Engaging Science, Technology, and Society

ORIGINAL RESEARCH ARTICLE

When 'Open' is Still Far from Good Enough: The Work of Counter-Mapping with Political Software

LUIS FELIPE R. MURILLO
UNIVERSITY OF NOTRE DAME
UNITED STATES

ERIN MCELROY
UNIVERSITY OF WASHINGTON
UNITED STATES

Abstract

What does "openness" mean when it comes to crafting digital tools and infrastructures for housing justice action research? This question is particularly urgent as global internet companies unleash new geospatial technologies to track and surveil. In this article, we examine the corporate software dependencies and organizational practices that the Anti-Eviction Mapping Project (AEMP) have encountered in its counter-mapping work. Free and Open Source Software (FOSS) projects for counter-cartography have been developed to support both social research and housing justice work, but little collaboration between FOSS developers, critical cartographers, and community organizers has been fostered and sustained to date. In order to address this critical gap, we analyze project documentation alongside software development practices to discuss AEMP members' experiences in developing open technologies for the "Covid-19 Housing Map." We elaborate on the distinction between "political software" and "software politics" as an analytic device to describe contrasting modes of engagement with digital design. We demonstrate that FOSS adoption is not a simple matter of technological choice, but rather a complex sociotechnical process that fundamentally alters technopolitical relations and forms of political action. For the conclusion, we reflect on the broader implications of the technopolitical challenges that AEMP encountered, while also examining possibilities for creating and supporting "political software" aligned with the goals of housing action research.

Keywords

technopolitics; critical cartography; free and open source software; commons

Introduction

When the Covid-19 pandemic struck and quarantine measures began to be implemented on a global scale, many of us anticipated a looming disaster. A select few top executives leading global internet companies would financially benefit from the new public health crisis, whereas the vast majority of people around the world, albeit unevenly, would be left to fend for themselves in a sea of misinformation compounded with

To cite this article Murillo, Luis Felipe R., and Erin McElroy. 2025. "When 'Open' is Still Far from Good Enough: The Work of Counter-Mapping with Political Software." *Engaging Science, Technology, and Society* 11(3): 47–70. https://doi.org/10.17351/ests2025.2107.

To email contact Luis Felipe R. Murillo: lfrmurillo@nd.edu.

economic instability, housing uncertainty, and a lethal virus. The Anti-Eviction Mapping Project (AEMP)—a counter-cartography collective based in the San Francisco Bay Area, New York, and Los Angeles—had been conducting action research by producing data, narratives, and maps to support housing justice well prior to the pandemic (Maharawal and McElroy 2018; Graziani and Shi 2020; AEMP 2021). When Covid-19 hit, the collective was faced with an unprecedented demand for research data on evictions, eviction moratoria, landlord retaliation, housing legislation, and mutual-aid networks.

The AEMP research collective had been planning, prior to the pandemic, to hold an in-person meeting in tandem with a March 2020 conference, "Power at the Margins," co-convened by collective member and longtime housing organizer, Rob Robinson. When travel plans were canceled due to lockdown measures, AEMP opted to instead hold an online meeting to discuss what could be done to support community partners in housing justice organizing work. One of the major needs that we identified as a group was mapping the growing landscape of eviction moratoria given tenants' inability to pay rent with decreased employment. AEMP's community partners suggested that generating spatial data of eviction moratoria would be crucial in helping to illuminate the complexity of the regulatory sphere with different tenant protections being (partially) enacted on city, county, and state levels across the US and beyond.

By the end of March of 2020, the AEMP research collective began compiling eviction moratoria policies, while other members began evaluating visualization software. At the same time, the collective became inundated with new volunteers looking to use their skills to support organizing against growing housing precarity in the wake of the pandemic. Some came from the software industry, while others joined with commitments and experience in research and development of community-based digital infrastructures. After collective discussion and deliberation, AEMP decided to migrate to what soon became known as the "Covid-19 Housing Map" to FOSS. Yet, tensions soon emerged regarding FOSS development practices, leading to a process of schismogenesis—that is, a process of differentiation and separation among the participants with respect to their contributions (Bateson [1972] 2000).

In many ways, the newfound infrastructural challenges that the AEMP encountered during the pandemic should not be surprising given how many FOSS projects have been the object of reappropriation and celebration by the computing industry for the past two decades. Most of today's global internet companies develop, use, repurpose, and commercialize FOSS-based services extensively (Coleman and Hill 2004; Birkinbine 2020). Companies from IBM to Facebook, Amazon, and Google have adopted open source as a hybrid strategy of "coopetition" over "industrial public goods," for example, where they collaborate on non-strategic infrastructural technologies, but compete on strategic consumer-facing ones (Hippel and Krogh 2003; Alcaras 2020; O'Neil et al. 2024). While examples of corporate capture of "open" projects abound, especially amid the dawn of so-called "open" Artificial Intelligence (Widder, Wittaker, and West 2024; Hao 2025), what is particularly important from an STS standpoint is how technology companies not only capture common projects for profit gains, but to fundamentally transform their moral economies. It is well-established in the literature that FOSS development communities have organized historically through exchange practices that are shaped by moral, aesthetic, technical, and political orientations, exceeding and challenging utilitarian explanations for why people engage in self-organized publics to produce common technologies (Kelty 2008; Coleman 2013; Dunbar-Hester 2020; Söderberg and Maxigas 2022; Corsín Jiménez and Estalella 2023).

While corporate software dependencies marked critical tensions for the creation of AEMP's "Covid-19 Housing Map," what became more challenging to navigate for the collective over time was admitting new members from the software industry. Many newcomers who were enthusiastic about open source brought with them an organizational culture that was, at times, antagonistic to the political culture of the collective. This included requests for implementing hierarchical roles, such as "project manager" and organizing meetings according to the accelerated temporality of the industry with quick meetings and coding "sprints" rather than around the needs of housing justice organizations. AEMP members soon began to encounter additional demands of software development that counter-intuitively led to longer delays in creating tools for housing activism. Questions also germinated around the technical limitations of mapping software regarding language justice and imperial cartographic conceptions—many of which were inherited from both open and proprietary software mapping infrastructures.

In this article we examine these sociotechnical and political dynamics based on our direct engagement—as volunteer and cofounder of AEMP respectively—with the "Covid-19 Housing Map" project. While other pieces have been published on related aspects of the project, such as front-end design and oral history research (Velazquez 2021; Halperin and McElroy 2023), here we focus on the sociotechnical process of design and implementation of the mapping software based on the orientation of "STS making and doing" (Downey and Zuiderent-Jerak 2021). In this collective STS project, knowledge-making practices are not assumed to come only from academia but from the interfaces we create as STS scholars through critical engagement with digital tools and infrastructures in human and other-than-human collectives. This article is not, therefore, the product of a canonical ethnographic study, but the result of our practical and theoretical engagement with AEMP's action research agenda during the height of the Covid-19 pandemic years (2020–2022). All the work that we discuss here was conducted remotely through online meetings we attended as AEMP members. This included weekly video calls, chat applications (such as Signal and Slack), and source code management platforms (such as GitHub and Gitlab) that were used daily.

We draw from the project archive (composed of meeting notes, presentations, and software documentation) and upon our participation as active project members to highlight the tactics that AEMP employed to prevent corporate software development logics from hampering the work of housing justice organizing. Based on our double engagement as researchers and practitioners, we analyze the software development process while also reflecting upon possibilities and barriers for supporting housing research with digital counter-mapping. We describe technical objects with a methodological approach that consists in the description of the design "scripts" that underpinned the Covid-19 Housing Map with respect to its planned and actual co-participants (Akrich 1992; Suchman 2007). Based on this sociotechnical approach to the mapping effort, we demonstrate that FOSS adoption is not a simple matter of technological choice, but rather a complex sociotechnical process that fundamentally alters technopolitical relations and forms of political action. We show that this process involved oppositional dynamics of *commoning* and *schismogenesis*, that is, to render digital technologies and resources *common* against proprietary enclosures but also to create contentious symbolic divisions within our collective. To illuminate this process, we propose the concept of "political software" to emphasize design practices around software ontologies enacted otherwise (Escobar 2018)—software scripting as a form of *commoning* that is performed in the context of contemporary political struggles to challenge corporate digital development on geopolitical and sociotechnical grounds.

