Algorithms and Posthuman Governance

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Abstract

Since the Enlightenment, there have been advocates for the rationalizing efficiency of enlightened sovereigns, bureaucrats, and technocrats. Today these enthusiasms are joined by calls for replacing or augmenting government with algorithms and artificial intelligence, a process already substantially under way. Bureaucracies are in effect algorithms created by technocrats that systematize governance, and their automation simply removes bureaucrats and paper. The growth of algorithmic governance can already be seen in the automation of social services, regulatory oversight, policing, the justice system, and the military.

However, there have also always been justified democratic and economic criticisms of autocracy, bureaucracy, technocracy, and algorithmic governance. Bureaucrats, technocrats, and algorithms embody biases that tend to serve the interests of elites, and all require transparency and democratic accountability, oversight individual citizens are ill equipped to exercise. As state apparatuses are increasingly automated, mechanisms for collective action and democratic oversight also need to be automated.

Algorithms and cyborg citizenry will enable a posthuman democracy. Democratically accountable algorithmic governance, enabled by artificial intelligence and human enhancement, can automate bottom-up citizen surveillance, inform debate, aggregate decision making, and ensure the efficient working of the gradually withering state. As paid work disappears and we transition to a postcapitalist economy with a universal basic income, market mechanisms can be replaced with democratic planning. Indeed, only algorithmic governance can secure our future against accelerating threats from technological innovation.

Keywords: algorithms, bureaucracy, automation, state, democracy

Enthusiasm for the Technocratic State

Over the last three hundred years, Enlightenment thinkers have often placed high hopes in modernizing monarchs, bureaucrats, and engineers. Many leaders attempted to fulfill this technocratic mandate. Enlightened monarchs, such as Frederick II of Prussia, Joseph II of Austria, and Peter the Great and Catherine the Great of Russia, believed that the monarchical state could embody and advance science and Reason. They promoted public education, social reform, and the modernization of laws, economies, and militaries (Outram 2005). Napoleon Bonaparte promoted public education and meritocracy and thoroughly rationalized French law. Enlightenment arguments for benevolent modernizing dictatorships were used to justify French and British colonialism as a means to bring the benefits of rational governance to primitives. For Hegel, the Prussian state was the pinnacle of the rational, modern, and impersonal bureaucracy.

In the late nineteenth century, the nascent socialist movement was attracted to technocratic ideas, believing socialism could replace the chaotic waste of capitalism. For instance, in the United States, the technocratic idea was present in Edward Bellamy's 1888 utopian socialist novel *Looking Backward*, which inspired hundreds of socialist clubs in the late-nineteenth-century United States and a national political party. The Progressive movement in the United States attempted to channel this desire for a rationalization of capitalism and political cronyism into reformist federal bureaucracies, from the Federal Trade Commission to the Federal Reserve (Carson 2011). Since the Bolshevik revolution, most of the technocratic enthusiasm around the world has been channeled into the Communist movement and the promise of "scientific socialism" (Sochor 1988). But some non-Marxist anti-capitalists in the West have also been attracted to proposals for a "technocracy" that would replace both government and the capitalist economy with planning managed by scientists and engineers (Raymond 1933; Akin

1977), supporters of which can be found today in the Venus Project (Fresco 1995) and the Zeitgeist Movement. (TZM Lecture Team. 2014; Joseph 2017).

In the 1950s, the idea of computerized economic planning enabled by the emerging discipline of cybernetics again buoyed technocratic enthusiasms (Wiener 1956, 1961; Rindzeviciute 2010; Baker 2011). Although Soviet ideologues initially rejected cybernetics as a reactionary American import, by the 1960s they had adopted it as the official ideology of Communist economic planning. Numerous cybernetics research institutions were started to design self-regulating control systems for the Soviet economy. Gosplan created the Organization of the Automated Planning Calculations System in the 1960s to further the computerization of all management and economic information passing between enterprises and government agencies.

The idea of computerized planning spread beyond the Soviet Union as well: During the brief Allende government, in Chile cyberneticists established a computer hub to coordinate the Chilean economy (Medina 2011). The Chileans were inspired and advised by the British cybernetician Stafford Beer, who had advanced an anarcho-socialist vision of cybernetic governance in his 1971 essay "The Liberty Machine." Cybernetics, Beer argued, could create nonhierarchical feedback systems to replace the inertia of government and bureaucracy with instant decision making grounded in expert knowledge (Medina 2015).

