Coleman, 2014), and many other groups and individuals have disrupted or obfuscated processes of digital subjection in new and creative ways (e.g. Brunton and Nissenbaum, 2015; Milan, 2017b; Nafus and Sherman, 2014). I wish to distinguish and elaborate ''productive'' modes of resistance—so named because these modes of resistance make use of and subvert, rather than avoid or disrupt or obfuscate, elements of the digital environment to serve digital subjects.

Algorithmic affordances for productive modes of resistance

Productive resistance in the relative infancy of the digital era already has encompassed wide-ranging modes. My purpose is not to provide a definitive catalogue because the dynamics of digital subjection and resistance produce synergistic effects that would render an inductive list out of date in short order. My aims are to exemplify variation in productive resistance, explain how various modes in different ways target and subvert specific technologies of power to render them useful to digital subjects, and identify limitations and potentialities.

Hacking—Free and open-source software (F/OSS)

A commonly referenced approach to resistance, ''hacking'' entails the deployment of technical and legal knowledge to redefine the parameters of internet use as non-proprietary, thereby destabilizing traditional copyright laws that exclude and control (Coleman, 2013). Unlike hacktivists whose actions are in the first instance political as they strive to disrupt existing institutions, hackers tend to embrace a classic liberal logic of freedom as opposed to an allegiance to particular political groups.[10] Developing F/OSS, hackers target licensure as a normally constraining convention and subvert it by reformatting copyright laws to emphasize a different ''truth'': communitarian values of access, distribution, and circulation (Powell, 2016). One pitfall of the F/OSS movement is that hackers' mode of operation is collaborative, to such an extent, however, that the means—collaborative participation—often overshadows the goal of a knowledge commons (Powell, 2016). Outside the F/OSS arena, firms especially pursuing ''open innovation'' can counteract ''commoning'' by developing and effectively marketing for-profit services for users of shared data, thereby transforming open-source into a platform for the commodification it was intended to undermine (Ettlinger, 2017b). Nonetheless, F/OSS software such as Linux-based operating systems are competitive with Microsoft Windows, and moreover more secure, thus posing a considerable threat to mainstream internet companies

because it increasingly attracts reflexive digital subjects wary and weary of digital subjection. The remarkable spread of F/OSS to various online tools and apps threaten wide-ranging firms and their offerings—from mainstream email servers to conventional, paid delivery of music, film, sports, and news.

Civic hacktivism

Similar to hackers insofar as they produce new software and algorithms, but decidedly different from classic hacktivists who aim at disruption, *civic* hacktivists hack systems to render them a new set of data on which subjects can act, thereby subverting the usual representation of algorithms—that of managing publics—by proactively reversing the direction of influence to serve digital subjects and construct space for their voices (Schrock, 2016). For example, ''InformaCam,'' which was conceived and operated by an open-source software company in partnership with a video advocacy group, both captures and stores metadata embedded in files that move with those files when they are copied, enabling users to retain metadata if they want to make them public (see van der Velden, 2015 for a detailed discussion of Informacam). InformaCam transforms mobile devices into witnesses with two versions of documentation: one with identifiable metadata that can be sent to a trusted party, and another with non-identifiable metadata that can be distributed to any network. Using Bluetooth along with InformaCam permits identification of other devices using InformaCam nearby to evidence documentation among multiple sources. Further, InformaCam structures data so that data can be assembled after capture, enabling timeline mapping and comparisons among multiple angles. This kind of civic technology cultivates an ''art of looking,'' a counter-governmentality of witnessing, evidencing, and rendering visible societal problems (van der Velden, 2015: 11).