Software Politics

In "Queering GIS with Good Enough Software," geographer Jen Jack Gieseking (2018) addresses peers in the fields of critical and digital geography to make a crucial point about the existing corporate hegemony of Environmental Systems Research Institute (ESRI)-based Geographic Information Systems (GIS) software, such as ArcGIS, in conducting geospatial analysis and making maps. QGIS—a free and open source GIS alternative—Gieseking argues, is a better, "good enough" option. Gieseking's observation points to how easy it is to map anticapitalist content with corporate, private, and proprietary geospatial software. However, not all FOSS systems are inherently unproblematic just because they are ostensibly "free" or "open," the problem sociotechnical and technopolitical problem of "openness" goes well beyond community-based alternatives to IP licensing. As Jathan Sadowski (2020) observes, most aspects of digital life—including digital mapping and software as service (SaaS) mapping platforms, such as ArcGIS Online, Google Maps, Carto, and Mapbox—collect rent in the form of users' data. From the purposes of service optimization to advertisement, information is obtained without users' consent, even with (and sometimes especially with) free and open source software (Srnicek 2017; Zuboff 2019; Terranova 2022). While alternatives such as QGIS may prevent data extraction, not all FOSS systems are designed and implemented with anti-surveillance affordances nor guided by converging understandings of freedom, autonomy, and openness. Most prevalent Euro-American narratives around free and open source technologies do emphasize liberal understandings of individual self-expression, negative freedom, and collaborative independence (Kelty 2008; Leach, Nafus, and Krieger 2009; Coleman 2013). As a disputed umbrella term that encompasses distinct political genealogies and local sociotechnical formations worldwide, however, FOSS is entangled in technopolitical projects across highly unequal contexts for computing North and South (Chan 2014; Amrute and Murillo 2020; Murillo 2025). Recent studies have pointed out internal disputes concerning perceptions of misuse and abuse of FOSS by corporations and governments, leading to the rise of ethical licensing (Schneider 2022; Ehmke 2025). These critical tensions are important to highlight in the study of FOSS-based mapping systems because they highlight sociotechnical trajectories that otherwise would not be accounted for in narratives of technological development.

In the Euro-American context of FOSS development, not enough ink or bytes have been dedicated to examining the technopolitical dynamics of what we call "political software"—software designed in common to support horizontal forms of political action. For us, the "political" transcends the confines of "capital-P Politics," the realm of established institutional or electoral politics, thus having to do much more with a bottom-up approach to politics via lived experience of social movements in their struggle against exploitative and dispossessive technopolitical dynamics. Alongside a body of scholarship on the dynamics of the "anti-commons" of spatial and intellectual enclosures, we find technopolitical potentiality in practices of *commoning* of electronic resources with grounding on environmental, spatial, and socioeconomic justice (Harvey 2011; Caffentzis and Federici 2014; Obeng-Odoom 2021). This is what we mean by "common" when talking about open technologies as an attempt to shift the traditional understandings of the "commons" as either environmental degradation that calls for private or public management (Hardin 1968) or collective governance of common-pool resources (Ostrom 1990). "Commoning" here refers to the collective practice of creating and putting something in common for a particular community, whereas the common figures as a political principle for community organization (Federici 2018; Dardot and Laval 2019). We could say that many open technology projects are not common according to this definition, but have the potential to be

made common if we consider their capacity for commoning technoscientific knowledge and "infrastructuring" community-led projects (Star and Bowker 2010).

Even though the dynamics of "commons-based peer production" has been extensively debated in the literature on FOSS, the challenges of designing and implementing "political software" have not yet been the object of concentrated sociotechnical inquiry (Benkler 2006; Benkler and Nissenbaum 2006). "Software politics" has received much more attention in the existing literature, meaning the ways in which software figures in political and moral economy disputes. Early discussions of FOSS politics, for example, involved heated disputes against the transnational intellectual property regime (Moglen 2004; Boyle 2008), the moral economy of internet engineers and activists creating a recursive public sphere (Kelty 2008), the "political agnosticism" of free operating system hackers (Coleman 2013), the moral imagination, global technopolitical ties, and diversity advocacy across community projects (Leach, Nafus, and Krieger 2009; Takhteyev 2012; Dunbar-Hester 2020). Media scholar Nathaniel Tkacz (2012), for example, questions why it is that movements for more collaborative, participatory, and transparent "open" software and network cultures emerged during a moment of liberal, "open societies." He does so in order to contribute to the debate concerning the neoliberal underpinnings of digital technology projects. This body of scholarship has contributed to our understanding of this emergent technopolitics in the context of the fast-expanding anti-commons of "intellectual property" worldwide. And, while there are key lessons to be found (and reanimated) here for interrupting IP maximalism, we ask if "open source" corporate enterprises did not end up obfuscating the major differences amongst international FOSS projects within public, market, and common circuits. In particular we ask if the (over) emphasis on "openness" resulted in abandoning the importance of the "common," where the political principle of building community with digital projects takes precedence for and root in collective action for common benefit within and beyond proprietary circuits?

More recent FOSS debates provided a valuable contribution in centering issues of ethnic, racial, and gender-based discrimination. These studies take as a point of departure the accumulated historical evidence that describes how women-identified and racialized engineers, despite their key contributions to computing, have been systematically excluded from the field of software engineering as it became professionalized as a masculine career (Ensmenger 2010; Abbate 2012; McIlwain 2020; Hicks 2021). Key studies of gender and technology have not only shown how performances of "masculinity as technical mastery" created considerable boundaries of entry to gender minorities (Faulkner 2001; Nafus 2012; Reagle 2013), but also created an internal counter-current of solidarity with feminist FOSS hacker groups (Toupin 2014; Dunbar-Hester 2020). In her book *Hacking Diversity*, Christina Dunbar-Hester (ibid.) examined the role of "diversity" in addressing structural issues in open technology projects, albeit, she argues, in an insufficient manner. The author suggests that the potential for an emancipatory politics can be found in the conjuncture analysis of FOSS by "diversity advocates," but it often remains limited to the liberal theme of "inclusion" without proper analysis of the structural production of exclusion. It is crucial to acknowledge that independent software development communities have created internal mechanisms to address recurrent issues of discrimination, but they have not yet altered the structural technopolitical dynamics of active exclusion in science and technology. It is important to note here the narrow understanding and performance of gender in diversity initiatives as they tend to focus on the inclusion of women-identified

technologists, while also excluding non-binary and trans technologists who can be found in many FOSS and counter-mapping collectives (Costanza-Chock 2020).

It was in this context of fraught disputes about the practices and meanings of "openness" that AEMP began holding meetings to think through collaborative software design to avoid reproducing exclusionary dynamics in the "Covid-19 Housing Map" project. While there was consensus around wanting to avoid surveillance-based cartographic software, there was little shared understanding around the exclusionary and oftentimes hierarchical nature of software design. In the next section, we discuss the challenges the AEMP research collective encountered concerning the predominance of corporate software politics over the collaborative production of political software. We do so with a focus on the practices of political design of digital objects.

Mapping Eviction Data for Housing Action Research

Amidst the heightened critique of FOSS—as its practitioners are increasingly reckoning with hard-pressing questions of unequal power relations power across origin, nationality, class, gender, ethnicity, race and access to digital technologies (Amrute 2016; Beltrán 2023; Kwet 2019; McElroy 2024; Murillo 2025)—the AEMP's Covid-19 Housing Map came into being as a tecnopolitical infrastructure. Previous AEMP maps did engage with FOSS technologies—including QGIS, KnightLab's "Story Map," Leaflet, and OpenStreetMap—but many also incorporated Software-as-a-Service (SaaS) mapping platforms like Carto and Mapbox (that also depend on FOSS infrastructural technologies). Because AEMP includes many members without formal training in Geospatial Information Systems (GIS), the ability to draw from a wide range of tools (open and proprietary) has been crucial for collaboration. Historically, AEMP volunteers have contributed maps for housing justice campaigns with fast turnaround times—not necessarily as complex software projects, but rather as provisional tools to display anything ranging from top serial evictors to rates of eviction in a particular region over time. This urgency of these types of timely responses did not emerge from the orientation for "moving fast and breaking things," but rather out of a sense of responsibility to community partners who engaged in the uphill battle against gentrification.