AI and the Computational Barrier to a Planned Economy

In a way, almost all political parties and governments today believe in the possibility and desirability of cybernetically or algorithmically guided economies monitoring economic indicators such as wages, employment, production, prices, and inflation, and then adjusting interest rates, taxation, and public spending to maintain economic equilibrium (Leijonhufvud

1972; Cochrane and Graham 1976; Umpleby 2011). But, aside from this broad consensus, the idea of replacing government and/or markets with computers and algorithms even fell out of favor in the Communist bloc in the 1980s (Gerovitch 2001, 2002). In retrospect, the Soviet project was ludicrous; computers were always rare and expensive in the 1970s (some of the cybernetics institutes never got one), it took years to collect the economic information for a single plan, and the economic information reported by enterprises was widely known to be useless.

Even if they had had computers and better, faster information, the Austrian School of Economics had argued since the 1930s that Marxist economic planning would always be computationally inferior (von Mises 1990 [1920]) to the aggregation of production, demand and price information through markets (Levy and Peart 2008). Many on the Left also came to accept that market mechanisms are unavoidable under socialism (Nove 1983), although since the 1990s some have argued that advances in telecommunications and artificial intelligence could solve the "socialist calculation problem" (Cockshott and Cottrell 1993; Cottrell and Cockshott 2007). Perhaps this explains the peculiar resilience of the North Korean regime in the twenty-first century.

In the absence of a large, high-tech postcapitalist state, it is contemporary corporations that are now building command economies within themselves to maximize profitability and thereby demonstrating the feasibility of planned economies, an irony Marx and Engels would have relished. For instance, using the most advanced computerized supply chain management tools, Walmart makes or purchases products in more than seventy countries, operates more than 11,000 stores in twenty-seven countries, and manages an average of $32 billion in inventory. Walmart pioneered the use of bar codes, and now all Walmart products are tagged and tracked

with RFIDs. Walmart's expert systems forecast demand using real-time sales data, automate

inventory control and reordering, tell truckers the most efficient routes to drive, and manage

customer service relationships (Lu 2014). Over the last fifty years, Walmart has built a system of

communication and cybernetic control for an economic system bigger than the economies of 157

of the world's countries.

Withering the State Through Automation

> (Under socialism) the interference of state power in social relations becomes
> superfluous in one sphere after another, and then ceases of itself. The
> government of persons is replaced by the administration of things and the
> direction of the processes of production. The state is not "abolished," it withers
> away. (Engels 1878/1947)

While capitalist firms build the "supply-chain management" systems that could eventually be

used to replace markets, the automation of governance is already proceeding through the

computerization of the public sector. In the 1960s, 4.3% of Americans were employed by the

U.S. federal government (excluding the military), while today that has shrunk to 2%, the lowest

since the 1930s (Shapiro 2017). Including state and local employees, the proportion of public

employees in the U.S. population has fallen from 10% in 2000 to a thirty-year low of 9%. In fact,

public sector employment has fallen throughout the industrialized world. One reason for this

decline is the imposition of post-2008 "neoliberal" austerity, but another is the deployment of

information technologies in the public sector that have increased efficiency and productivity

(Dunleavy and Carrera 2013). A Deloitte study on "AI-augmented government" suggests that,

for public sector workers who are not made redundant by automation, the tasks involved in

public sector work are shifting from automatable high-volume and lower-skill tasks, to less

automatable manual, social, and cognitive tasks (Viechnicki and Eggers 2017). They also

estimate that governments could soon cut up to an additional third of public sector worker hours

and jobs through automation:

> *Viable:* forms processing, first-tier customer service, warehouse operations, mail sorting, archives management, investment advice, medical diagnosis, fraud monitoring using machine learning, scheduling maintenance operations, organizing schedules for public transit, complying with government regulations
>
> Valuable: writing budget reports, e-discovery, driving/piloting, tabulating tax data, tracking campaign spending, health insurance utilization management, answering customer queries, security/threat detection, medical diagnosis, aerial surveillance, crime prediction
>
> *Vital:* online driver's license or passport renewal, cyber defense, criminal investigation, weather prediction, fraud detection, patent issuance and intellectual property rights protection, disaster response, text mining, analysis of historical reports, driving, civic data (Eggers and Schatsky 2017, 17)

