Working Around Democracy:
Big Tech, Computational Power, and Racial Equity

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Changes in our technological infrastructures are deepening inequalities and intensifying systemic racism. As society becomes more reliant on computation-hungry technologies such as cloud or software as services, computational service providers are hollowing out public institutions and diminishing their ability to administer basic democratic duties and to serve populations. For members of marginalized communities, this transformation adds to the challenge of getting the state to adequately address economic disparity, cultural violence, and political power imbalances, further obstructing paths to racial justice and equity. This paper argues that the rise of computational power warrants new ways of demanding racial equity and justice above and beyond familiar interventions focused on equitable access, diversity, and inclusion. To build out this argument, the paper looks at historic ways that race intersects issues of technology governance and identifies blind spots that overlook the outsize influence and wealth of technology companies. The paper then explores Big Computing, differentiating between computational power and the kinds of power associated with networked or platform technologies. Computational power often works around democracy, and its problems encompass more than the typical ones of access, bias, privacy, or free expression. Advocates for racial justice and equity face a unique opportunity to lead debate on computational infrastructure and its broad implications for equity and justice.

* The author is grateful for conversations over the years with Martha Poon and Seda Gürses, whose critical perspectives on computational infrastructure force new questions about equity and justice. Their work lays the groundwork for understanding the nexus of economic and technical changes wrought by cloud computing. These ideas were nascent in 2017, as seen by Poon's formative presentation, "Microsoft, the cloud" (Poon 2017), and Gürses' co-authored work on "Privacy after the agile turn" (Gürses and van Hoboken 2017), and again three years later at the "Seminar on programmable infrastructures" (Gürses and Dobbe 2020).

Part 1: Race and Technology

The first section will establish the basic parameters of racial equity, introduce an expansive way of thinking about the technology sector, and describe how racial equity frameworks are beginning to impact the technology. The goal here is to: first, establish the ongoing struggles to eliminate maldistribution of wealth, misrecognition of the racialized "other," and misrepresentation of marginalized communities in key sites of political decision making; and second, canvas the ways in which these debates have surfaced in the tech sector. As with the entire paper, this section begins from the lens of the most marginalized and operates from the premise that capitalism and democracy disproportionately exploit or exclude racialized communities.

Racial Equity: What, Who, and How

Racial equity refers to a society where all individuals and groups live the lives they value most, free from race-based harm, violence, and oppression. Racial equity is about redrawing the lines of social, economic, and political power in the United States, a nation whose very founding was driven by white settlers racializing, exploiting, and abusing the Other.

Racial equity refers to both processes and outcomes. In plain terms, racial equity depends on seeing and not seeing race. That is, it depends on recognizing racial differences, including the ways in which racialized groups are "othered," as well as on eliminating race as a determinant of people's wellbeing and overall flourishing. It also depends on meaningful participation by people and groups who bear the burdens of systematic, institutionalised racism and who are thus typically left out of key decision-making processes. The fact that racial equity involves process and outcome is not a contradiction, but rather a testament to the dynamic and complex ways in which social, economic, and political power operate in society. Power changes—and is changed by—society.

The complex nature of power means that the path towards racial equity is not a linear one. In the 1960s, the social, political, and economic landscape shifted when civil rights advocates won the battle for desegregation. The Civil Rights Act of 1964 had countless positive impacts, such as evidence of improved graduation rates, higher test scores, higher incomes, and better health outcomes for Black Americans, especially in the period following the Civil Rights Act through to the 1980s. However, over time, equal protection for different groups has been interpreted in ways that contribute to systematic injustice. Along these lines, the Supreme Court issued decisions—first in the mid-1970s, on school bussing, and then in the 1990s, on court-mandated school integration at the local level—that helped to unravel antidiscrimination in public education. Today, public schools across the country are separate and unequal, especially for students of color. The reappearance of school segregation in the United States gives constant reminder that racial equity exists as a moving target.

Though the path towards racial equity may be circuitous, the benefits of a racially equitable society are unambiguous. When racial equity is achieved, society reaches a type of equanimity. Everyone benefits and not just racialized groups.

The Racist Roots of Technology-as-Human-Progress

Different from education, health, or other sectors which connect to individuals and groups' ability to meet their basic human needs and which, if deprived, materially and emotionally impact racialized groups, technology can be difficult to place with respect to human needs, race, and racial inequity.

The reasons for this difficulty can be understood in relation to the very roots of the idea of technology. Most commonly, we think about technology in relation to human progress, as opposed to superiority or supremacy of certain groups (possessing technological tools) over others. Yet, discourses around the power of technology and its centrality to human progress stem from a 19th century ethos that set industrializing nations against primitive ones. In the 19th century, technology was a neologism that functioned to differentiate between and discriminate among races. As Schatzberg (2018) explains, American anthropologists who first employed the term were influenced by social Darwinism (i.e., a framework for scientific racism). They used technology to denote the study of the material aspects of culture or "arts of life" and evaluate such arts in relation to stages of civilization or human progress. Here, civilization stood in contrast to so-called savage societies, which, at least according to proponents of scientific racism, would need disciplining or colonizing, including at the hand of new technological tools.

The difficulty in parsing the relationship of technology to racial equity also stems from the fact that race is itself a technology. North American and Western European scientists—i.e., proponents of scientific racism—help construct the idea of race in the 19th century, leading to institutions and practices committed to differentiating between, discriminating among, and committing violence against racialized groups. Race was established as a tool of differentiation, and its function in society continues to this day. As Benjamin (2016) argues "contemporary technoscientific practices coproduce racial classifications" (n.p.). Understood in this way, some technologies are racial or carceral (in the case of Benjamin) by virtue of their goal of classification, differentiation, discrimination, exploitation, or punishment. For example, high-tech police surveillance technology or facial recognition technology perpetuates the classification and criminalization of racialized people.