Since the inception of its action research collective, AEMP members have positioned their utilization of mapping infrastructures in the tradition of counter-cartography which seeks to expropriate corporate platforms for emancipatory means (Elwood 2006; Dalton and Stallman 2018; kollektiv orangotango 2018; Rivera 2024). In this sense, the adoption of corporate tools is often identified as a form of *détournement* from underlying utilitarian scripting logics. By using corporate platforms for alter-mapping purposes, for example, AEMP members have historically sought to reappropriate and repurpose them against themselves, so to speak, with a counter-logic of expropriation. While the collective has long grappled with internal contradictions, frictions, and complexities of corporate digital platforms and their geospatial politics (McElroy 2022), the production of the "Covid-19 Housing Map" took the collective into an even knottier space of "software politics," despite the ultimate goal of building political software.

One of the primary tensions stemmed from the fact that some of the professional software development volunteers took open source practices for granted, but not the political tradition of counter-mapping in their technical practices. New volunteers purported a naturalized relationship to corporate digital platforms as the "most efficient way" of "getting things done." Against this utilitarian orientation, how could the anti-capitalist commitments of AEMP seep into corporate practices of software development?

As the research collective continued to work through this encounter across technopolitical differences, volunteer members came across numerous bottlenecks, exclusions, and tensions—some which ended up stalling the production of the map and its ability to be utilized by tenants and housing organizers. In retrospect, it is important to examine these challenges because they elicit structural dynamics that are often reproduced across digital projects. While arguably these problems are not specific to AEMP, it is significant how marked distinctions between the technical and political were refracted in its case through digitally mediated interactions (Pfaffenberger 1992; Simondon [1958] 2012). These distinctions, we suggest, reflect a long-lasting ontological division between political concerns from engineering matters to establish a political technoculture without politics, but also mark the onset of schismogenesis at a micropolitical level.

Early on into producing the "Covid-19 Housing Map," the collective formed a subgroup dedicated to updating eviction moratoria policies on city, county, and state levels—first in the US and then globally. The logic of "political scripting" for the software was explicit: the plan was to design an interface that could assist tenants and tenant organizations to situate, but also contribute housing data to fight evictions. The data that we generated indexed whether or not there was an eviction moratorium, but soon AEMP began to expand to dozens of data fields in a Google form to document how strong or weak moratoria was, how long protections lasted, what types of evictions they covered, whether they applied to courts, sheriff's departments, whether they were accompanied by rent relief policies, and whether or not they were superseded by other scales of protections. There were, after all, not only hundreds of US cities with their own legislation, but also numerous counties and states. Each would have their own exceptions regarding what types of evictions were protected, and their own expiration dates (not to mention ongoing amendments, accompanying rent relief protections). The questions we asked in online questionnaires were not limited to the regulatory and legislative landscape, however, but included information about landlord harassment and oral histories with displaced tenants as well.

ORIGINAL RESEARCH ARTICLE

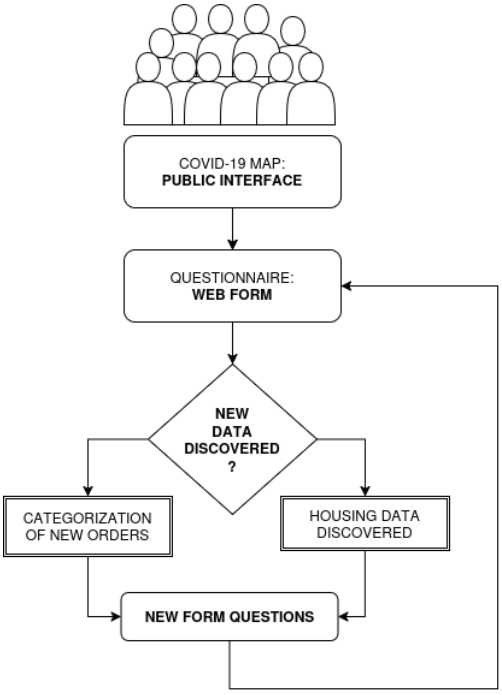

Figure 1 (left). Workflow data collection and categorization of eviction moratoria, designed by AEMP member (Source: Azad Amir-Ghassemi for AEMP).

Figure 2 (right). Anti-Eviction Map "Struggle for Housing During the Pandemic" in São Paulo, Brazil. (Source: Luis Felipe R. Murillo for AEMP).

Given the urgency of the situation, data gathering and modeling put AEMP's research subgroup into overdrive. As many as seventy dimensions were used to compute a score that would, in turn, be used to define how protective a US city, county, or state was of its tenants on the web map. This computation, led primarily by AEMP member Azad Amir-Ghassemi, used a range of variables that included strength, timeline, and efficacy of existing or new anti-eviction legislation. To make this possible, a policy survey was created by the research collective to review hundreds of ordinances, executive orders, and court orders on a weekly basis. The key categories that organized the survey were: "eviction policies," "changes to court processes," and "increased renter protections." There was no stable data entry form, however: new findings would generate questions to be included in new versions of the website form. This iterative, dynamic approach created the conditions for the collective to refine the data collection instrument on-the-fly from two important sources: (1) the research work to categorize new legal ordinances and (2) the user-contributed data gathering through the website form (figure 1). As the data model grew in complexity over time, the scoring system became a research project in and of itself and the collective ran into problems of capacity. Data gathering and cleaning efforts engaged dozens of AEMP members, many of whom put in dozens of hours before the data could be displayed on the map at every iteration of the public form accessible through a web link ("submit data") on the interface of the mapping software.

The collective was fully conscious of the global nature of the housing crisis, so it began to collect data beyond the US in partnership with several housing justice networks in Brazil, Italy, Germany, and Romania with whom the authors had prior ties. These include the *Observatório das Remoções* (Evictions

To cite this article Murillo, Luis Felipe R., and Erin McElroy. 2025. "When 'Open' is Still Far from Good Enough: The Work of Counter-Mapping with Political Software." *Engaging Science, Technology, and Society* 11(3): 47–70. https://doi.org/10.17351/ests2025.2107.

To email contact Luis Felipe R. Murillo: lfrmurillo@nd.edu.

Observatory) in São Paulo, the *Frontul Comun pentru Dreptul la Locuire* (Common Front for Housing Rights) in Bucharest, *Sciopero degli Affitti* (Rent Strike) in Rome, in addition to the *European Action Coalition for the Right to Housing and the City*, the *Housing Justice in Unequal Cities Network*, and kollektiv orangotango in Eastern and Western Europe. By bringing together housing rights allies internationally, the AEMP collective was faced with pressing challenges not only in terms of language justice, but also the incommensurability of legislative frameworks, colonial toponymies, and imperial/national topographies. Since housing policies and anti-eviction efforts could not be compared internationally due to their vastly different histories (Ghertner 2015; McElroy and Werth 2019), the collective began to compute the strength of anti-eviction policies on a simplified scale of one-to-three ("few," "some," or "many tenant protections" respectively). The creation of a new scale for scoring housing policy was discussed as the best possible approach, given the hard challenges of summarization of a highly complex legal landscape compounded with the urgency of the housing crisis. This effort was primarily led by Erin McElroy in consultation with AEMP's community partners.

In addition to our ongoing struggles of internationalization with respect to software, data, and design, the research collective decided to design a new map layer dedicated to the display of rent strikes, mutual aid campaigns, occupations, and squats. This was an attempt to partially address the problem of cross-contextual comparison in the legislative layer of the map, but also the perceived political effectiveness of the legislative. This required constant reworking of our data model, as well as a new effort to translate data into multiple languages for the web interface. To accomplish this, AEMP mobilized a wide network of volunteers to help with translations, all of which was facilitated and integrated into the map software by Luis Felipe R. Murillo. By January 2021, the collective had amassed contributions from housing activists to translate our maps into nine languages that reflected the network of housing rights groups (including Spanish, Portuguese, Italian, German, Serbian, Romanian, Greek, Czech, and Hungarian). As a limitation of this line of work, however, data input was contingent upon where and with whom AEMP volunteers had previous ties. Despite its practical challenges, political scripting here fundamentally indexed an internationalist ethos through the counter-mapping work—that is, the affordances of the digital object were implemented to reflect a commitment to political solidarity across borders.

There was a parallel group of AEMP researchers producing oral histories and videos with tenants experiencing Covid-19-induced housing precarity as well. Initial partnerships were formed with the California-based housing organization, Tenants Together, and the media justice collective, Hope.xyz, to crowdsource stories that could be used in campaign efforts to extend eviction moratoria. Even though it was challenging to embed the oral histories in the web interface, a new map layer was designed and brought online in July 2021 with displacement narratives that have been curated by AEMP volunteers. The efforts of political scripting to create this new layer indexed yet another aspect of political solidarity with tenants undergoing the experience of eviction.