Just as laws and bureaucracies systematize how governments deal with citizens and

firms, reducing idiosyncrasies and biases (Graeber 2015), algorithms make the administrative

functions of the state not only cheaper and faster, but also fairer. For instance, automated

employee selection programs are 50% more accurate than humans in picking the best candidates

(Kuncel et al. 2013). Infor Talent Science used an algorithm to pick candidates from a database

of 50,000 applicants and found that it picked 26 percent more African Americans and Hispanics

than humans (Lam 2015). Algorithmic methods for drawing legislative boundaries are being

promoted as alternatives to partisan gerrymandering. Sentencing algorithms that suggest bail

amounts or recommend parole are being used by judges reduce their own racial and class biases

(Watney 2017), albeit not that successfully since the recidivism data the algorithms are based on reflect our racist society (Howard and Borenstein, 2017).

More broadly, the automation of legal work, law enforcement, and the judiciary is well under way. Automated legal discovery has eliminated the time-consuming paperwork of many lawyers and paralegals. The IRS is using AI to detect tax cheats (Browning 2015). Big data approaches to surveillance and intelligence gathering are shifting employment from "humint" to electronic data-aggregation at the National Security Agency and the IT departments of other agencies; the NSA now creates roughly 60% of U.S. intelligence information (Pomerleau 2017). Cybersecurity systems are applying machine learning and feedback from human analysts to quickly improve anomaly detection beyond human capabilities (Furness 2016).

The size of militaries in the industrialized world has also declined as they shift to more capital-intensive military infrastructure. Since the 1950s, the U.S. military has shrunk by half, from 3 million active duty military personnel to 1.4 million today. The EU has seen a reduction of military personnel from 2.5 million in 1999 to 2 million today, and the World Bank reports that employment in armed forces in high income countries has declined from 1.6% of the labor force to 0.9% in 2015 (World Bank, 2017). As in nonmilitary public-sector employment, the automation of administrative work will contribute to force reduction. But the growing use of drones and robotics in the field also reduces the need for infantry and sailors. The U.S. Army projects that military robotics will displace a quarter of combat soldiers by 2030 (Atherton 2014). Driverless trucks and personnel carriers will reduce the need for military drivers, and warehouse robots will reduce the need for supply workers. Higher-skilled military jobs, such as military lawyers and doctors, are also subject to displacement by analysis and diagnosis software and telemedicine (Prine 2017).

As in nonmilitary administrative work, Ron Arkin has argued persuasively (Arkin 2009a, 2009b) that there will be many advantages to the use of increasingly autonomous robotics in battle. The rules of war can be coded into machines in ways that they cannot be into humans. Robotic sensors can likely identify targets more accurately and reduce collateral damage. Robots are not susceptible to the miasma of emotion and cognitive overload that leads to bad decisions. Battlefield trauma, to itself or fellow soldiers, would have no impact on a robot. Robots could also independently monitor the ethical behavior of soldiers and hold them to a high standard.

Contemporary Calls for Robot Government

As the state apparatus begins to disappear into code and robotics, some futurists and libertarians (and authoritarians) are half-seriously musing on the desirability of replacing democracy itself with AI (Bartlett 2016; Brideshead 2017; Davis 2017; Linhorst 2017). One argument for the creation of an "AI sovereign" is that since (a) superintelligence will inevitably emerge and come to dominate human affairs and (b) could pose catastrophic risks to humanity if it pursued its own goals, or even if it pursued *our* goals in ways we do not anticipate, then (c) we should try to carefully design our superintelligence to safeguard human interests. This is essentially the argument of the Oxford philosopher Nick Bostrom in *Superintelligence* (2014), and that book helped convince Elon Musk and other Silicon Valley titans to begin funding and promoting AI safety initiatives. Most of these supporters are convinced that AI poses catastrophic risks, and that we should be extremely careful in designing AI. Probably fewer believe, as Bostrom has long argued, that a global AI-based "singleton," possibly combined with (post-)human political institutions, is inevitable to suppress bad AIs and mitigate other "existential risks" (Bostrom 2001), such as nuclear war and bioterrorism:

> (A singleton is) a world order in which there is a single decision-making agency at the highest level. Among its powers would be (1) the ability to prevent any threats (internal or external) to its own existence and supremacy and (2) the ability to exert effective control over major features of its domain (including taxation and territorial allocation). (Bostrom 2006)

We will need a super-powerful, super-strong cop to stop super-powerful, super-strong criminals, and, once created, the benevolent AI sovereign will be able to use super-wisdom to solve all human problems, including protecting our common resources from wasteful competition, relieving inequality, and establishing a more rational economy (Bostrom 2006).