Manipulation of metadata can empower, in part because it is ''a bottom up and not a top down process, resulting in metadata that makes it possible not only to navigate through data, but also to link them and thus to trace within information the circuits that transform this information into knowledge.'' (Stiegler, 2011: 33). Further, as feminist scholar Deborah Withers (2015: 172) explained regarding her experiences in archiving women's liberation music, an examination of ''ontological layers of software'' (2015: 160) and a critical approach to classification of knowledge are crucial to preserve ''multiple, internally different real-time historicities that enact the performative expression of inauthentic historic differences.'' She says that we should all be critical information managers (2015: 178), although such management in civic technologies does require tech-savviness. Nonetheless, although new technologies of the digital era may dominate digital subjects by way of the human–software interface, reflexive digital subjects, specifically those with technical and also often legal expertise, can proactively use themselves as so-called ''human computers'' to serve counterpublics[11] by disentangling, re/producing, and re/coding information, a signpost of a new, digitized frontier of resistance. ''Human computers'' in the rapidly growing field of ''human computation'' (Law and von Ahn, 2011) refer to crowdworkers on online work platforms; the work of actual computers is to combine input from crowdworkers to absorb their knowledge in machine learning, which reverses the traditional human–computer relation whereby people learn from computers. I argue that critical mediators turn human computation inside out by using their tech-savvy skills to produce new elements of the digital environment to serve not computers, but rather, counterpublics. Challenging the governance of digital life often pivots on the role of ethical subjects willing to use their exclusive knowledge to serve counterpublics (Baack, 2015).

If it appears that only resource-rich people and organizations have the capacity to develop civic technologies, consider Five-O, a mobile app (http://fiveo.us/) developed in the aftermath of Ferguson and related events by three technically sophisticated African American siblings in high school (The Economist, 2015). The app targets police brutality with the use of algorithms to subvert oppressive police–citizen interaction. It produces metadata that provides information about citizen rights; informs and serves as data collection; serves as an evaluation tool regarding police–citizen interactions that may range from negative to positive; and moreover, also produces positive prototypes for police behavior. Five-O is especially instructive insofar as three African American youths in high school—two girls and boy—are the heroic mediators of civic knowledge and futures. In a world of resistance that has been dominated by white men, especially among hacktivists and hackers (O'Toole, 2013; Tanczer, 2015), the actions as well as the actors of Five-O suggest that exclusive knowledge requirements can escape conventional raced, gendered, as well as aged, boundaries. Algorithmic affordances can be accessed by diverse actors—a hopeful set of possibilities that connect with Allison Parish's new hacker ethics (https://vimeo.com/187595174).

More generally, *informal* critical mediation appears emergent in the relative infancy of the digitized regime. Individuals who are or become ethical digital subjects target systems that unfairly target vulnerable subjects or communities, and they subvert these systems by producing new elements of the digital environment that

serve people who lack the expertise to help themselves. The circumstances of one such mediator, Stanford University student Joshua Browder from the United Kingdom, as told via podcast, illustrate the contingent circumstances that can stimulate the development of informal critical mediation (https://www.theguardian.com/technology/audio/2017/mar/31/how-tech-can-help-asylum-claims-homelessness-and-parkingfines-tech-podcast). Joshua's journey into critical mediation began with his own problem, an accumulation of numerous parking tickets; he eventually realized that he often was fined inappropriately.[12] He began to appeal, and becoming adept at the process, he then began to help friends and family as well. With the ability to code and develop algorithms, Joshua then realized he could develop a website easily and cheaply to help many people outside those he knew personally. He developed a chatbot that gleans detailed information from "the accused" to determine the in/appropriateness of parking fines and a basis for a legal defense, and then automatically sends an appeal to the local government. At the date of the podcast, 31 March 2017, the chatbot had appealed over 275,000 parking tickets, equating to about six million dollars in parking fines that otherwise would have become revenue for the local government. Joshua explained: "It was really just like a side project to impress my friends at school and I could never have imagined that almost everyone who gets parking tickets in the UK would start using it and they would have appealed so many fines." Amazed by both the corruption of local governments that fine citizens inappropriately as well as high legal fees that render legal assistance inaccessible to ordinary people who lack financial as well as technical and legal resources, Joshua then sought assistance from lawyers working with charities and specializing in human rights. He developed a legal chatbot to provide free, automated legal services to help people effectively navigate the bureaucratic and expensive maze of UK government housing for the homeless and asylum for refugees that often prevents people from claiming rights. And recognizing that many people, especially the homeless and refugees, have a significantly reduced suite of accessible technologies, Joshua subsequently extended his reach via Facebook Messenger to ensure operation across different types of devices, as well as to charities in communication with people with no technology at all. Further, Joshua's services are in English, but he is working on extending them to Arabic for Syrian refugees migrating to the UK, and Spanish for Mexican immigrants in the United States. This remarkable journey of a tech-savvy subject, from resolving his own individualized problem to making use of online technologies and his skills in coding and algorithms to counter criminalizing digital systems to serve vulnerable counterpublics, may reflect the early stages of a critical emergent sector that operates informally to complement non-profit organizations formally engaged in other such critical mediation. Limitations of lone mediators with limited knowledge apparently can be overcome by connecting with formal critical mediators, such as human rights lawyers working with charities in Joshua's case.