While all of these new mapping components in a shifting, highly uncertain and anxiety-producing pandemic landscape would have been enough to complicate any research collective, what is crucial for our examination here is the recurrent tensions we experienced in the design and implementation process. Changes in the data model that were dictated by the urgency of the political work involved often modification of other layers (such as the translated input forms, database schema, mapping software implementation of queries to the schema, map layers, and fields to be displayed and styled on the web map), thus comprising a

whole chain of interconnected, technical, political, and functional dependencies. In the end, a group of software developers took the initiative of rebuilding the entire web application as the approach selected by the first volunteers who had left the collective was massively slowing progress on features requested by community partners. The task of "refactoring" the software was intended to increase the speed of development, but also, and most importantly, the alignment to political organizing. As we examine in the next section, however, it also led to schisms between so-called "technical" and "non-technical" participants and fraught communication between those fulfilling different project roles and situated within different technopolitical traditions. In the end, the map had become so complex that the project had starkly diverged from other collective endeavors, which, while scrappier and dependent upon corporate digital infrastructures, were also less dependent upon specialized software development expertise and less troubled by attendant corporate development practices. The project also had become so technologically cumbersome that it had become difficult to provide real-time data to community partners—in effect, failing to deliver what the project had initially intended to produce.

Technopolitical Frictions at the Design Level

The challenges of political software were ignited by the fact that a growing number of people began to join the AEMP collective seeking to help during the pandemic. While each AEMP chapter maintained roughly fifteen or so active members historically, the research collective was suddenly getting inquiries from dozens of volunteers each month. The collective has always been volunteer-based and rooted in community-led efforts, but it suddenly began to receive requests from incoming volunteers from various parts of the US. Given that the collective grew accustomed to meeting online per Covid-19 protocols, broadening the geography and scale of the team was perceived more generally as very promising. As AEMP members soon realized, it also meant that new members were not necessarily rooted in the same political cultures of resistance and tenant organizing.

Many of the sociotechnical issues encountered during this period were generated by tensions within the "dev" subgroup that emerged with the institution of new project management guidelines. Other research subgroups in the mapping project included oral history, US-based policy, and non-US-based policy and translation. Yet, by fragmenting the project into sub-groups, the work of software development became increasingly disconnected from political (software) work. Put in another way, those designing the base software began to perceive themselves as distinct in their work from those maintaining community relationships, conducting interviews, and studying policies. Implicitly, the "dev" subgroup assumed a utilitarian orientation toward the project: software developers centralized the response-ability as technical challenges took precedence over other concerns. This was the key contributing factor for the schismogenesis that ensued through the incorporation of industry development practices, that is, the genesis of a differentiation process that established symbolic divisions within the research collective.

Numerous debates within the new "dev" sub-group were nevertheless productive as its members considered the possibilities and limitations of software design, internationalization, and migration from corporate infrastructural dependencies. As we began to realize by prioritizing open tools, the group began to assimilate inadvertently the logics of software development. While much has been critiqued of the industry's elitism and its discriminatory reproduction of cultures of meritocracy (Harris 2023; Liu 2020; Noble and Roberts 2019), sociologist Karina Rider (2022) notes that "Tech for Good" civic initiatives have become sites

where many tech workers attempt repair work, making up for the harms that they observe in corporate lifeworlds.

Over time within the "dev" subgroup we began to perceive key changes: (1) the transposition of an accelerated time discipline inherited via development methodologies from the software industry; (2) the adoption of tools and platforms for managing the "project as a product" (with specific design sensibilities, but around centralized management of "deliverables"); and (3) the language practices inherited from commercial software development that constrained and negatively impacted the exchange among those perceived as "experts" versus "non-experts," effectively dividing internet company employees from housing researchers. A technical object, such as a web map, may serve utilitarian purposes, but it is never, as philosopher Gilbert Simondon (2014) reminds us, only a tool for a particular use: it comes about from a series of relational interdependencies before it is rendered as an individuated, "concretized" technical object. In other words, it stems from a technopolitical, sociohistorical genealogy of scripting practices and semiotic-material dependencies that affords particular modes of appropriation (while excluding others). This relational approach helps us better describe the practices of software scripting in the context of housing justice work—which, in term, better illuminates the distinction between "software politics" (with its covert technopolitics of symbolic division) versus "political software" (with its overt politics toward common tools and infrastructures).

To understand why sociotechnical legacies matter in software scripting, consider the role of imagination of "personae" as "system users" in user-interface (UI) and user-experience (UX) design patterns. In their ethnographic work, anthropologists Diana Forsythe (2001) and Lucy Suchman (2007) studied how computer scientists imagined the "user" in early artificial intelligence applications for knowledge representation called "expert systems." The authors emphasized the introduction of tacit elements into the computer system design, but also the importance of the situated interaction between human and machines as crucial for the interpretation of symbolic distinctions, breakdowns and repairs, and technical outcomes. Their argument about the pragmatic foundations but also the limits of formal design have key implications for political software action. Instead of investing in scripted abstractions that speak more about the designers themselves, "personae" can be better understood in terms of what it means to be a person in the anthropological sense of the term, that is, as a "bundle" of intersectional ties of obligation, reciprocity, domination, and solidarity (Mauss 1985; Strathern 1988; Caillé 2007)—a relational orientation to substantiate what we mean by "sociotechnical dependencies" of the counter-mapping project that involve persons, infrastructures, institutions, and technical objects.

The technopolitical schisms we report here are not limited to the Covid-19 Housing map. It is often the case that software politics prevents political software from being written as the most important urgencies get sidelined: whose forms of life are we designing *with and alongside* and not "designing for"? What scripts we may be inheriting through software modules and extensions that we import to our projects? Whose forms of life we may be designing *against* by rendering them invisible in the process of scripting? By engaging these questions, we are reminded of the work that media scholars Catherine D'Ignazio and Lauren Klein (2020) describe as "data feminism" and what communications scholar Sasha Costanza-Chock (2020) calls "design justice." That is, design practices in computing that are positioned against the "standards" of software development scripted for a specific demographic of technologists' and their imagination of what counts as their "users" in the Euro-American context. As a project rooted in anticapitalist housing politics,

conversely, AEMP members wanted to work against hegemonic technopolitical imaginaries and toward emancipatory futures.

Another key but veiled corporate orientation that became a source of tension in the counter-mapping project has to do with the adoption of the "agile method," widely used in the industry to manage piecemeal project tasks that get divided into "user stories" ("non-technical" narratives about features as "functional requirements") and "technical requirements" (which parse out the computational aspects of the features that are needed). While "agility" is something that was mostly needed given the urgency of evictions, there were more structural impediments in the implementation of "agility" from a technical standpoint.

One of the "agile" orientations involved generating and placing "user stories" in an electronic board, known as "Kanban." Interestingly, no one participated in the board except for those who were trained to do so in their software development jobs. The origins of Kanban are well-known in the computing industry as historical overviews are often included in "agile" courses for programmers and IT managers. Taiichi Ōno, a young industrial engineer who worked for Toyota as a machine shop manager, is often credited with the invention (Poppendieck and Poppendieck 2003). In the late 1940s, he devised the usage of a board (Kanban) for agile product management after finding inspiration in the way supply-chain management was conducted in US supermarkets. As far as the historical record goes, the method brought substantial increases in productivity and found company-wide adoption for managing industrial processes. From Toyota outward into the industrial landscape, this managerial logic started to spread and became an influential alternative to the Fordist model by the 1970s with "lean, flexible, and agile" ("just-in-time") production, multi-functional attribution and training of the workforce with the so-called "total quality assurance." Fast-forwarding to 2001, a group of seasoned software developers published the "Agile Manifesto," drawing from the Japanese model to "create a safer environment for software developers" (Hohl et al. 2018). It is well-known that several software development methodologies led to the Manifesto, but its main thrust is unmistakably post-Fordist. Of the "11 principles of the Manifesto," the very first states: "Our highest priority is to satisfy the customer through early and continuous delivery of valuable software" (Beck et al. 2001).1

Yet another set of corporate dependencies were imported for the development of the mapping software. GitHub is a commercial web platform that serves as a front-end for Git with participatory web affordances, that is, combining a fairly complex and flexible code versioning tool with social networking affordances for collaborative development with automation capabilities. Its purchase by Microsoft in 2018 by 7.5 billion dollars led several FOSS activists to migrate to other platforms under the suspicion that data would be mined on community projects, which eventually happened with the creation of "GitHub Co-pilot,"

1 The point here is not a critique of kanban per se, but of corporate interdependencies around Agile. Kanban is just one element of a broader methodology, which is at stake here (the critique of agile as it is practice in the industry . . . based on its genealogy . . . which was created in the industry for the industry).

a commercial service that consists in a coding completion service based on a large-language model (LLM) trained on billions of lines of community-contributed code. The general contours of this process have been anticipated by sociologists Pierre Dardot and Christian Laval (2019) under the term "quasi" or "ersatz commons" that is made "open" and "collaborative" for the purposes of capital accumulation. Git's origins, however, are situated in a veritable common of software sharing around the Linux project—to the extent that the sociotechnical structure of decentralized collaboration with key points of decision-making with the figure of remote "maintainer" can be read in its very design as the technology that underlies GitHub as a commercial platform.