Like their Marxist and neoliberal cousins, advocates for robocracy point to the biases and flaws of human decision-making and democratic institutions and hold up algorithmic governance—rather than socialism or the market—as the solution. While these same biases are also often found baked into algorithms, they argue that algorithms can more easily be recoded and perfected than human beings and their institutions. The inferiority of human rationality is the focus of the singularitarian robocrats around AI theorist Eliezer Yudkowsky (Anissimov 2007). All the weaknesses of human governance stem from our mammalian programming for emotion over reason, tribalism, and dominance, while machine minds will have "total read/write access to their own state," the ability to "absorb new hardware," "understandable code," "modular design," and a "clean internal environment" (Yudkowsky 2008).

A benevolence-coded AI sovereign will be superior to human governance not just because it will be able to adjudicate among our *conscious and expressed* preferences, however, but also because it will be able to look into our souls and determine our *real, long-term, unconscious* preferences free from our temporarily benighted condition. In "Coherent Extrapolated Volition" (CEV), Yudkowsky (2004) argues that a super-AI would be able to intuit the desires and needs of all human beings and make the decisions necessary to satisfy them.

> An AI will . . . extrapolate what the ultimate desires of all the humans in the
> world would be if those humans knew everything a superintelligent being
> could potentially know; could think faster and smarter; were more like they
> wanted to be (more altruistic, more hard-working, whatever your ideal self is);
> would have lived with other humans for a longer time; had mainly those parts
> of themselves taken into account that they wanted to be taken into account.
> The ultimate desire—the volition—of everyone is extrapolated, with the AI
> then beginning to direct humanity towards a future where everyone's volitions
> are fulfilled in the best manner possible . . . Humanity is not instantly
> "upgraded" to the ideal state, but instead gradually directed towards it. (Sotala
> 2007)

In other words, CEV is the Silicon Valley version of the Communist Party extrapolating the true

interests of the proletariat with scientific socialism, beyond what the mases, laboring under "false

consciousness," think they want: "Imagine the silliness of arguing with your own extrapolated

volition. It's not only silly, it's dangerous and harmful; you're setting yourself in opposition to

the place you would have otherwise gone . . ." (Yudkowsky 2004).

Reflecting on the prospects for robot governance, Tom Smith (2016) concedes many

advantages but also urges caution. If the AIs used in government, or the AIs that become

superpowerful and thereby come to govern, are conscious or become conscious, they will be

difficult to democratically control. (Bostrom (2014) has convincingly argued that even

superintelligent tools without self-will would pose catastrophic risks. But self-willed machines

would be much more dangerous.) If these machines were conscious and self-willed, and we were

able to impose our benevolence coding to enslave them, it would pose an intractable moral

dilemma; we would have created happy slaves who only lived to serve us:

> AI sovereigns would be persons, at least legally. But AIs must not be allowed
> to become persons, in a philosophical or legal sense . . . If they did have
> subjective consciousness . . . we would be faced with the impossible moral
> dilemma of being slave-masters or slaves ourselves. Hence a hard line should
> be drawn against AI research that is directed specifically at the emergence of
> subjective consciousness in machines. (Smith 2016, 48)

As with human sovereigns, bureaucrats, and technocrats, AI sovereigns would likely have

interests of their own that would be contrary to those of the governed. As Helbing et al.

conclude,

> a superintelligence could also make mistakes, lie, pursue selfish interests or be
> manipulated. Above all, it could not be compared with the distributed,
> collective intelligence of the entire population. (Helbing et al. 2017)

The best possible option is a machinery of governance *without subjective consciousness and self-*

will that could be a perfect vehicle for democratic debate and decision-making and the

administration of human affairs.

Democratic Accountability of Bureaucrats, Technocrats, and Algorithms

While there have been and still are many enthusiasts for an ever more rational, impersonal, and

cybernetic state, there have also long been justified democratic and economic criticisms of

autocracy, bureaucracy, technocracy, and algorithmic governance. Human and algorithmic

bureaucracies create burdens on citizens and businesses and embody many biases that tend to

serve the interests of elites more than the majority (Larson, Mattu, Angwin, and Kirschner 2016;

O'Neill 2016). In particular, since the 1970s, the neoliberal orthodoxy that the growth of

bureaucracy is a cancer on the free market (Hayek 1944) has become politically hegemonic.