To be clear, behind those technoscientific practices lies an ensemble of interconnected institutions. The most conspicuous among these institutions include the "MAFAA"—Microsoft, Apple, Facebook, Alphabet, Amazon. But many more institutions form part of the food chain that

fuels such practices. The production or development and consumption of technology and the technoscientific practices associated with such technologies involves institutions as diverse as venture capital firms, mining companies, computer literacy organizations, real estate investors, higher education, and more.

On balance, institutions involved in the production of racial technologies or carceral technologies form a relatively small slice of the tech sector. While this might seem a narrow problem, once the institutional ecology for racial or carceral technologies is considered, it becomes necessary to account for the broad range of technology institutions (again, not only MAFAA, but also those involved in finance, education, materials).

Race at the Intersection of Technology: Representation, Distribution, Participation
Beyond the racist roots of technology, racist technoscientific practices, carceral technologies, and the institutions that enable them, lies a broader, if not more complex set of domains where racial equity intersects technology. Recall the statement above about racial equity and social, economic, and political power. Technology and its institutions are entangled with each of those domains of power by virtue of the ability of technologies and technoscientific practices to represent or misrepresent racialized groups (social), as well as of technology institutions to affect the distribution of material resources or accumulation of wealth (economic) and to influence decision making or tech governance (political).

(Mis)Representation and Technology

By and large, public understanding on race and technology typically revolves around issues of representation—or misrepresentation—of racialized groups in digital spaces. In scholarly circles, the examination of race and technology began mostly in the 1990s. As the use of the commercial internet increased, a very small group of scholars wrote about race, identity, and digital culture. Many of these studies scrutinized the whiteness of UseNet and other interactive spaces, including the rise of neo-Nazi groups, online anonymity, and hostile expression towards users who express their racial and ethnic identities.

Issues of representation and belonging have blossomed in the second decade of the 21st century. A major thrust in research on race and technology spans the fair or accurate representation of racialized groups in algorithmic systems. A significant amount of scholarship—both academic and popular—concerns diversity and inclusion in computer science and engineering, in the tech sector, and in the financial sector (investing in the tech sector).

Unsurprisingly, policy strategies since the 1990s have similarly targeted problems of (mis) representation and (lack of) belonging. These policy interventions span bridging the digital divide; supporting digital, computer, data, and algorithmic literacy; broadening STEM programs in elementary, secondary, and higher education; incentivizing minority-owned businesses; and more.

Many would argue issues of representation and tech are gaining traction. Like many other sectors in society, racial justice uprisings following the murder of George Floyd as well as brought on by the Covid-19 pandemic, have driven awareness and responsiveness to problems of misrepresentation. Here a range of high profile or high stakes examples demonstrate an awareness of the problem of structural racism in connection with technology education, research and development, and industry: the firing of Timnit Gebru, surveillance of Black Lives Matter activists, the calling out so-called inclusive and diverse artificial intelligence (AI) initiatives, and the hiring of race and technology scholars in higher education.

Race, Technology, and the Business of Inequality

While representation issues are relatively well known in public discourse, what tends to be neglected in debates on racial equity and technology are business practices of extraction from, exploitation of, and predation on racialized communities. It is important to note that business practices in other sectors—not just technology—have an impact on racialized communities. But the technology sector has arguably seen staggering rates of economic growth, including and especially during the crisis period of the Covid-19 pandemic, and contributes to wealth inequalities in significant ways. Despite provocative studies of the role of technology companies in urban development, tax base erosion, labor exploitation, and predatory capitalism (areas of research that do note the agglomeration of wealth by the tech sector) (Feldman, Guy, and Iammarino 2021; Zukin 2020), the centrality of racial disparity in monopoly power and tech wealth remains relatively underexplored.

Race, Technology, and the Business of Politics

To a slightly lesser extent, there is also a dearth of attention to participation in technology policymaking by members of racialized groups, especially those groups who face injustices due to misrepresentation and maldistribution. Political power in the tech industry runs deep, threatening to crowd out marginalized voices from debates on technology governance. As Public Citizen reports, Amazon and Facebook topped 2020 spending on lobbying, outpacing typical spenders from Big Oil and Big Tobacco (Chung 2021). Amazon and Google are two out of three major funders bankrolling a university-based think tank (Wakabayashi 2020).

On top of this, technology governance has not been a central facet of racial justice or racial equity political platforms (Movement for Black Lives 2016). Although racial justice uprisings in the past seven years spawned young, racial justice organizers to run for office or get involved in policy (Ossé 2020), and despite the launch of experimental and participatory models to address power imbalances in policymaking (Race Forward 2021), race and tech issues tend to attract occasional and inconstant attention.

The relative reticence of racial justice leaders and unheard or dwarfed voices of marginalized communities equate with lesser political power for racialized groups and a lack of political participation by and for racialized groups who bear the burden of misrepresentation and maldistribution at the hands of tech. While people of color in elite institutions may reach the political spotlight, the same cannot be said for members of marginalized and racialized communities. Severe gaps in political access mean that the impacts of tech power on community power get overlooked.

In sum, technology—as an idea and a discourse—has a dark history with respect to race. Modern day institutions—not only the MAFAA, but also finance, mining, education, and other kinds of institutions—are responsible for extending and exacerbating systemic, institutionalized racism, by developing and promoting new practices and tools that racialize and denigrate the "Other." These are known as racial or carceral technologies.