We may concede that the trajectory of the Covid-19 Housing Map is not unusual in the context of software development. From high-level design decisions to the work of implementation, software management practices afforded a greater degree of agency and control over the project to the most technically proficient. As a programming language of choice with its own ecosystem and technical culture, JavaScript (JS) was adopted with a series of dependencies for creating a mapping interface and providing an integration with the questionnaires that was created by the research collective. The first series of "commits" (code contributions) were sent to GitHub on March 19, 2020, with the modification of a Leaflet project template—a software library that inherits its mapping capabilities from another community project called OpenStreetMap (OSM)—updated to display the project title: "Covid-19 Emergency Tenant Protections Map." The description followed: "where City, County, or State governments in the US have passed (or have pending legislation for) emergency legislation to halt evictions or otherwise keep tenants in their homes during the Covid-19 pandemic." For the organization of the "build" system, a tool called Webpack was adopted to "package" several JS source code files for the dynamic web map. Web services were integrated over time to implement the "data pipeline" for the map. This pipeline included Carto for serving geo-localized data queries (based on the Postgres database server extension for GIS, PostGIS) and Google Forms for data entries to be synchronized with Carto. Not long after "bootstrapping" the project, the LICENSE file with the MIT license had its copyright attribution modified from an individual name to the name of the collective. From here on, software and platform dependencies were set as path dependencies for the project.

From Software Politics to the Design of Political Software

As the mapping software rapidly advanced, interpersonal tensions started to percolate. AEMP members, one after another, started to feel alienated and confused as they felt they were frequently disregarded at the weekly meetings. Some of those who felt harmed made it known and a small project mediation team was formed. Notably, those in the mediation team came from housing justice organizing backgrounds and had no experience in professional software development. In the mediation group, AEMP members identified a pattern: those who felt wronged were trans, gender-non-binary, women-identified, or people of color. One of the contentious dimensions of the interaction in the "dev group" was that of the technical jargon, which became a barrier for those without software development backgrounds to participate in important design decisions. Professional language practices indexed shared experiences of writing code for commercial products and services. "Minimum viable product" (MVP), "milestones," "tickets," "code reviews," "shipping," "deliverables," "production" and "development environments" were recurrent terms of the new management lexicon that were imported to the research collective. While it was virtually impossible to avoid technical debates in addressing software problems and solutions, there was no collective awareness at

that point of how the incorporation of the managerial language would come to alienate those who were cultivated otherwise in social research and activist work.

During one event of discussion of multilingual support for the map, AEMP members suggested prioritizing language support for migrant and precarious communities within and outside the United States as the map had been expanded to include global geographies. We were approaching May 1, 2020 (also known as "May Day" for the celebration of labor struggles worldwide). After this priority was brought for discussion, technical details of the implementation proved to demand substantial work. One of the JavaScript developers took up the task and followed the suggestion by implementing internationalization on the map, which basically depended on translations made by a network of volunteers. Once their piece of code was submitted for code review, tensions escalated over the "best implementation," following a trend of heated interpersonal exchanges.

The urgency of the activist work around the map software eventually made interpersonal conflicts secondary. The project continued moving forward despite its ongoing clash with "software product" development temporalities—which oscillated between the slowness of perfectionism and hard stalls due to technical disagreements. The collective felt that recurrent conflicts could be repaired, and continued efforts were made to talk through the issues without assigning individual blame. In net positive terms, the project was growing fast in response to the need of a common platform for housing activism during the pandemic, despite the schisms that were unintentionally created between "devs" and their "others." After several sessions of remediation, the divide was eventually addressed, and the research subgroups got back together to integrate design, software development, and oral histories in one regular meeting space and time. It took well over a year for this reintegration to happen in the research collective.

From a series of technopolitical (dis)encounters in the thick of software politics, a document was drafted by AEMP collective members to remind newcomers of the reason why they were developing a software in the first place: the "Housing Protection/Justice Mapping Community Agreement" (see table 1). This document expressed broader political sentiments, voicing what the group understood by "good relations," but also included a direct response to the emergent issues concerning hierarchical behavior that appeared with the large influx of volunteers. This document included nine points that expressed a tacit contract for joining in the Covid-19 Housing map based upon a similar set of agreements already drafted for a separate AEMP project, Evictorbook. Like the map project, Evictorbook is a complex project that requires specialized software development skills. Members of the Evictorbook team drafted the community agreement as a response to unequal power dynamics that appeared with the participation of volunteers with professional experience in the "Big Tech" industry. The final version of the agreement was edited by Erin McElroy and Luis Felipe R. Murillo to reflect the challenges the collective encountered.

Table 1. "Community agreements" for the Covid-19 Housing Map project.

Housing Protection/Justice Mapping—Community Agreements
1. We are not here to simply create a "cool" tech tool; we are here to support community organizing according to the Anti-Eviction Mapping Project's mission.
2. We intend to move at the speed of our relationships with housing justice organizations.

3.	We recognize the seriousness of the housing crisis and the consequences of corporate land and computational infrastructure control and ownership.
4.	We reject the premise of corporate profiteering off of land ownership.
5.	This project aims to support, uplift and amplify the existing work of housing justice groups and organizers.
6.	As a community of developers, researchers and community organizers we aim to treat each other with respect, love, and dignity and do not tolerate any harmful behavior.
7.	For software developers with educational and other privileges that enable them to do this work, we aim to support one another to build and share skills to the extent possible while choosing non-corporate tools and platforms. We actively work to prevent hierarchical divisions between tech/non-tech collaborators.
8.	We aim to *practice nonviolent communication within our meetings, online communication, and more.*
9.	*We understand the asymmetry of power between occupiers, tenants and landlords. Therefore, we strive to exercise collaborative research* practices and prudently assess the risks posed to users of this tool.

Yet another event of conflict between volunteers illustrates the process of schismogenesis as a sociotechnical process of division and change (reflected, accordingly, in the trajectory of the software codebase). In another instance of disagreement over technical matters, the code for the mapping software was "forked" (that is, copied for the purposes of introducing changes) into another repository and a series of measures were taken to highlight the corporate dependencies that have been originally (and inadvertently) introduced. As the lowest-hanging fruit in the codebase, Google fonts were promptly removed and standard fonts were used in place, so no requests to corporate services would be made from the mapping software. Next, the centrality of the United States in the representation of the map was called into question and the map re-centered around the Atlantic to highlight other locations where AEMP had strong solidarity ties. The group involved in the "fork," then, proceeded to change how "basemaps" were requested from OpenStreetMap to include translated place names, instead of defaulting to English colonial names (figure 2). This shift stirred a heated debate in the collective about the need to move away from colonial names in support for indigenous and other historically displaced groups. Volunteers felt the urgent need and, yet, realized that they could not respond to this challenge as they would like to as they were all over-committed with other demands for providing real-time policy and eviction information. This conflict highlighted the double-bind of project members in trying to navigate antagonistic scripting practices.