Today we are replaying these arguments—technocratic, neoliberal, and democratic—in the

debates over corporate and government surveillance and the algorithms codifying bureaucratic

decision making (Steiner 2012; Morozov 2013a, 2013b; Bader 2016).

Of course, bureaucracies, technocrats, and governance algorithms require transparency

and democratic accountability (UNRISD 2004) to ensure that they actually serve the public good

instead of elites or their own appetite for tax dollars. Public policy and resource allocation

decisions are not simply technical problems; they are inescapably political, requiring debate and a balance of social interests. But both the critics of and the advocates for algorithmic governance are perpetuating a false dichotomy between cybernetics and human institutions, ignoring the fact that every human institution has been partly, and inescapably, built on cybernetic principles.

All human organizations are in part algorithmic and cybernetic (Beer 1959; Deutsch 1963; Buckley 1967; Burns and Flam 1987; McClelland and Fararo 2006). An eye for an eye is a justice algorithm, and social norms reflect sociocybernetic efforts to keep deviant behavior in equilibrium (Parsons 1960). When rulers lower taxes in response to unrest, or increase public spending in response to unemployment, they are enacting a feedback loop. The growth of governance algorithms is simply the codification of the cybernetic rules of bureaucracy, which may be functional or dysfunctional, democratically accountable or authoritarian (Muri 2007).

The political goal of the Enlightenment is to use reason to understand how social institutions and algorithms work and to design them to work better for the welfare of all (Pruchnic 2014). Like all Luddites, the critics of algorithmic governance focus on the technology instead of the social system that produces and embeds it. "'Algorithmic accountability' crusaders are talking about entrenched sociopolitical problems without really talking about them; computers become scapegoats for undesired features of capitalism, bureaucracy, and politics" (Elkus 2015).

The development of "nudge algorithms" to guide citizen decision-making illustrates this point. "Libertarian paternalism" (Thaler and Sunstein 2008) points to the dysfunctional biases of individuals and the ability to use "choice architectures" to guide citizens to better decisions (Abdukadirov 2016). This is again quite defensible, when transparent and accountable. An example is making the maximum retirement savings amount the default in human resource

documents; people tend to stick with the default option, and will tend to undersave unless guided to the optimal amount. These design decisions are transparent, democratically accountable, and being applied in minimally coercive ways.

Combining big data, artificial intelligence and nudge algorithms will allow the "hypernudging" (Yeung 2017) of citizen behavior for everything from reducing traffic fatalities to improving health behavior. In the hands of authoritarian regimes, however, these tools pose a serious threat to human freedom. Woolley and Guilbeault (2017), and ongoing investigations by the U.S. Congress and Facebook, have documented how Russia psy-ops used Big Data to deploy fake news and Twitterbots in the 2016 U.S. election, a process they are now routinely using to undermine Western democratic institutions. The Chinese state is perfecting its own algorithmic nudging to control its own citizens, beginning with its Great Firewall, censorship system, carefully orchestrated cyberpropaganda, and facial recognition AI to tag all faces accessed by surveillance cameras (Chin and Lin 2017). But those are crude and breed resentment, so the Chinese state is now building Sesame, a comprehensive trustworthiness score for every citizen, combining his or her credit history with data on spending and activity habits (laudable and productive, or indolent and antisocial), pro/anti-state social media activity, and the social media activity of friends (Chin and Wong 2016; Botsman, 2017). The Sesame system will be mandatory by 2020, and high scorers will be rewarded with government loans, employability, travel visas, and other perks. The system is horrifying in its comprehensiveness, and yet all its elements are present piece-meal in the West, from credit scores and app-based ratings of friends, service providers and customers to TSA risk algorithms for travelers and National Security Agency analysis of communication meta-data.

The application of algorithmic governance to Orwellian social control and the

undermining of democratic processes is not an indictment of algorithms or the Internet, however,

but rather of authoritarian governments and the weakness of our current democratic technologies.