But racial or carceral technologies alone do not impact racial equity. Issues of representation are the most well-known juncture between racial equity and technology, owing to concerns about how the racialized "Other" appears or disappears and is heard or stifled in online spaces (ICTs). Issues of representation also connect to ideas about how needs of racialized groups are reflected in the design of technology, not only of ICTs, but of more recent innovations, such as automated technologies or machine learning tools, and precisely who, such as members of homogeneous or racially and ethnically diverse groups, designs such technologies. Lesser well-known or widely discussed junctures between racial equity and technology concern the lack of participation by members of marginalized, racialized groups, as well as the profound wealth inequalities associated with tech sector growth and the burden borne by these same groups. We turn to this last item in greater detail in the next two sections.

Part 2: Taking Stock of Computational Infrastructure with a Racial Equity Lens

The second section will present the political economic landscape of Big Tech, focused on a new area of concern arising in academic literature: computational infrastructure. Computational infrastructure refers to the computing resources required of Big Tech to drive demand for new automated and intelligent technologies. This foundational section importantly delineates between computational infrastructure and networked infrastructure. While the latter refers to platform economies and historically has invited discussions about access and control of information and communication, the former relates to new economic configurations which focus on optimal performance.

From Networks and Network Infrastructure to Platforms and Platform Power

For decades, the most common way of thinking of the political economy of the tech sector has been in terms of networks or networked infrastructures. The shift from analog media to digital media brought interest in the openness or closed nature of networks. The Open Systems Interconnection model informed the design and engineering of the internet, a resilient network that could still function if any one node was cut off. Borrowing from the Open Systems Interconnection model, legal scholars Lessig (1999; 2002) and Benkler (2003) helped to draw attention to the importance of openness in logical (code), physical, and content layers of the internet.

The rise of networks and networked infrastructure has brought attention to network effects and economies of scale, as well as network control. To the latter, arguments about the appropriate stewards of network design abound, and the core debates over the nature and extent of openness concern access, free speech and expression, privacy, and innovation. To the former, networks are notable in that the value of the network to the user depends on the number of the users in the network, which can make it difficult for users to switch networks. Networks may also display economies of scale, meaning a declining costs of production for network owners.

To be clear, networked infrastructure birthed the platforms and platform economies we have today. These platforms are characterized by key features. They link two sides of a transaction (supplier, user); offer content desired by users; collect, retain, and use data about platform users; adhere to a business model that pays for maintenance and improvement of the platform; and provide auxiliary services. Considering these practices, platform economies are said to be fundamentally extractive (Zuboff 2019; Khan 2017), with platforms extracting from users and suppliers equally and following a “winner take all” mentality. Owing to economies of scale and network effects, platforms have enormous gatekeeping power.

Both the unique technical features and growth models for networks, and later platforms, did not arise in a vacuum. Libertarian norms in speech regulation advantaged platforms and corporate speech (Weiland 2017). Platforms gained intermediary liability, shielding them from culpability for speech acts—including hateful speech acts—and toxic culture online. Meanwhile, laissez-faire norms in tax regulation (Shome 2021), corporate law (Meagher 2019), antitrust (Britton-Purdy et al. 2020), and finance (Feldman, Guy, and Iammarino 2021) aided platforms in minimizing public interest obligations or other interventions designed to induce consumer and public welfare. Deregulation in telecommunications (Noam 2018), as well as policies such as network neutrality (Newman 2016; Pasquale 2010b; 2010a), strengthened platforms further (Cohen 2019).

Within this favorable regulatory environment, as well as due to network effects, platform companies have become highly concentrated. Platforms now have achieved a status more powerful than, for example, factory owners during the industrial revolution (Kenney and Zysman 2016). They boast market valuations equivalent to nation states (Mostrous and Hoskin 2020). According to the Subcommittee on Antitrust, Commercial and Administrative Law of the Committee on the Judiciary (Bond et al. 2020), major tech companies have monopoly or near-monopoly status. Facebook outpaces all its competitors in social networking. Google controls online search and search advertising. Amazon dominates more than fifty percent of online retail sales. Apple has significant market power in the mobile operating systems market.

For racialized communities, powerful platform companies put a squeeze on freedoms and opportunities. This is most evident and most argued with respect to network control and inclusion or exclusion (Chavez 2015). Who is in the network, how one can be included, and whether the government or the state should control one's entry and one's behavior in the network are paramount issues. To a certain extent, the arguments leveraged during net neutrality debates parallel those related to platforms: members of marginalized communities get locked out (of platforms or networks), their ability to express themselves diminishes, or worse yet, their perspectives are distorted or exploited (Ross-Brown 2015; Gilliard 2017). As platform economies concentrate wealth rather than distribute as predicted or hoped (Benkler 2006), and platform companies become gatekeeping powers (Khan 2017), members of racialized communities have struggled to gain the kind of platform visibility they desire.

Additional impacts of platform power on racialized communities ranges from data-based surveillance and predation, to market exclusion. As is well documented (Zuboff 2019), digital behaviors serve as metrics for companies deciding to target (or avoid) particular groups, at a price set by platforms. For members of racialized and marginalized communities, targeting based on digital behaviors and data analysis thereof has been linked to predatory services and goods. Be they short-term lenders advertising payday loans' staggeringly high interest rates (Yu, McLaughlin,

and Levy 2014), for-profit colleges that offer sub-par services and unfavorably termed college loans (Shell 2018), or fraudulent services that steal one's identity (Petty et al. 2018), predatory targeting can go under the radar. For less conspicuously nefarious services, third parties who purchase platform data as well as first parties (e.g., the platforms themselves) can exercise discretion and discriminate in deciding which users should be served differential prices or services on platforms.