In her discussion of the limits of counter-mapping, Elspeth Iralu (2021) demonstrates how it can often operate within the frameworks of colonial cartographic tools and practices, even by political collectives that aim for positive sociotechnical change. Using the example of an attempt of Google in its campaign "Map Your Indigenous Community Month" to include indigenous landmarks and placenames, the company "depoliticise[d] the landscape representations Google Maps promotes, deliberately ignoring the conditions of genocide and dispossession which created this 'underrepresentation'" (ibid., 1488). Motivated by similar objectives of addressing the limitations of critical cartography, the group involved in the fork pushed further away from Google, removing the dependencies on Google Forms with a Python application another collective

member wrote from scratch in one weekend. In this context, the implementation of geocoding was introduced to advance the internationalization of the project, including web forms in various languages in addition to an important privacy measure: when resolving names to latitude and longitude coordinates, the coordinates were truncated to only include a few decimal points thus preventing more precise localization of housing activists. Finally, the forked version of the map was configured as a Tor "Onion Service" to help protect the privacy of tenants who were being threatened of eviction and/or organizing housing justice campaigns. The backend software was baptized "Reclus, your counter-mapping friend," as an homage to the anarchist geographer Élisée Reclus and hosted in the Gitlab instance of the Riseup collective, away from Microsoft-owned GitHub.

To support Reclus, a group of AEMP-adjacent technologists and activists gathered in close connection with the Brazilian housing justice movement. As the group proceeded with weekly meetings, they found two important challenges that brought this derivative version of the mapping project to a halt. The first consisted in the fact that the urgency of the mobilizations during the pandemic in Brazil took on fundamentally different aspects than it did elsewhere. Not only the emphasis on "tenant rights" was far removed from the experience of these groups, where constitutional rights rarely translated into political levers for displaced communities, whose primary tactic involved "flash-occupations" of abandoned buildings and vacant lots; but also, the emphasis on the crowd-sourced, FOSS-based, and privacy-focused digital map did not figure as a priority for social movements, such as the MTST (Unhoused Workers' Movement). Brazilian activists and researchers used different communication tools that were much more accessible, despite their dependency on corporate platforms that have proven to be directly linked to mass surveillance programs worldwide (Schneier 2015; Snowden 2019; Zuboff 2019). Cell phones were primarily used to articulate direct action over Whatsapp, for example, as well as for sending audio messages that circulated within close-knit, affinity groups for supporting occupations. Brazilian activists decided to circulate infographics with eviction data (as well as the number of vacant houses throughout the country) using static PDF documents that could be printed as well as re-posted over Facebook and other social media—instead of going through the work of designing their own web map.

After a period of evaluation, the group working on the mapping software Reclus decided against the continuation of the "fork." They found that their map software was more complicated to use than the software-as-a-service (SaaS) tools for many AEMP members. In the end, the contribution of Reclus was not infrastructural, but technopolitical. It rekindled the debate about the representation of multiple "housing justice actions," involving the AEMP and its international networks. It also provided a key lesson on the limits of "openness:" its increased technical openness did not effectively translate into increased accessibility for the collective and its partners, despite all the privacy and security affordances of its common software stack. Reclus proved in the end to be counterintuitively "more closed" for being more difficult for people to read and understand the codebase. Here Simondon's philosophy of technology is once again fruitful in sustaining that open technical objects depend, to be "open," that producers and users be found in the same person.

This period of difficult schisms within the research collective led eventually to a final fork. One of the JS developers who felt harmed by interpersonal dynamics decided to rewrite the map software using a web framework that was meant to facilitate maintenance work. The framework of choice was React, an internal tool developed by Facebook and made open source in 2013. React became extremely popular because

it helped to abstract and organize the work on the canvas of the web browser for concurrent (and potentially complicated) application processes, allowing for better control over interactive elements of a page. With React, however, a whole baggage of commercial web development logics and practices would, once again, over-determine the counter-mapping project and create a new demand for web development skills that were cultivated primarily in the IT industry.

As soon as the React fork was completed, the "dev team" finally reorganized: several original project members left, and new volunteers arrived to continue with the work. The dedicated channel of communication for software development, separated from moratorium policy research, oral history research, and design, was abandoned. Everything from this point onward included members from several subgroups in addition to software developers. This marked an important discontinuity with the previous period of emphasis on software development as a separate group: the work for political software was now at the forefront with the work for campaigning, activism, and community-based research. The "Covid-19 Housing Protection Legislation & Justice Action" was finally combined with the "Covid-19 Oral Histories of Tenant Resistance & Eviction Information" map, presented as tabs of the same website canvas. To this date, the research group is still curating oral histories and fixing software bugs, but new features have not been planned.

Final Considerations

Software development team dynamics are more than just an object of analysis for project managers and "technical wonks," they are fundamental for understanding sociotechnical processes and collective trajectories that are informed by design practices for specific forms of life, under specific politico-economic and infrastructural conditions. As we demonstrated, they consist in a form of "ontological design" as they script technopolitical futures with serious consequences for multiple forms of life that are racialized, dispossessed, and displaced by corporate enterprises (Winograd and Flores 1987; Escobar 2018). The distinction between "software politics" and "political software" that we introduced was meant to tease apart *schisms* and *commoning* practices, making them accessible for analysis: dynamics of software development (where software is perceived as a "tool" and scripted by experts to configure a lay "tool-user") and political action (the quality, affect, and tempo of relations in collective mobilization).

As we were called as a political collective to respond to the Covid-19 pandemic, socioeconomic urgencies and ever-changing political tactics evidenced how brittle software development workflows can be, especially when reciprocity is not front-and-centered in a technopolitical horizon. When we were faced with commercial development practices as a research collective, the web map group realized that the managerial logics of professional software development could not be left unproblematized for its control over political work. In this regard, one of our findings is that open technologies are far good enough when software politics prevent political software from being written and used for housing research. This realization took place as we reflected on the "slowness" that kept the map from being useful for tenant organizations. While AEMP maps were never conceived to be "technical solutions" but critical media to battle evictions, the collective hoped for the project to be useful for those grappling to understand the ever-shifting territorialization of eviction moratoria, renter debt, landlord retaliation, and impending dispossession alongside emergent forms of solidarity, mutual aid, and rent strike organizing. As active participants of the sociotechnical process we discussed here, we hoped for the map to serve, first and

foremost, as a common resource of situated housing data and eviction narratives within and beyond the Covid-19 crisis.

For those involved in creating the counter-map, the extended period of tensions and schisms was also one of growth as the group underwent an experience of commoning. It is fair to say that our interpersonal dynamics were highly affected by the psychosocial pressures of the pandemic, not only by the symbolic divides between political work and software development. It is also important to realize that, as we came to rely upon each other online much more during the pandemic, we found solidarity through the difficulties we experienced in terms of discrimination and crypto-domineering practices in software development. We became closer as a collective as a result, building a research commons that was sustained by affective ties between participants, but also by technical infrastructures and political concerns. This commons was not only infrastructural, but also methodological as we participated in the technopolitical organization as much as we did in the research work to bring together a research collective through a constellation of practices, affects, and symbols, helping to chart a path for political software. Despite all the schisms we reported here, AEMP continues to sustain an aspirational commons for the purposes of housing justice. Lasting political work ties were cultivated through the software scripting of what we have identified as "political software." In the end, we learned how not to let software development demands overdetermine political software work. Political software, we argue, can prefigure practices of solidarity within and beyond the digital, obviating the paralysis of a (naturalized) software politics rooted in technocapitalist understandings of agile management.

Acknowledgements

We would like to thank the Anti-Eviction Mapping Project (AEMP) members who worked on the design and implementation of the Covid-19 Housing Map. In particular we would like to thank those who provided direct feedback for the preparation of this article: Azad Amir-Ghassemi, Paul Schweizer, and River Honer. Special thanks to Diego Martinez-Lugo who provided excellent editing support and feedback on our revisions. We would also like to thank the ESTS editors and anonymous reviewers for helping us to improve this article.

Author Biographies

Luis Felipe R. Murillo is Assistant Professor in Anthropology at University of Notre Dame. His work is dedicated to the anthropological study of the common(s) in science and technology. He is the author of "Common Circuits: Hacking Alternative Technological Futures" (Stanford University Press, 2025).

Erin McElroy is an Associate Professor in the Department of Geography at the University of Washington, where their work focuses upon intersections of gentrification, technology, empire, fascism, and racial capitalism, alongside housing justice organizing and transnational solidarities. McElroy is author of "Silicon Valley Imperialism: Techno Fantasies and Frictions in Postsocialist Times" (Duke University Press, 2024) and coeditor of "Counterpoints: A San Francisco Bay Area Atlas of Displacement and Resistance" (PM Press, 2021). They are also cofounder of the Anti-Eviction Mapping Project and Landlord Tech Watch.

