Movement Data Science: Practices for Working in Solidarity with Social Justice Efforts

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Although many data scientists are eager to promote social justice, their efforts often fall short, and in some cases even exacerbate existing injustices. This gap between intentions and impacts follows from issues in how data scientists conceptualize their role in social justice efforts: they typically act as technicians, aiming to develop technical tools that will produce social justice. This default role generally results in depoliticized techno-fixes that fail to produce substantive changes. In this paper, we contribute "movement data science" as a framework to guide data scientists in taking on more productive and equitable roles in social justice efforts. Our framework is inspired by movement lawyering, a practice used by lawyers to situate themselves in grassroots social movements. Movement data science suggests that data scientists should ground their efforts to advance justice in sustained and solidaristic relationships with social movements. We contribute a process with four essential practices to help data scientists build these relationships and identify roles to play within specific social justice efforts. Movement data science does not provide a simple blueprint for data scientists to follow, but it can help them support social justice movements in substantive ways that go beyond attempting to solve injustices with technical tools.

CCS Concepts: • **Human-centered computing** → **HCI theory, concepts and models**; • **Social and professional topics** → *Computing education.*

Additional Key Words and Phrases: social movements, participatory methods, relational approaches

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1 Introduction

Many data scientists are eager to leverage their expertise to challenge social and political injustices, from systemic racism to worker exploitation. However, data scientists often fall short of these goals. At best, their efforts do not meaningfully advance social justice [101, 117, 126]. At worst, their efforts may entrench and reproduce existing inequalities [59, 67, 121].

This gap between intentions and impacts stems, in part, from issues in the roles that data scientists play in social justice efforts: the types of contributions that they aim to make and how they engage with other actors.[1] In most instances, data scientists presume a default role as technicians who develop data-based tools (e.g., dashboards and algorithms) that lead to social justice [35, 61, 67]. They assume that these technical tools, if well-constructed, will drive change. Meanwhile, data

[1]By social justice efforts, we refer to grassroots-driven initiatives to challenge systemic inequities and empower marginalized people; these efforts commonly take the form of social movements. Data scientists engage with social justice efforts under labels such as data science for social good, public interest technology, civic technology, and design justice.

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scientists generally do not build accountable relationships with directly-affected communities [38, 75, 83]. This default role results in two major failings that hamper data scientists' efforts to promote social justice. First, data scientists produce depoliticized techno-fixes that fail to advance substantive changes in social conditions [40, 90, 109, 117]. Second, they often disempower the communities they aim to support [29, 36, 38, 103].

Contending with these issues, critical scholars have attempted to reconceptualize how data scientists participate in social justice efforts. They argue that data scientists should resist technosolutionism and critically examine whether technology can actually address injustices [30, 52, 61, 76]. Scholars also suggest developing accountable relationships with directly-affected communities and applying technology to build grassroots power rather than to provide silver bullet solutions [7, 12, 13, 32, 63, 75, 103]. This guidance lays out a broad normative vision for data scientists' engagements in social justice efforts.

However, it is not clear how data scientists should implement these principles. Where should data scientists start? How should they identify positive roles to play? How should they remain accountable to communities? Indeed, data scientists who have attempted to pursue these recommendations note that the literature lacks practical guidance [37, 122]. Thus, even when data scientists want to play thoughtful and accountable roles in social justice efforts, they struggle to do so.

In this paper, we contribute a practical framework to guide data scientists in identifying productive and equitable roles in social justice efforts. To develop this framework, we turn to movement lawyering, a practice within law for situating lawyers in grassroots social movements [33, 62, 112]. Movement lawyering arose in response to issues in legal practice that resemble the issues in data science: when lawyers work with social movements, they generally assume a default role as technicians who use legal tools (like litigation) to solve injustices [33]. As a result, lawyers produce depoliticized legal fixes that do not substantively transform social conditions.