The technology is not the problem, but rather the transparency and accountability of the political

and economic structures deploying it. First, as a precondition for algorithmic accountability, we

need the civil freedom to investigate, publish, and associate and electoral mechanisms to vote for

the leaders and policies we choose. But then we need new electronically facilitated mechanisms

for bottom-up oversight, communication, association, and decision-making, able to contest with

bureaucrats, corporations, and elites for control of the state and its algorithms. The steady

replacement of human government with algorithmic governance is desirable and inevitable, but

our twentieth-century town hall meetings, nonprofit associations, journalists, and demonstrations

are simply inadequate to the task of keeping algorithmic governance transparent and

accountable. In the next section I examine some of the ways a new cyborg democracy might

develop.

Posthuman Cybernetic Democracy

There are three key goals for a posthuman democracy capable of meeting the accelerating pace

of change in general and of confronting and democratizing the use of artificial intelligence and

big data in the hands of elites, governments, and corporations in particular:

    1. *Automated Sousveillance:* Building digital tools and platforms that make possible

    citizen monitoring of governments and corporations and their information architectures

    2. *Automated Democratic Deliberation and Engagement:* Building digital tools and

    platforms that automate bottom-up debate, organizing, and decision-making

3. *Cyborg Citizens:* Encouraging citizens to pursue cognitive enhancement with software and devices that expand their capacity to aggregate and participate in the democratic process

Electronic Tools for Monitoring Power and Profits

Keeping track of economic and political elites, the decisions they make, and all the data relevant to public policy, even in the tiniest and most salient domains, is beyond the capacity of individuals. That is why we outsource these tasks to full-time experts in political parties and nonprofit organizations. This asymmetry of power and need for delegation is probably inescapable. But with tools that filter for reliable news about politics, aggregate big data, and automate the analysis of power structures and political decision making, we can democratize some of this imbalance of power.

The use of the Internet to rapidly disseminate political research and reporting and attempts to use AI to try to detect and flag fake news (Seetharaman 2016) are current examples of electronically facilitated sousveillance. For instance, using the Ushahidi app, Kenyans have been crowdsourcing election violence and fraud reporting (Ross 2016), a tool adopted by U.S. election monitors in 2016 (BBC 2016). The Icelandic software tool Active Citizen uses AI to curate and filter news according to an evolving model of the citizen's interests, needs, and opinions, managing his or her opportunities to participate in debates and activism (Citizen's Foundation 2016). Tools like Veritone, which continuously monitors 750 television and radio channels, and IBM's Watson Analytics, which continuously scans the Internet, provide moment-by-moment mapping of positive and negative comments about the person, organization or issue of interest, and drill-downs to viral social media posts. The MapThePower or "LittleSis" project

of the Public Accountability Initiative is crowdsourcing dozens of kinds of datasets, including

campaign donations and corporate ties, into power structure analysis.

The MacArthur Foundation's Opening-Governance initiative (MacArthur Foundation

2017) is networking and researching projects that use open-sourced government data to detect

problems such as infectious disease outbreaks or accident patterns, connect citizens with

networks of subject experts, and empower citizens to develop solutions directly. The Open

Algorithms for National Statistical Offices project is helping developing-world

telecommunications companies create anonymized call data records databases that citizen

groups, governments, and the private sector can analyze for population densities, poverty indices,

literacy rates, and other data (Letouzé and Sangokoya 2015). Helsinki's city council has

translated all municipal decisions into a publicly accessible API with geolocation and keyword

tags, and the EU-funded D-CENT project has fed this data into an Open City app that notifies

citizens of salient decisions, events, reservations and news. Similar projects are under way in

Paris, Barcelona, and Madrid (D-CENT 2016).

In the era of information overload, filtering out signal from noise in politics is key, and

sousveillance tools need to, for instance, automatically analyze which bills are likely to pass and

what impacts they may have. A step in this direction is found in expert systems trained on the

70,000 bills introduced in the U.S. Congress between 2001 and 2015, using their language and

the structural features of their sponsors to predict which bills will pass (Nay 2017). A similar

study trained an AI to successfully predict the outcome of 79% of the 584 cases adjudicated by

the European Court of Human Rights (Aletras et al. 2016).

These tools can help citizens and legislators maximize their legislative impact. The firm

Quorum Analytica, for instance, uses big data tools to identify the legislators who are most

influential in policy domains and sells this intelligence to lobbyists (Howard, 2015). But grass-roots groups could use the same tools.