References

Abbate, Janet. 2012. *Recoding Gender: Women's Changing Participation in Computing*. Cambridge, MA: MIT Press.

Akrich, Madeleine. 1992. "The De-Scription of Technical Objects." In *Shaping Technology/Building Society. Studies in Sociotechnical Change*, edited by Wiebe E. Bijker and John Law, 205–24. Cambridge, MA: MIT Press.

Alcaras, Gabriel. 2020. "Des biens industriels publics. Genèse de l'insertion des logiciels libres dans la Silicon Valley" [Industrial public goods: A genesis of the insertion of free software in Silicon Valley]. *Sociologie du travail* [*Sociology of Work*] 62(3). https://doi.org/10.4000/sdt.33283.

Amrute, Sareeta. 2016. *Encoding Race, Encoding Class: Indian IT Workers in Berlin*. Durham: Duke University Press.

Amrute, Sareeta, and Luis Felipe R. Murillo. 2020. "Introduction: Computing in/from the South,"*Catalyst: Feminism, Theory, Technoscience* 6(2): 1–23. https://doi.org/10.28968/cftt.v6i2.34594.

Anti-Eviction Mapping Project. 2021. *Counterpoints: A San Francisco Bay Area Atlas of Displacement and Resistance*. Oakland: PM Press.

Bateson, Gregory. [1972] 2000. *Steps to an Ecology of Mind: Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology*. Chicago: University of Chicago Press.

Beck, Kent, Mike Beedle, Arie van Bennekum, Alistair Cockburn, et al. 2001. *Manifesto for Agile Software Development*. Accessed September 10, 2021. https://agilemanifesto.org/iso/en/manifesto.html.

Beltrán, Héctor. 2023. *Code Work: Hacking Across the US/México Techno-Borderlands*. Princeton: Princeton University Press.

Benkler, Yochai. 2006. *The Wealth of Networks: How Social Production Transforms Markets and Freedom*. New Haven: Yale University Press.

Benkler, Yochai, and Helen Nissenbaum. 2006. "Commons-Based Peer Production and Virtue." *The Journal of Political Philosophy* 14(4): 394–419. https://doi.org/10.1111/j.1467-9760.2006.00235.x.

Birkinbine, Benjamin J. 2020. *Incorporating the Digital Commons: Corporate Involvement in Free and Open Source Software*. London: University of Westminster Press.

Boyle, James. 2008. *The Public Domain: Enclosing the Commons of the Mind*. New Haven: Yale University Press.

Caffentzis, George, and Silvia Federici. 2014. "Commons Against and Beyond Capitalism." In "Commons Sense: New Thinking About an Old Idea," edited by Mary McDermott, Tom O'Connell, and Órla O'Donovan. Supplement, *Community Development Journal* 49(S1): i92–i105.

Caillé, Alain. 2007. *Anthropologie du don: le tiers paradigme* [Anthropology of the gift: The third paradigm]. Paris: La Découverte.

Chan, Anita Say. 2014. *Networking Peripheries: Technological Futures and the Myth of Digital Universalism*. Cambridge, MA: MIT Press.

Coleman, Enid Gabriella. 2013. *Coding Freedom: The Ethics and Aesthetics of Hacking*. Princeton: Princeton University Press.

Coleman, Biella, and Mako Hill. 2004. "How Free Became Open and Everything Else under the Sun: Introduction." *Media/Culture Journal* 7(3). https://doi.org/10.5204/mcj.2352.

Corsín Jiménez, Alberto, and Adolfo Estalella. 2023. *Free Culture and the City: Hackers, Commoners, and Neighbors in Madrid, 1997–2017*. Ithaca: Cornell University Press.

Costanza-Chock, Sasha. 2020. *Design Justice: Community-Led Practices to Build the Worlds We Need*. Cambridge, MA: MIT Press.

Dalton, Craig M., and Tim Stallman. 2018. "Counter-Mapping Data Science," in "Speculative and Constructively Critical GIS," edited by Jim E. Thatcher, Luke Bergmann, and David O'Sullivan, special issue, *The Canadian Geographer / Le Géographe Canadien* 62(1): 93–101. https://doi.org/10.1111/cag.12398.

Dardot, Pierre, and Christian Laval. 2019. *Common: On Revolution in the 21st Century*. Translated by Matthew MacLellan. London: Bloomsbury Academic.

D'Ignazio, Catherine, and Lauren F. Klein. 2020. *Data Feminism*. Cambridge, MA: MIT Press.

Downey, Gary Lee, and Teun Zuiderent-Jerak, eds. 2021. *Making & Doing: Activating STS Through Knowledge Expression and Travel*. Cambridge, MA: MIT Press.

Dunbar-Hester, Christina. 2020. *Hacking Diversity: The Politics of Inclusion in Open Technology Cultures*. Princeton: Princeton University Press.

Ehmke, Coraline Ada. 2025. *We Just Build Hammers: Stories from the Past, Present, and Future of Responsible Tech*. New York: Apress.

Elwood, Sarah. 2006. "Beyond Cooptation or Resistance: Urban Spatial Politics, Community Organizations, and GIS-Based Spatial Narratives." *Annals of the Association of American Geographers* 96(2): 323–341. https://doi.org/10.1111/j.1467-8306.2006.00480.x.

Ensmenger, Nathan L. 2010. *The Computer Boys Take Over: Computers, Programmers, and the Politics of Technical Expertise*. Cambridge, MA: MIT Press.

Escobar, Arturo. 2018. *Designs for the Pluriverse: Radical Interdependence, Autonomy, and the Making of Worlds*. Durham: Duke University Press.

Faulkner, Wendy. 2001. "The Technology Question in Feminism: A View from Feminist Technology Studies." *Women's Studies International Forum* 24(1): 79–95. https://doi.org/10.1016/S0277-5395(00)00166-7.

Federici, Silvia. 2018. *Re-Enchanting the World: Feminism and the Politics of the Commons*. Oakland: PM Press.

Forsythe, Diana E. 2001. *Studying Those Who Study Us: An Anthropologist in the World of Artificial Intelligence*. Edited by David J. Hess. Stanford: Stanford University Press.

Ghertner, D. Asher. 2015. "Why Gentrification Theory Fails in 'Much of the World.'" *City: Analysis of Urban Change, Theory, Action* 19(4): 552–63. https://doi.org/10.1080/13604813.2015.1051745.

Gieseking, Jen Jack. 2018. "Operating Anew: Queering GIS with Good Enough Software," in "Speculative and Constructively Critical GIS," edited by Jim E. Thatcher, Luke Bergmann, and David O'Sullivan, special issue, *The Canadian Geographer / Le Géographe Canadien* 62(1): 55–66. https://doi.org/10.1111/cag.12397.

Graziani, Terra, and Mary Shi. 2020. "Data for Justice: Tensions and Lessons from the Anti-Eviction Mapping Project's Work Between Academia and Activism." *ACME: An International Journal for Critical Geographies* 19(1): 397–412. https://doi.org/10.14288/acme.v19i1.1776.

Halperin, Brett A., and Erin McElroy. 2023. "Temporal Tensions in Digital Story Mapping for Housing Justice: Rethinking Time and Technology in Community-Based Design." In *DIS '23: Proceedings of the 2023 ACM Designing Interactive Systems Conference*, 2469–88. Pittsburgh: ACM. https://doi.org/10.1145/3563657.3596088.

Hao, Karen. 2025. *Empire of AI: Dreams and Nightmares in Sam Altman's OpenAI*. New York: Penguin Random House.

Hardin, Garrett. 1968. "The Tragedy of the Commons: The Population Problem has No Technical Solution; it Requires a Fundamental Extension in Morality." *Science* 162(3859): 1243–8. https://doi.org/10.1126/science.162.3859.1243.

Harris, Malcolm. 2023. *Palo Alto: A History of California, Capitalism, and the World*. New York: Little, Brown and Company.

Harvey, David. 2011. "The Future of the Commons." *Radical History Review* (109): 101–7. https://doi.org/10.1215/01636545-2010-017.

Hicks, Mar. 2021. "Sexism Is a Feature, Not a Bug." In *Your Computer Is on Fire*, edited by Thomas S. Mullaney, Benjamin Peters, Mar Hicks, and Kavita Philip, 135–158. Cambridge, MA: MIT Press.

Hippel, Eric von, and Georg von Krogh. 2003. "Open Source Software and the 'Private-Collective' Innovation Model: Issues for Organization Science." *Organization Science* 14(2): 209–23. https://doi.org/10.1287/orsc.14.2.209.14992.