As well, platform gatekeeping affects minority owners of small and medium-sized enterprises who must operate by the terms set by platforms. While this problem is not unique to minority business owners and applies more globally to small business entrepreneurs, the unique disadvantages faced by non-white business owners, especially Black business owners (Fairlie and Robb 2007) can be compounded with the difficulty of, for example, dealing with platform gatekeeping. Overall, large tech firms have the upper hand. Discourse on entrepreneurship has been less than supportive of small businesses, while high-tech growth firms continue to dominate media, investment, and research (Marvel, Wolfe, and Kuratko 2020). Needless to say, minority-owned businesses struggled to stay open or compete (U.S. Chamber of Commerce 2020; Kuratko and Audretsch 2021) during the Covid-19 pandemic, while companies like Google and Amazon achieved record-breaking profits (Neate and Rushe 2021). The power imbalance bodes poorly for entrepreneurs from racialized and marginalized communities.

Computational Infrastructure: What Differs and What Matters for Racial Equity

With the "dawn" of big data (Mohammed 2018), computational infrastructure has emerged (Balayn and Gürses 2021), prompting new and different questions of control. Whereas networked infrastructure denotes a content, physical, and logic layer and is fundamentally concerned with the openness of communication at each layer, computational infrastructure is concerned with data-driven services (also known as cloud services, service-oriented computing) and their optimal performance. This focus on optimal performance has implications for how problems are defined and resolved technically as well as politically.

Computational infrastructure is not an easy concept to grasp. On the one hand, it requires reorienting how we think of the internet. On the other, computational infrastructure is intertwined with the internet; it has depended on networked infrastructure. In addition, the companies commonly associated with Big Tech often double as computational infrastructure providers as well as platform companies or network business (see above for reference to Microsoft).

Nevertheless, computational infrastructure is distinctive. There are many more data-driven services than those operated by platform services, and computational infrastructure is needed to make these data-driven platform services work. As computer scientists Kostova, Gürses, and Troncoso (2020) state, data-driven services involve several component parts. Specifically, they require the splitting up of the execution logic and data flows of software services and distributing these across computational infrastructure, making software development more agile (e.g., "moduralized"), and optimizing and automating steps in the software development process. This kind of service-oriented software requires computational infrastructure for distribution—and not just for the delivery of the data-driven service to a client or end user, but also for maintaining the service itself—the composition, monitoring, conformance, and provision of quality of service. Moreover, there is a complex set of actors involved in the maintenance of a data-driven service, and coordination between teams and organizations is key.

This model of service-oriented software differs from other models of software production. Here, computation is "always on." Maintenance is ongoing. The service is always optimizing (Kulynych et al. 2020). The agile model of software development and deployment means a service never has a final version; it is always being improved, as opposed to services produced according to a sequential software development process with a static output like a cd-rom (Kostova, Gürses, and Troncoso 2020).

An always-on, optimizing data-driven service has implications for who is powerful and who is weak. On the one hand, the provider (or the group of actors involved in the provision of a data-driven service) typically has the upper hand. As Kulynych et al. (2020) point out, the negative consequences of optimization are often borne by users (as opposed to providers). Users are subject to constant extraction: they provide the data that help service providers optimize their services (e.g., Waze). Constant monitoring and improvement of a data-driven service essentially normalizes extraction. In the process, non-users also suffer consequences as they are at the whim of the optimizing process (e.g., traffic being routed through an otherwise quiet neighborhood). Perhaps more significantly, the drive for optimization ignores whether a service is needed or relevant to users. For racialized and marginalized communities, this problem is especially striking, given the legacy of technologies that such groups have been forced to adopt (Gangadharan 2021).

On the other hand, in an environment where data-driven services are always optimizing, computational infrastructure providers also have the upper hand. The complex technical manner and the unique institutional configurations by which data-driven services are composed, monitored, "conformed," and meet quality-of-service thresholds means the actor or actors threads between and manages coordination of the different component parts or layers of data-driven services. In this sense, the computational service provider has more power than, say, the data-driven application. Google has the upper hand over applications.

Indeed, many of the Big Tech companies hold much of that power, given their early transition to agile services. For example, throughout the 2000s, Amazon "virtualized" web servers (instead of having to have a rack on the premises), and later Microsoft released Azure, which allows companies to control servers, storage, databases, networking, and analytics virtually. Meanwhile, Apple streamlined software updates to end users of iPhones and iPads. Google offered a platform-as-service with the launch of Google App Engine. Whether businesses' computing operations, on-demand software, or platforms for developing and hosting web applications, these companies have laid the groundwork for agile services to thrive, and their dominance remains relatively uncontested.

Nowadays, while discourse on platform monopolies and platform control abounds, targeted conversation about ownership and control over computational infrastructure is more muted. The 2020 Congressional report on platforms and monopoly remained relatively silent on Amazon Web Services. It also punted on Alphabet's control over the data-services pipeline. Finally, it failed to review Microsoft's business practices whatsoever. Yet, the move to data-driven services/agile software production is associated with a trend towards consolidation. Yet, monopoly power is evident within cloud computing, as Apple, Alphabet, Microsoft, and Amazon all have strongholds in what industry refers to as infrastructure-as-service, software-as-service, and platform-as-service. These companies have all pursued an aggressive multibillion dollar acquisition strategy, with some of the most well-known being LinkedIn (by Microsoft) at $26.2 billion, Whole Foods (by Amazon) at $13.7 billion, Motorola (by Alphabet) at $12.5 billion, and Intel at $1 billion and Beats at $3 billion (by Apple) (Jones 2019).