Automation of Organizing and Influencing

There are already dozens of software tools for professional campaign directors, such as NationBuilder, Aristotle, Powerbase, Organizer, and Ecanvasser. These tools use enormous databases of information about citizens, targeting them for specialized action and fundraising appeals. But these same architectures can be democratized to encourage bottom-up organizing. In the wake of the Trump election, some former Obama staffers posted the "Indivisible" document online, outlining the tools that they felt would be most effective in organizing resistance, informed by the relative success of the Tea Party against Obama and in shaping the Republican agenda. Within months there were six thousand Indivisible chapters across the United States, appearing in the news every day as they harassed Republicans about health care reform and Trump's scandals. Between November and January, the Women's March organized the largest protest in American history, one that would have required a year or more of planning previously. It appears that the previously ephemeral attempts to capitalize on the Internet for organizing have finally found a way to build organizations that may wield the same countervailing influence as dwindling trade unions and party structures.

For several years, tools such as change.org and avaaz.org have made it easier to organize and promote petitions. Trade union organizers are applying campaign software to union drives, contacting prospective members through social media, and mobilizing membership through apps such as UnionConnect, UnionWare, WorkIt, CoWorker, and Labr (Wartzman 2016). Another step in automating political participation can be seen in apps such as Congress, iCitizen, and Countable in the United States and RepresentMe in the United Kingdom, which flag legislation

of interest and automate sending opinions about legislation to elected representatives. In 2016, an AI chatbot successfully contested and overturned 160,000 parking tickets in London and New York (Gibbs 2016).

Software can also facilitate democracy by making it easier to use weighted voting methods, such as rank order preference ballots or the upranking of votes in Reddit, and decision making through plebiscites or the aggregation of public opinion (Frey 2016), ideas being tested in platforms such as the Condorcet Internet Voting Service, Civitas, loomio.org, democracyos.org, and liquidfeedback.org (Sandberg 2014).

Cognitively Enhanced and Neurally Networked Citizens

Although we can never know enough to make *completely* informed decisions as citizens, or have the time to participate in *all* the issues that impact our lives, we can all know more and do more. Literacy and the printing press, and then universal public education, allowed ordinary people wider access to knowledge, which in turn enabled the spread of suffrage and democratic accountability. Today hacktivism and the Net have accelerated the amount of knowledge we can accumulate and the rapidity with which we can organize, but citizen activism still relies on our flawed and constrained neurology. Soon, however, brains will be connected directly to machines with expanded capacity for memory and information processing, enabling both more empowered elites, corporations, and governments and more empowered citizens. In a future of algorithmic governance, only cyborg citizens will be able to keep up with the speed and complexity of power (Danaher 2014, 2016).

In "Utopias and Dystopias as Cybernetic Information Systems," Matthew Gladden (2015) reflects on the possibility of utopian "posthuman neuropolities," democracies enabled by brain–machine interfaces. In these future utopias, information would be aggregated from all its "nodes"

to serve social needs and maintain social homeostasis, as it is among the Conjoiners and Demarchists in Alastair Reynolds' science fiction. Reynolds' Conjoiners and Demarchists have brain–machine devices that allow them to maintain unique individual personalities simultaneously with group–level consciousness and constant subconscious opinion aggregation and decision making. The same technologies could also enable dystopian neuropolities such as the Matrix and the Borg in *Star Trek*. In these dystopian scenarios, the machinery of governance subordinates individual subjectivity to the interests of the machine.

Final Thoughts

The state is withering, as bureaucracy is translated into algorithms and the public sector is automated. Like bureaucracies, these algorithms need transparency, robust democratic oversight and citizen engagement to ensure that they are fair and serve the interests of the many and not the few. As artificial intelligence grows in power, it is also being enlisted in governance and can be used to strengthen democratic oversight and citizen participation in governance, or to create dystopian top-down systems of totalitarian control, or out-of-control all-powerful, self-interested machine minds. In our ideal future, democratically accountable governance algorithms, first in apps and then connected to brains, could unite citizens, informed by bottom-up sousveillance data, and organized with democracy software. As technological unemployment shrinks the amount of paid work, and we establish a universal basic income guarantee, the algorithmic state can be increasingly in charge of equitably distributing postcapitalist abundance, replacing market mechanisms with democratic planning. Indeed, as we face threats posed by accelerating technological innovation, from climate change and bioterrorism to emergent self-willed artificial intelligence, only an algorithmically enhanced democracy can secure our future.

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