Platform cooperatives

Platform cooperatives have emerged around the world across the spectrum of industries to mediate relations between people producing digital as well as on-the-ground goods and services with global and localized markets (Scholz, 2016, 2017; Scholz and Schneider, 2017; http://wiki.p2pfoundation.net/Platform_Cooperativism). In the wake of the decline of unions, platform cooperatives have emerged as a mode of digital organization to accommodate digital subjects who have been compromised in the digital economy. They target the dominant role of corporate mediation in the new digital landscape[13] by self-organizing, pursuing cooperative ownership and democratic governance, and finding ways to self- and crowd-fund to avoid dependence on the venture capital sector. In the interests of space, below I offer examples of platform cooperatives specifically regarding online work platforms.

The problems posed to crowdworkers who seek wages by producing digital services via online work platforms (e.g. Bergvall-Kåreborn and Howcroft, 2014; Ettlinger, 2016, 2017c; Felsteiner, 2011) have paralleled some of the problems among Uber drivers (Scholz, 2017), who have been more visible in the popular media. Firms called "requesters" post tasks online via corporate mediators such as Amazon's subsidiary Mechanical Turk (https://www.mturk.com/), perhaps the most well-known online work platform and often considered an archetype[14]). Requesters pay a nominal fee to Mechanical Turk, which posts the digital tasks online and mediates the relation between requesters and crowdworkers, dubbed "Turkers" in the case of crowdworkers on the Mechanical Turk platform. Accordingly, there is no communication between requesters and Turkers, and like Uber drivers, Turkers are rendered independent contractors without employee status and thus employee rights. Turkers sign contracts in which they must agree to denial of payment by requesters without discussion or negotiation if a requester is dissatisfied, and moreover, they relinquish their intellectual property on submission of a task. Further, Turkers (Bergvall-Kåreborn and Howcroft, 2014) and crowdworkers commonly are paid less than 10 cents per task, considerably below minimum wage.