The rapidity with which data-driven services has grown is also a testament to the power of computational service providers. The uptake of data-driven services is staggeringly large. The agile model has "revolutionized" businesses. The cloud is everywhere. The estimated size of the global datasphere by 2025 is 175 zettabytes, five times larger than what it was in 2018 (Ang 2020). (One zettabyte is a trillion gigabytes.) Public institutions are no different. From high-profile and controversial contracts of the United States Department of Defense (Kaufman and Cohen 2021), to lesser-known and local procurements of cloud-based, optimized data-driven services, the demand for or dependence on computational infrastructure is only increasing. The Obama Administration supported a "Cloud First" policy beginning in 2010 and advanced cloud adoption following the establishment of a risk management program (Lumb 2017). By 2017, government interest in transitioning to agile services accelerated with the Trump Administration (U.S. Chief Information Officers Council 2017). In 2020, federal agencies spent $6.6 billion on cloud computing (Konkel 2021).

As dependence on computational infrastructure has grown, tech companies have evolved new strategies for financial growth and management related to the phenomenon of financialization. Financialization means companies derive profit from financial tools, rather than through the production of goods and services or trade. As Feldman, Guy, and Iammarino (2021) note, public held companies, including tech companies, interact with financial markets at rates not seen in previous eras. When combined with monopoly and infrastructural power, such as that which is seen among computational service providers like Microsoft, Apple, Alphabet, and Amazon, this manner of making money from money is significant for consumers and citizens. By virtue of their financial market activities, computational service providers and other high growth tech firms can operate with some measure of distance to issues "on the ground" and the people living the realities of extreme wealth disparity.

For racialized and marginalized communities of color, that distance presents a significant challenge for transforming tech power. Unlike platform power, computational power is not primarily concerned with free expression, access, inclusion/exclusion, or privacy. Computational power has its own logic, a large majority of which ties to the logic of optimization. Though platforms and computational service providers both thrive off extraction of users, computational power is more agnostic about the users, the data-driven services offered, and the conventionally discussed problems (e.g., censorship, bias) therein. For racialized and marginalized communities, the profound distance between them and financialized, monopolized computational powerhouses poses significant boundaries for addressing inequalities.

To sum up, computational infrastructure differs from network infrastructure, and computational power differs from platform power. Although there is some overlap between platform providers and computational service providers, not all platforms contribute to computational infrastructures, and not all computational service providers function as platforms. Perhaps more importantly, those that dominate the computational ecosystem contribute to the enormous political power that tech companies have come to assume.

Part 3: Losing Democracy and Computational Power

Having differentiated between networked infrastructure, computational infrastructure, and their specific forms of political economic power, the third section will provide an overview of how concentrated control over platforms and computing impedes democratic institutions, processes, and practices. For the discussion of computational infrastructure, I offer to develop a case study, which illustrates the way in which democratic institutions lose power to govern when they increasingly rely on computational service providers. Here the goal is to begin to sketch out the enchainment of public institutions to tech companies in ways that undermine democratic safeguards.

The Nature of Data-Driven Dependence

Dependence on data-driven services differs from dependence on digital services of the past. In 2002, with the passage of the E-government Act, Congress aimed to upgrade the technological savvy of federal government, make public records accessible, and drive access to government information (Klima 2002). As government information sharing and service delivery increased, dependence on private vendors was inevitable. Ultimately, transparency and oversight mechanisms evolved to match the influx of private vendors from small to large contractors for small and large projects (Anthopoulos et al. 2016; Janssen and van der Voort 2016). Transparency in digital government was a priority, and oversight mechanisms reflected faith in public-private partnerships as an effective means to the creation of public value (Gil-Garcia, Dawes, and Pardo 2018). Despite challenges to its authority over redistribution of resources (Carnoy and Castells 2001), government still occupied a central position in allocating resources to different groups.

With the cloud modernization efforts of the Obama and Trump administrations, government commitments to transparency and control over resource allocation have been significantly redrawn. Datafication—not just digitization--of government services introduces new unknowables that threaten the knowledge and power of public institutions, and datafied public institutions exhibit a new kind, if not more centralized, dependence than previously experienced. Service providers that offer products to “virtualize” federal government and, in some cases, streamline delivery of (private, intellectual property-protected) software services are complex institutions with complex product development structures. Datafication makes it difficult to see and understand what factors into outputs or decisions made by data-driven services. The spread-out nature of the computational ecosystem (e.g., the different pipelines that factor into machine learning systems) also challenges the goal of transparency. The state relies on a computational service provider to help explain the who, what, and how of computation, though not necessarily the why.

Public institutions face additional technological challenges that complicate government's ability to govern. As Binns (2018) writes, optimized data-driven services tend to follow a utilitarian logic. As a result, clients, like public institutions, face narrowed choices for what data-driven services can do for them. As the state becomes more reliant on data-driven services, its raison d'être—managing redistribution of resources throughout society—becomes imperilled. Its organizational priorities shift to managing relationships with the computational service provider and managing performance expectations (of the data-driven service). Combined with non-technological forces undoing the liberal, welfare state (Mbembe 2021), the state, for its part, only indirectly manages data-driven services tied to maximalist redistribution strategies.

On a more pragmatic level, public institutions face contractual challenges. As Brauneis and Goodman (2018) and Veale et al. (2018) intimate, the provider often knows more than the client, and the client (e.g., public institutions) come to rely upon providers for explanations as to "how things work." The pricing model of some data-driven services emulates that of platforms: freemium or low-cost services initially, and increased fees later, leading to lock-in effects. Altogether, information asymmetries contribute to a scenario where public institutions lack a clear exit strategy that would allow them to extricate from a dependent relationship.