Hohl, Philipp, Jil Klünder, Arie van Bennekum, Ryan Lockard, et al. 2018. "Back to the Future: Origins and Directions of the 'Agile Manifesto'—Views of the Originators." *Journal of Software Engineering Research and Development* 6: 1–27. https://doi.org/10.1186/s40411-018-0059-z.

Iralu, Elspeth. 2021. "Putting Indian Country on the Map: Indigenous Practices of Spatial Justice." *Antipode: A Radical Journal of Geography* 53(5): 1485–1502. https://doi.org/10.1111/ANTI.12734.

Kelty, Christopher M. 2008. *Two Bits: The Cultural Significance of Free Software*. Durham: Duke University Press.

kollektiv orangotango+, ed. 2018. *This Is Not an Atlas: A Global Collection of Counter-Cartographies*. Bielefeld: transcript Verlag.

Kwet, Michael. 2019. "Digital Colonialism: US Empire and the New Imperialism in the Global South." *Race & Class* 60(4): 3–26. https://doi.org/10.1177/0306396818823172.

Leach, James, Dawn Nafus, and Bernhard Krieger. 2009. "Freedom Imagined: Morality and Aesthetics in Open Source Software Design." *Ethnos: Journal of Anthropology* 74(1): 51–71. https://doi.org/10.1080/00141840902751188.

Liu, Wendy. 2020. *Abolish Silicon Valley: How to Liberate Technology from Capitalism*. London: Watkins Media Limited.

Maharawal, Manissa M., and Erin McElroy. 2018. "The Anti-Eviction Mapping Project: Counter Mapping and Oral History toward Bay Area Housing Justice." *Annals of the American Association of Geographers* 108(2): 380–89. https://doi.org/10.1080/24694452.2017.1365583.

Mauss, Marcel. 1985. *Sociologie et anthropologie* [Sociology and anthropology]. Paris: Presses Universitaires de France.

McElroy, Erin. 2022. "Digital Cartographies of Displacement: Data as Property and Property as Data" *ACME: An International Journal for Critical Geographies* 21(4): 357–71. https://doi.org/10.14288/acme.v21i4.1959.

———. 2024. *Silicon Valley Imperialism: Techno Fantasies and Frictions in Postsocialist Times*. Durham: Duke University Press.

McElroy, Erin, and Alex Werth. 2019. "Deracinated Dispossessions: On the Foreclosures of 'Gentrification' in Oakland, CA." *Antipode: A Radical Journal of Geography* 51(3): 878–98. https://doi.org/10.1111/anti.12528.

McIlwain, Charlton D. 2020. *Black Software: The Internet and Racial Justice, from the AfroNet to Black Lives Matter*. New York: Oxford University Press.

Moglen, Eben. 2004. "Freeing the Mind: Free Software and the Death of Proprietary Culture." *Maine Law Review* 56(1): 1–12. https://digitalcommons.mainelaw.maine.edu/mlr/vol56/iss1/2.

Murillo, Luis Felipe R. 2025. *Common Circuits: Hacking Alternative Technological Futures*. Stanford: Stanford University Press.

Nafus, Dawn. 2012. "'Patches Don't Have Gender': What Is Not Open in Open Source Software." *New Media & Society* 14(4): 669–83. https://doi.org/10.1177/1461444811422887.

Noble, Safiya Umoja, and Sarah T. Roberts. 2019. "Technological Elites, the Meritocracy, and Postracial Myths in Silicon Valley." In *Racism Postrace*, edited by Roopali Mukherjee, Sarah Banet-Weiser, and Herman Gray, 113–29. Durham: Duke University Press.

Obeng-Odoom, Franklin. 2021. *The Commons in an Age of Uncertainty: Decolonizing Nature, Economy, and Society*. Toronto: University of Toronto Press.

O'Neil, Mathieu, Laure Muselli, Xiaolan Cai, and Stefano Zacchiroli. 2024. "Co-Producing Industrial Public Goods on GitHub: Selective Firm Cooperation, Volunteer-Employee Labour and Participation Inequality." *New Media & Society* 26(5): 2556–92. https://doi.org/10.1177/14614448221090474.

Ostrom, Elinor. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.

Pfaffenberger, Bryan. 1992. "Social Anthropology of Technology." *Annual Review of Anthropology* 21: 491–516. https://doi.org/10.1146/annurev.an.21.100192.002423.

Poppendieck, Mary and Tom Poppendieck. 2003. *Lean Software Development: An Agile Toolkit*. Boston: Addison-Wesley.

Reagle, Joseph. 2013. "'Free as in Sexist?' Free Culture and the Gender Gap." *First Monday* 18(1). https://doi.org/10.5210/fm.v18i1.4291.

Rider, Karina. 2022. "Building Ideal Workplaces: Labor, Affect, and Identity in Tech for Good Projects." *International Journal of Communication* 16: 5005–22.

Rivera, Isaac. 2024. "Towards Accountable Digital Geographies." *Dialogues in Human Geography* 14(2): 317–321. https://doi.org/10.1177/20438206231177080.

Sadowski, Jathan. 2020. "The Internet of Landlords: Digital Platforms and New Mechanisms of Rentier Capitalism." *Antipode: A Radical Journal of Geography* 52(2): 562–80. https://doi.org/10.1111/anti.12595.

Schneider, Nathan. 2022. "The Tyranny of Openness: What Happened to Peer Production?" *Feminist Media Studies* 22(6): 1411–1428. https://doi.org/10.1080/14680777.2021.1890183.

Schneier, Bruce. 2015. *Data and Goliath: The Hidden Battles to Collect Your Data and Control Your World*. New York: W. W. Norton & Company.

Simondon, Gilbert. [1958] 2012. *Du mode d'existence des objets techniques* [*On the mode of existence of technical objects*]. Paris: Aubier.

———. 2014. *Sur la technique (1953–1983)* [On technique (1953–1983)]. Compiled by Nathalie Simondon. Paris: Presses Universitaires de France.

Snowden, Edward J. 2019. *Permanent Record*. London: Pan Macmillan.

Söderberg, Johan, and Maxigas. 2022. *Resistance to the Current: The Dialectics of Hacking*. Cambridge, MA: The MIT Press.

Srnicek, Nick. 2017. *Platform Capitalism*. Cambridge: Polity Press.

Star, Susan Leigh, and Geoffrey C. Bowker. 2010. "How to Infrastructure." In *Handbook of New Media: Social Shaping and Social Consequences of ICTs*, edited by Leah A. Lievrouw and Sonia Livingstone, 230–245. London: Sage.

Strathern, Marilyn. 1988. *The Gender of the Gift: Problems with Women and Problems with Society in Melanesia*. Berkeley: University of California Press.

Suchman, Lucy A. 2007. *Human-Machine Reconfigurations: Plans and Situated Actions*. Second Edition. Cambridge: Cambridge University Press.

Takhteyev, Yuri. 2012. *Coding Places: Software Practice in a South American City*. Cambridge, MA: The MIT Press.

Terranova, Tiziana. 2022. *After the Internet: Digital Networks between Capital and the Common*. Cambridge, MA: The MIT Press.

Tkacz, Nathaniel. 2012. "From Open Source to Open Government : A Critique of Open Politics" *Ephemera: Theory & Politics in Organization* 12(4): 386–405. http://www.ephemeraweb.org/.

Toupin, Sophie. 2014. "Feminist Hackerspaces: The Synthesis of Feminist and Hacker Cultures." *Journal of Peer Production* 5: 1–9.

Velazquez, Maria. 2021. "Precarity by Design: Tenant Oral Histories in the Evolving Terrain of 'Eviction Moratoriums,'" paper presented in the panel "Techniques, Technologies, and Relationships in

Mapping Evictions," Society for the Social Studies of Science Annual Conference, Toronto, October 7, 2021.

Widder, David Gray, Meredith Whittaker, and Sarah Myers West. 2024. "Why 'Open' AI Systems are Actually Closed, and Why this Matters." *Nature* 635(8040): 827–33. https://doi.org/10.1038/s41586-024-08141-1.

Winograd, Terry, and Fernando Flores. 1987. *Understanding Computers and Cognition: A New Foundation for Design*. Boston: Addison-Wesley.

Zuboff, Shoshana. 2019. *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power*. New York: Public Affairs.