In response to the problems posed to Turkers, researcher-activists at Stanford University and the University of California at San Diego made use of the digital infrastructure to develop two different online platforms to target different problems of exploitation and provide Turkers a critical voice.[15] ''Turkopticon'' in its initial version targeted the panoptical gaze of the corporate world on crowdworkers by subverting it to enable Turkers to evaluate firms, and in a later version, to evaluate the tasks posted on the Mechanical Turk online work platform (Irani and Silberman, 2013; https://turkopticon.info/). ''Dynamo,'' an online platform on which Turkers can share their experiences and vote on activist strategies, enabled spatially dispersed Turkers to write a collective letter to Amazon CEO Jeff Bezos. The letter humanized Turkers, targeting and subverting the dehumanization of crowdworkers through wide-ranging tactics, from ascribing identities to crowdworkers exclusively by alphanumeric code to refusing crowdworkers the status of employees and thereby denying worker rights. Dynamo also enabled Turkers to target their remarkably low wages by using the platform to produce labor guidelines directed to graduate students who crowdsource their survey work to Turkers, paying them pennies (http://www.wearedynamo.org/). This remarkable platform cooperative has enabled dispersed crowdworkers to virtually congregate and act, although the impacts of Turkers' empowerment have yet to effect change in conditions of online work on Mechanical Turk and on other online platforms. Another limitation: the creators of Dynamo remain its administrators.[16] Alternatively, ''Daemo,'' an independent online work platform developed by a research collective at Stanford University and still in experimental stages, is governed collaboratively and ground-up by crowdworkers and requesters (Stanford Crowd Research Collective, 2015).[17] Daemo targets the problems posed by the increased corporate mediation exemplified by Amazon's Mechanical Turk by eliminating corporate mediators as a node in the value chain and thereby directly connecting crowdworkers with their clients, who co-govern. While striving for fair working conditions produced through direct communication and negotiations between crowdworkers and requesters, Daemo was constructed to produce relations of trust and reliability between crowdworkers and requesters, subverting the abjectly exploitative capital–labor relation common in crowdwork. One potential problem with Daemo's operation, however, may be a lack of corporate demand. Success of independent, self-governing online platforms may be possible but partial, perhaps because algorithms will rank mainstream services higher in search engine results, and perhaps also because only a relatively small percentage of socially conscious firms may be willing to increase pay, negotiate, and co-govern with workers.

"Cloud protesting"

All approaches to resistance that rely in some way on critical mediators are limited insofar as they necessarily entail some form of dependence of the crowd on ethical subjects willing to use their exclusive technical and legal expertise to serve counterpublics. One approach open to internet users who are ''ordinary'' in the sense that they lack exclusive technical and legal knowledge is what Stefania Milan (2015) has called ''cloud protesting.'' Although the cloud is distributed while brokering personalized messages to users that have individualizing effects, individual actors can, however, use the cloud as a vehicle by which to connect personal stories to others to form a critical community. Use of social media can range from perfunctory, a matter of self-curation, to critical, which is my focus. ''Counter-conduct''[18] associated with ''cloud protesting'' renders the cloud far more than storage; in Foucauldian terms it becomes a mentality of distributed access while social media becomes the rationality, the general strategy to make use of the cloud to communicate personal stories to a counterpublic. Actors lacking opportunities for face-to-face contact can make use of the cloud in everyday online practices to share their lives, critiques, and their political agendas with the use and subversion of mechanisms—''technologies of power'' per Foucault—such as profiles on social media, tags, citations, ''likes,'' and mentions. Ordinary crowdworkers without access to critical mediators can make use of this approach to tell their stories and connect with other crowdworkers experiencing similar problems to visibilize firms with unethical practices, such as unfair payment practices, discrimination, and the like. An outpouring of complaints on social media can render apparent behemoth firms such as Uber extremely vulnerable. Mobilizing dispersed, divergent perspectives transnationally subverts the siloing of digital subjects produced by invisible data collection and delivery of individualized messages by using the internet to develop, rather than erode, people's identities, and communicate critical sentiments towards the establishment of online movements (Sobré-Denton, 2015). Moreover, actors conceivably can manipulate the feedback loop to re/construct identity dynamically relative to changing flows of web traffic to accommodate change in the identity/identities of a virtual collective.

The rub, however: the development of virtual communities constituted heterogeneously across space via social media can be difficult to sustain precisely because social media for political purposes itself becomes politicized as internet firms differentially target groups with

distinct messages, often resulting in divisive effects (e.g. Lynch et al., 2016). Resistance by way of manipulating the system is possible, but sustaining it requires strategies to counter the selective routing of messages that can censor a movement or disband communication among constituent factions of a counterpublic. Counter-tactics to preserve privacy are possible using elements of the digital environment such as encryption, a TOR browser, or a Tails operating system, which otherwise stated constitute affordances of the digital assemblage that potentially can become part of new trajectories towards thwarting mainstream governance of social media.