Squeezing States, Taking Over

While some might argue lock-in with data-driven services does not differ from digital services of the New Millennium, in some cases data-driven services appear to be fulfilling services performed by government. Nowhere is this more evident than in the "blitz scaling" that occurred in the wake of the Covid-19 pandemic. As lockdowns came into place, and government increased delivery of digital services, demand for computational infrastructure increased. Remote services, constantly updating software, increased data storage and analytic capacity became par for the course. Sectors such as public health were particularly vulnerable to offers from computational service providers not only promising artificially intelligent solutions for health and healthcare, but also efficient solutions for patient management, customer self-service, and more. In other words, optimized health services created state dependence on providers, but also displaced the institutional and professional expertise, especially non-metrics-based expertise.

Unfortunately, growing dependence on data-driven services by public institutions is taking place against the backdrop of computational service providers denying governments of tax revenues. As Shaxson (2019) states, the loss of corporate tax revenue is staggering (an estimated $245 to $600 billion a year is lost worldwide) and devastating for state authorities struggling to serve and support its citizenry, allocate resources, and ensure individuals and groups can live dignified lives. The Tax Justice Network estimates that $89.4 billion is lost yearly in the United States alone, an

amount equivalent to 5.82 percent of the health budget, and 9.72 percent in education spending (Tax Justice Network 2021). Meanwhile, other instruments designed to convert facets of corporate wealth into public welfare—such as common carriage or rights of way—have been battered by corporate legal challenges seeking to undo their public-interested outcomes. Amidst all of this, states and municipalities are unable to finance projects in the same ways they have in the past (see also, Robyn and Goodman 2019).

At the same time, computational service providers are dabbling in state-like duties by engaging in redistribution projects. Skeptics connect such efforts to tax-saving, profit maximizing, and reputational management. Whether genuine or not, providers' charitable projects reach deep into communities in need. Just last year, Microsoft provided a line of credit to the Washington States Finance Commission to develop affordable housing (Johnson 2020). This move expanded its entry into the housing finance market the year before, when the company promised loans to developers building affordable housing. On top of this, the company has also donated millions to challenge the problem of homelessness in its headquarter city, Seattle (Sharf 2019).

Meanwhile, in 2021, Amazon announced an expansion of its educational support programs. Beginning next year, the company will offer free education to its 750,000 workers. The program is comparable to other educational support programs at companies like Target and Walmart, the latter of which employs the largest workforce in the United States. But because of Amazon's record earnings coupled with its use of surveillance technology and algorithmic management in the workplace, the promise of free education has drawn considerable attention. The company struggles with recruitment and retention of workers, especially in fulfilment centers where workers keep pace with harsh performance metrics (Kantor, Weise, and Ashford 2021).

Finally, computational service providers generally engage in a significant amount of charitable work. Some of the firms have developed their own for-profit philanthropic centers, while others engage in non-profit activity. From the well-known, such as MacKenzie Scott (ex-partner of Jeff Bezos), Laurene Powell Jobs (wife of the late Steve Jobs), Bill Gates, and Eric Schmidt, to the lesser well-known as well as those seeking anonymity, tech leaders and tech workers regularly set up foundations or charitable institutions or partake in charitable giving to myriad causes, including systemic problems like homelessness, poverty, malnourishment, environmental degradation, deskilling—all areas that overlap with state-led initiatives to bring about equality and equity in society. As is well established in literature (Hemel 2020; Hall 2006; Anheier 2004), philanthropy in the United States comes with significant tax benefits or relief. Tech philanthropy is no different and forms part of companies' legal tax avoidance strategies.

Political Power

Datafication of government services chains public institutions to the success or failure of Big Tech and computational service providers, threatening their ability to effectively regulate tech firms. As Balayne and Gurses (2021) explain, state dependency on computational infrastructures means that the state walks a thin line with firms. If the state regulates them too effectively, quality of service could be affected (not just for public institutions, but also for all institutions) (see also, Gürses and Dobbe 2020). Any measures deemed to interfere with the growth strategies, including regulation of acquisitions and mergers, corporate tax, and financialization, will attract the ire—as well as lobbying presence—of computational players. Computational service providers are likely to avoid significant changes in structure of the computational ecosystem, just in the same way that traditional media outlets lobbied against stricter ownership regulations.

Part 4: Up Close: Computational versus Community Power

In the fourth section, I wish to present the flip side of this process of enchainment and focus on the impacts on members of marginalized communities. This will bring us back full circle to where the research started—with consideration of the problems of maldistribution, misrecognition, and misrepresentation that befalls racialized communities. Where possible, this section will draw on previous research on marginalised communities and data governance.

By now, it should be evident that computational services providers possess a different kind, if not more worrisome type of power than platform companies. Computational power is technical, institutional, and political, and it encompasses more than concerns about data, access, bias, privacy, or free expression. With computational service providers and the complex ecosystem that ties to them, a significant transformation in the composition of public institutions is in play. The very constitution of democratic procedure is shifting as public institutions have come to depend on the computational powers-that-be for operational or logistical management as well as substantive decision making. Companies like Amazon, Alphabet, Apple, and Microsoft, as well as other companies that form part of the supply chain for data-driven services, harbor enough wealth to undertake redistributive responsibilities while shielding themselves from market interventions that historically supported the liberal, welfare state.