The use of art in individualized resistance

Beyond using the internet to connect with others and develop critical online communities, reflexive individuals independently have the capacity to challenge algorithmically-derived norms. One medium for politics is art (Rancière, 2004), and in the algorithmic age the remarkable art of artist–researcher–activist Paolo Cirio, examined by critical theorist and communications scholar Sunil Manghani (2017), illustrates the potential of art to construct new truths by producing ''digital instruments for an operational and participatory aesthetic'' (205). Cirio's art targets the ''black box'' of algorithmic dynamics (Pasquale, 2015) to expose how Big Data structures operate, and to visibilize unseen crimes such as tax evasion or problems such as the erosion of digital subjects' privacy and algorithmically based surveillance systems. More generally, Cirio targets algorithmic practices in the realms of copyright, privacy, transparency, and corporate finance using media such as artefacts, photographs, installations, and videos. As Manghani explains, Cirio's art operates as a camera within the internet to document what is otherwise opaque, and moreover paves roads to the development of broader movements. For example, in association with his work *Obscurity*, which focuses on the problems posed by digital subjects' digital footprints, Cirio developed the *Right to Remove* policy in the UK that advocates for the legal right to remove personal information from search engines. Crucially, as Manghani (2017: 201) explains, Cirio re-orders structures ''to reveal how data flows *across* media, not simply appearing in it . . . he is working with and often extending (through the means of hacking and coding) the affordances of the systems to reveal how they work and how we work them, whether knowingly (as with social media) or unwittingly (as with surveillance and/or private data systems) . . . Cirio's artworks can be said to help re-focus how we *look at* contemporary data structures and in doing so . . . provides us with new heuristic tools.''

Unlike other art that escapes contemporary life, Manghani (2017: 202) clarifies that Cirio ''reveals and implicates us in the *weightings* of data, both in terms of its computational structures and its infrastructures of ownership and control.'' Cirio injects himself into the digital environment as a ''self-declared curator of data,'' (Manghani, 2017: 197), refusing anonymity to render himself as well as the ''black box'' transparent and accessible.

Similarities and differences among modes of productive resistance

All the modes of productive resistance above have in common the production of new elements of the digital environment that make use of existing elements to produce new truths. The vehicles for such productive power in algorithmic contexts are new material elements, ranging from new software and metadata to new platforms and heuristic tools, as well as immaterial cooperative relations in platform cooperatives and cloud protesting.

Yet all these modes of productive resistance also share limitations. Beyond practical problems of funding as well as the time and energy expenditure and the inconveniences inherent in any form of sustained resistance, all the collective forms of resistance are limited by varying degrees of consciousness among the participants. Except for cloud protesting, the other modes of collective resistance entail dependence on experts (e.g. Powell, 2016; Treré, 2016) to enable relatively passive use of the benefits of new elements of the digital environment among participants, without the critical consciousness required to situate oneself, identify, target, and subvert repressive technologies of power. The main point is that differential consciousness among members of a group suggests that the ''antagonism of strategies'' is partial because subjectivities vary—a feature that can be interpreted as a limitation, depending on whether one conceptualizes resistance as encompassing change in subjectivity. One potential problem of lack of critical consciousness is the risk of viewing resistance solely in terms of technology, thereby overlooking cultural, social, economic, political, and ecological elements of the digital environment that require attention (Perng and Kitchen, 2016). One social problem among even radical collectives, for example, is the perennial problem of implicit hierarchies wrought of difference among axes of class, race, gender, sexuality, and/or age or duration of membership in a group (Schor, 2017)—a reminder that well-intentioned efforts require continual reflexivity and critical situation within the digital environment to sustain the communitarian and democratic values that radical collectives discursively embrace yet in practice may elide.

Finally, recognizing the digital environment as an assemblage in which each element and the assemblage overall can affect and be affected by change in any one element, the production of new elements in the digital environment is always subject to external constraints.[19] For example, as indicated, the use of social media in "cloud protesting" is subject to the homophilic manipulation of social media by internet firms through the sorting and filtering processes against which many social movements form. Yet with the use of counter-tactics such as encryption, Tails OS, or a Tor browser, users of social media may be able to counteract these constraints; the as yet unanswered empirical question is how internet firms may respond. The larger point is that we should expect fluid interaction among users and firms or governments.

In the relative infancy of modes of productive resistance in digital life, effects are unclear yet suggest changing processes. To date, the dynamic character of the digital environment has been "located" in the realm of subjection, notably regarding the mutability of trends in the feedback loop of user–algorithmic interaction (Cheney-Lippold, 2011, 2017). But accounting for digital contestation *in relation to* pivotal technologies of power permits the recognition, and possibly the manipulation, of the relation between subjection and resistance. The effects of fluidity wrought of productive resistance in turn can produce wide-ranging effects, which can be positive as well as negative, thereby requiring continual ethical vigilance.

Conclusion: The social power of algorithmic resistance[20]

Accounting for the range of productive algorithmic resistances reveals considerable variation, not only in the content of strategies themselves but also in motivation and duration of effects. These and other limitations of productive resistance may reveal a lack of sustainability and therefore may appear ineffective at producing systemic change, but numerous such strategies over the long run could well produce effects that prompt apparent power brokers to modify or change strategies, possibly with extensive results. Beyond stunning expressions of agency, productive use of the affordances of algorithms to resist digital subjection suggests interesting possibilities regarding a dynamic interplay between subjection and resistance. As Foucault suggested regarding the targeting of repressive power:

> "... the domination of a group, a caste, or a class, together with the resistance and revolts that domination comes up against ... manifest in a massive and global form, at the level of the whole social body, the locking together of power relations with relations of strategy and the results proceeding from their interaction" (Foucault, 2000, 348)

The last point in the above quote—"... results proceeding from their interaction"—points to synergy rather than the pre-ordained regime of domination and dependence that align with critical conceptualizations. The pace of technological change has become extremely rapid, in part as firms constantly develop new modes of profitable subjection to gain competitive advantage, but very likely also because they as well as governments may have to recalibrate their strategies as digital subjects find ways to circumvent their attempts at invisible surveillance, control, and the mining of personal spaces articulated in digital footprints. Productive resistance suggests that the direction of influence in the digital regime is bidirectional between firms and government on the one hand, and on the other, digital subjects who construct paths of resistance.

Yet in most cases the interplay between strategies of control and resistance is messy; there is no reason to expect an orderly direct correspondence between specific strategies of control, those of resistance, and those of new measures of control. A mapping exercise may be possible in specific cases, such as the relation between Microsoft and F/OSS (e.g. Paul, 2017; Vaughan-Nichols, 2011; Vetter, 2007), but relations between specific modes of productive resistance and firms or governments are ambiguous and may require a longer period of time to materialize. More generally, productive resistance may produce synergistic rather than direct or distinct effects on a particular element of the digital environment.

In the early stages of the algorithmic regime, the prompt, therefore, is not to map specific firm or government strategies onto specific strategies of resistance and then trace back to firm or government responses, but rather to recognize that relations between apparent power brokers and subjects in the digital regime are dynamic. Looking ahead, in addition to identifying and developing productive activist strategies to monitor and manipulate changes, it also may be fruitful to develop research strategies to identify the complex, synergistic effects of the various existing and developing modes of productive resistance. Accounting for productive digital contestation and its effects opens our conceptualization of algorithmic life to hopeful possibilities for change that may, even if neither probably nor inevitably, contribute to the mutability of digital governance itself.