Perfecting the "Work-Around"

One of the most potent examples of computational power today lies with Amazon. Amazon's profits soared to 220 percent during the pandemic (Weise 2021). This staggering growth comes at a time when journalists, advocates, researchers, and decision makers are beginning to shed light on the extent of Amazon's tax avoidance. Already, the company was well known for its "origin story." Shopping for a suitable tax jurisdiction, Jeff Bezos established the company in Seattle as a means of gaining competitive advantage in the retail market since internet customers could avoid paying sales tax. Since then, it has grown even more ambitious in its manner of legal tax avoidance. As explained by MacGillis (2021), it funneled profits through its Luxembourg office, thereby relieving the company of $1.5 billion in payment to the US government. Meanwhile, between 2009 and 2018, the company managed to only pay corporate income taxes at the equivalent rate of 3 percent annually. After sensing pushback against its strategies in Seattle, the company waged a nasty campaign against tax reform which would have taxed the wealthiest residents and raised much needed support for housing and social services (MacGillis 2021). In addition, as of November 2021, Amazon has received $4.1 billion in tax exemptions and credits from states and cities for the construction of warehouses and data centers (Good Jobs First 2022).

As mentioned in the previous section, tax strategies include philanthropic giving, and while more muted in its efforts (as compared to Microsoft and its former and current CEOs), Amazon and Jeff Bezos have managed well. The company spent $63 million on a variety of causes between 2011 and 2020. In 2021, the company, not unlike Microsoft, entered the housing finance market, committing $2 billion in below-market loans and $125 million in grants to public agencies, housing partners, and minority-owned businesses in Arlington, Nashville, and Seattle (Bishop 2021). Meanwhile, Jeff Bezos launched his own personal foundation called the Bezos One Day Fund, with an initial give of $97.5 million and a second amount of $98.5 million to support educational programs for homeless families. He also gave $20 billion to fight climate change with the Bezos Earth Fund (Leskin 2020). Both of Bezos' initiatives raise many questions, given the proximity of development of fulfilment centers and Amazon headquarters and of commercial space flight to the issues of homelessness and climate change respectively. Some critics deride the efforts as hypocritical, if not too late (Associated Press 2020).

A 21st Century Haymarket Affair

As detailed by MacGillis (2021), Haymarket, Virginia, was the site of Amazon's computational ambitions. The story illustrates the outsize power of computational service providers over communities, including marginalized communities.

In 2014, when data centers were at capacity in the DC and Northern Virginia area (a region called "Data Center Alley") and demand for cloud-based, data-driven services was rapidly rising, Amazon sought to move into Haymarket to build a 500,000 square-foot data center. The move entangled Amazon, the local utility company, Dominion, and county officials. Amazon had to have an electricity source to power its energy-hungry data center. It needed permission from county officials to move forward with planning and agreement with the utility regulator to make utility payments reasonable for the company, which promised to bring jobs to the area.

After a coalition of white, affluent, eco-minded residents successfully managed to pressure the local utility company, regulators, and Amazon into ceasing construction of power lines for a new Amazon data center (MacGillis 2021), Amazon and Dominion, the utility company, proposed to build in Carver Road. An historic Black neighborhood, Carver Road was a little patch of land that formerly enslaved people purchased from a descendant of the Mount Pleasant planation in 1899. Over the decades, the 50-acre property became an enclave for African American families, who over generations stuck to the area despite urban sprawl from Washington, DC, and eager developers. The environmentalists who originally opposed construction of the data center eventually teamed up with Carver Road community members to jointly fight the construction.

While union of activists was successful in disrupting Amazon and Dominion's plans, the win was bittersweet. As explained by MacGillis (2021), Amazon basically engineered a work-around that kept them in a winning position. Through Amazon pressure, the Virginia House of Delegates approved Dominion's proposal that utility customers pay a monthly fee to fund the construction, leaving Amazon with a smaller burden to pay for costs. Concurrently, Amazon applied for and received a discounted rate for utility payments to power its new data center, the details of which were kept under state seal (MacGillis 2021). In all, Amazon was able to defray costs mostly to consumers, while bending democratic procedure to its favor.

Amazon and Maldistribution, Misrecognition, and Misrepresentation

As the above example of Haymarket, Virginia, should make clear, Amazon's strategic maneuvering—or what Bezos calls "entrepreneurial capitalism"—comes with costs to communities. Here, the costs are ones related to democratic culture. As Amazon and Dominion got the state to seal the amount of the discount service, citizens and those defending citizens' rights were placed in an unequal position. They would ultimately possess less information about Amazon's pact with the utility provider, and the city lost out. This put them—and countless other citizens and citizens' advocates in Seattle, Columbus, Nashville, and other Amazon cities—in a position of powerlessness.

In other words, as Amazon has grown bigger, the problem of misrepresentation is escalating. In the Haymarket case, affluent white environmentalists and working-class Black homeowner community members both lacked political power to take Amazon to task. In regions predominantly populated by Black communities and communities of color, however, the battle over Amazon plans for fulfilment centers, data centers, and more comes at the intersection of economic and racial inequities. The political field is deeply unequal for those not on Amazon's payroll, be it formally or informally.

But political misrepresentation isn't the only facet of the problem of rampantly growing computational power. As mentioned in the first and second sections of this paper, misrecognition, especially of Black people and people of color, also plagues the company. The most common of critiques against Amazon focuses on its lack of diversity. In early 2021, Chanin Kelly-Rae, global diversity manager at Amazon, came out publicly to highlight the companies' systematic direct and insidious bias (Rey 2021). This bias runs up and down the ranks of the company, from its predominantly Black frontline workforce picking, packing, and shipping orders to its far-less diverse cloud division, where Kelly-Rae was situated (Rey 2021). This critique came not too long after the company's chief lawyer, David Zapolsky, had been caught denigrating Chris Smalls, a young Black man protesting the lack of health and safety protections in fulfilment centers (Blest 2020).