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Notes

1. Thomas Kuhn's (1962) analysis of the rise and fall of a paradigm includes a stage underscored by tacit consensus regarding underlying assumptions.
2. Although Foucault was interested in collective resistance (for which the concepts ''dispotif'' and ''apparatus'' might have been useful), his approach to resistance in his late scholarship is fixed at the scale of the individual.
3. Although Foucault's interests and positions shifted, kernels of his late views indeed exist in his earlier work. Pertinent here, the ''antagonism of strategies,'' which he conceptualized in his ethical frame of critique and resistance, has roots in his earlier statements about *strategies*. Foucault earlier found military theorist Carl von Clausowitz's *strategic* approach to war interesting and adapted that approach to apparently ''peaceful'' contexts, signifying oppositional strategies of repression and struggle (Foucault, 1980b, 1980c).
4. Another approach to broad classification is ''proactive'' and ''reactive'' resistance (Milan, 2017a). Yet I would argue that particular strategies of resistance vary across users depending on their subjectivities such that a ''productive'' approach to resistance could be reactive or proactive depending on whether a digital subject forges the path of productive resistance or makes use of the work of others. At issue is whether the primary subject of analysis is the strategy or the user. The approach I adopt focuses on strategies, recognizing wide-ranging variation in subjectivities.
5. Many other aspects of Deleuzian theory, such as ''modulation'' (Cheney-Lippold, 2011, 2017), pertain to digital life but are not germane to the argument I develop here to explain the bleakness underscoring critical theories of digital governance.
6. Black Mirror is a British television series that examines bleak if not disastrous implications of digital technologies for everyday life.
7. Thatcher et al. (2016) used ''dispossession'' to refer to the entire regime of accumulation. I use it here more narrowly to refer to specific online practices among digital subjects that enable firms to mine their electronic footprints for profit. Conceptualizing dispossession at the scale of a regime of practices rather than at a regime of accumulation opens analysis to possibilities of resistance.
8. Influenced by the Stoics, Foucault (2005) engaged ascetics as a means to achieve an aesthetics or art of living.
9. For an articulation of an analytics of resistance that makes use of Foucault's ''antagonism of strategies'' see Ettlinger's (2017a) analysis in *Foucault Studies*.
10. As Gabriella Coleman (2013) argued in *Coding Freedom*, hackers offer a critique of liberalism from within liberalism.
11. As conceptualized by critical theory and feminist scholar Nancy Fraser (1990: 67), ''counterpublics'' are ''parallel discursive arenas where members of subordinated social groups invent and circulate counterdiscourses, which permit them to formulate oppositional interpretations of their identities, interests, and needs.'' The main limitation of this definition is that it lacks recognition of internal hierarchies in any, including subaltern, community. I use the term to refer to subordinated groups, recognizing that some members may be passive while others, such as those with exclusive knowledge who enable critical mediation, are more aggressive and are the ''inventors'' of both material practices and discourses.
12. Although Browder did not provide details about his parking tickets, he made a compelling case about corruption in the case of fines to vulnerable populations. This point connects with a growing body of research regarding the increasing use of civil fines and penalties, especially among vulnerable populations, to fund municipalities in the wake of tightening state and local budgets (Atkinson, 2016).
13. See Ettlinger (2016, 2017c) for a critical discussion of the new corporate landscape and increased mediation specifically regarding crowdsourcing in the digital economy.
14. Scholars in the field of human–computer interaction Vakaharia and Lease (2014) lament the attention to Mechanical Turk and discuss the various technical capabilities among many other online work platforms. The problems posed to crowdworkers associated with Mechanical Turk nonetheless are emblematic.
15. Mechanical Turk's online discussion forum, ''Turker Nation'' (http://www.turkernation.com/), also enables discussion, both critical (see Milland, 2016) and uncritical, among Turkers along with discussion among firms that post tasks.
16. One exception: Kristy Milland is a Turker, researcher (Milland, 2016), and part of the administration of Dynamo.
17. Daemo as an independent, democratically operated platform comes close to the generalized suggestion for the development of independent activist platforms (Ochigame and Holston, 2016).
18. Foucault (2007c: 201) coined the term ''counter-conduct'' in his lectures series *Security, Territory and Population* to refer to conduct that counters ''the conduct of conduct,'' a governmentality.
19. Such external constraints are analogous to the ''frictions'' discussed by Perng and Kitchen (2016).
20. The subtitle points to a different analytical direction from David Beer's (2017) seminal paper on ''The Social Power of Algorithms,'' namely the affordances of algorithms in a social assemblage for synergistic rather than dominant–dependent relations between digital subjects on the one hand and on the other, firms, and governments.

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