(Note: Misrecognition is somewhat missing from the Haymarket example. Campaigners—whether environmentalists or Carver Road residents—against Amazon did not intimate high-ranking Black executives would have made their cause easier. While it is difficult to know—or prove—whether such diversity within the company would have backed down from Carver Road plans sooner or would have avoided it altogether, suffice it to say that Amazon still got the upper hand in the Haymarket deal, the outcome of which benefited only a very few.)

Finally, Amazon conspicuously ties to the problem of maldistribution. With the Haymarket example, the costs of doing business more respectfully and more soundly were passed to consumers. Amazon had very little to pay. More generally, whether Haymarket or other regions, Amazon perpetuates material inequality, diminishing collective welfare with a set of financial strategies that drive wealth disparities. Wealth disparities are conspicuously in-house: the distance between Jeff Bezos' and S-suite executives' nine-to-twelve digit dollar earnings and (predominantly Black and people of color) frontline workers' wages is staggering (Rey 2021). That material inequality appears in urban configurations, as Amazon drives up housing costs in headquarter cities, Seattle and Arlington (see also, Zukin 2020), as well as in municipalities, counties, and states where tax deals have not reaped anticipated returns (Cafcas and LeRoy 2016).

To be sure, the problems of misrepresentation, misrecognition, and maldistribution are intertwined. The problem of misrecognition is not divorced from problems of misrepresentation and maldistribution. A critique of Amazon's facial recognition business is case in point. Most conspicuously, the technology perpetuates Black criminality. It depends on misrecognizing (not technically! but from a humanistic point of view) Black and Brown faces. At the same time, Amazon's publicity tactics—such as voluntarily extending its ban on police use of facial recognition—squeeze public discourse, diverting attention from the fact that Amazon has a successful business with Ring, which creates appetite for racial profiling by consumers desiring safe delivery, among other things, of their Amazon packages (Fight for the Future 2021). The most impacted in Amazon's Ring business are the racially profiled, for whom course of action and manner of redress is less than clear.

Reflections

The example of Haymarket serves as an important departure point for understanding Amazon's computational-cum-political prowess. Racialized and marginalized communities such as residents of Carver Road may be able to defeat Amazon and defend their neighborhood, but the problem of Amazon's computational power persists. It persists because of legal maneuvering that allows Amazon to continue to lower its costs and reap enormous profits at the expense of all citizens. The lessons learned from this example should be clear: no one strategy or policy intervention may be enough to tame Amazon. Only a multifaceted, intersectional approach that attends to the ways in which Amazon's computational power affects misrepresentation, misrecognition, and maldistribution will adequately address the profound impacts that computational service providers are having on the form and function of democratic culture today.

Part 5: Computational Power and Policy Strategy

Taking stock of computational power from a policy perspective requires attention to multiple moving parts. Policy attention today focuses on three areas of potential change: risk mitigation strategies at the product level to tackle representational harms in data-driven services; antitrust interventions to deal with platform dominance at the market level; and diversity in hiring and board of directors to confront myopia and privilege in the industry. But none of these strategies will be enough to challenge the ways in which computational service provision undermines democracy.

In fact, some proposed strategies risk strengthening computational service providers. Risk mitigation strategies as well as diversity initiatives risk enshrining a self-regulatory environment that entrusts corporations to make the right choices, without any feedback or input from affected communities. Recent hype surrounding participatory AI—which supposedly gives voice to those who will be on the receiving end of data-driven services—similarly legitimates the actions of computational service providers. Even proposed civil rights audits risk entrenching providers' power, rather than questioning fundamental business strategies that drive political, economic, and racial inequities.

More specifically, the Senate's proposed Filter Bubble Transparency Act, leaving aside the technical challenges of personalized notice-and-consent, leaves intact the fundamental business model of platforms. The same might be said for the well-intended Ending Platform Monopoly Act. This proposal does little to lift the burden of harms caused by Big Tech on affected communities (the most difficult of which will be borne by Black, Indigenous, and people-of-color communities facing a "matrix of domination"); (Collins 2009). It risks repeating problems seen with the break-up of AT&T (and then later re-consolidation of Baby Bells) as well as in the wake of the antitrust case against Microsoft in 2001. Finally, it leaves aside the financial strategies used by computational service providers to gain market advantage and drive dependence or lock-in. Meanwhile, diversity initiatives, such as California's law which requires one woman and one person from an underrepresented group to serve on the board of companies headquartered in the state, are staking a lot on minority board members to transform institutional and market practices.

To be sure, each of these areas—diversity in hiring and boards, risk mitigation strategies for representational harms in data-driven services, and competition—have merits and can contribute to the path of racial equity. But it may be time to try something new that brings accountability and transparency—and fundamental change—to the strategic work-arounds practiced by computational service providers. One area for consideration is tackling financialization strategies with a specific racial equity analysis. Classifying computational service providers as core to

financial services could make it harder for Big Tech to keep up its habit of aggressive acquisitions, since tech companies would have to keep more cash on hand. Another area for consideration is reform in nonprofit law that would place greater oversight on companies' (tech or otherwise) philanthropic activities in and around merger and acquisitions and initial public offerings (IPOs). A third area is to rethink public interest requirements for research and development (R&D) of tech infrastructure, such as quantum computing which will depend on and extend computational infrastructure. An R&D policy framework that builds towards a resilient—and public—computational ecosystem is a worthwhile, if not more secure investment.

The analysis of computational power is new and will take time to strategize around. But a wide-open opportunity exists to do something original and impactful in the space of racial equity and technology governance, and to help steer technology in a more democratic direction.

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