Movement lawyering rejects the default emphasis on legal action as the primary driver of social change, and instead orients lawyers toward empowering social movements. Across domains, movement lawyering has overcome the depoliticized solutionism and unaccountable participation that characterize typical lawyering practices. We therefore use movement lawyering as an analogous field through which to theorize similar practices for identifying and enacting productive roles in data science.

To identify practical lessons for data scientists, we were motivated by two research questions:

- RQ1: How do movement lawyers conceptualize their role in social justice efforts, and what practices do they use to situate their role within specific movements?
- RQ2: How can data scientists adapt movement lawyering principles and practices to play more productive roles in support of social justice efforts?

To answer the first research question, we reviewed movement lawyering scholarship. We reviewed canonical works that offer high-level frameworks (e.g., [33, 62]) and empirical case studies with detailed descriptions of movement lawyering in practice (e.g., [39, 55]). Through this analysis, we identified that movement lawyering emphasizes *relationships with organizers* as the linchpin of supporting social justice efforts. Movement lawyers recognize themselves as social actors working in solidarity with social movements. They build deep, long-term relationships with grassroots groups through collaborative participation in movements. Movement lawyers have developed practices for building these relationships and then using them as the foundation for identifying impactful ways to support movements.

We then adapted the insights from movement lawyering to propose a similar approach for data scientists: **movement data science**. Movement data science suggests that, in order to promote social justice, *data scientists need to focus on building relationships rather than building tools*. This

means that data scientists should reject the default technician role and instead allow relationships with organizers to guide their contributions to movements. Of course, building solidaristic relationships and supporting social movements is a difficult task. Movement data science therefore provides four practices to help data scientists situate their roles within social justice efforts: 1) immerse yourself in the movement, 2) explore potential roles by situating your expertise within organizing goals, 3) select your role to build power for organizing goals, and 4) flexibly adapt your role as circumstances change. We describe how data scientists can apply these practices and discuss one detailed case study of a project that exemplifies movement data science [123].

The numerous roadblocks to achieving social justice, in data science as a field and society at large, mean that movement data science does not provide a perfect solution for overcoming injustice in the world. Nonetheless, movement data science provides data scientists with new conceptions and tactics. It prompts data scientists to broaden their understanding of their own expertise, recognizing how they can contribute to movements in a wide range of ways beyond building algorithms. Movement data science also suggests new approaches to participatory data science. First, the framework prompts data scientists to work with organized movements, rather than disconnected individuals. Second, the framework prompts data scientists to view *themselves* as participants in a movement, rather than affected communities as participants in a data science project. To conclude, we discuss strategies for overcoming the practical barriers to movement data science and for teaching students the skills that movement data science requires.

2 Background: Data scientists' role in social justice efforts

In this section, we trace the default roles that data scientists aim to play in social justice efforts, the shortcomings of these roles, and attempts to promote better roles for data scientists.

2.1 Default conceptualization of data scientists' role in social justice efforts

When attempting to support social justice, data scientists generally presume their role is to be a technician who produces social change by building technical tools [5, 35, 61, 67, 121]. This tendency follows from the field's training and incentives. Data science pedagogy hails the ability of algorithms to solve social problems [61, 85]. Students are taught to prioritize technical competency and view the social dimensions of algorithms as out of scope [80, 88]. Similarly, data science journals and conferences value generalizable technical advances as the primary form of research contribution [14, 78]. Researchers are discouraged from focusing on real-world problems and evaluating systems based on real-world impacts [14, 60, 78]. Thus, even when data scientists want to improve society, they often lack sufficient training and face professional constraints [43, 57, 128].

Some data scientists do buck these trends to pursue more humble and contextually-engaged projects. Many recognize the social complexities of their work and creatively adapt their methods to suit real-world contexts [23, 93, 97, 132]. Data scientists have worked with organizers and social movements in domains such as the criminal justice system, housing, labor, and privacy [12, 70, 104, 123, 127] (we highlight these projects later in the paper). Nonetheless, although there are certainly exceptions, an emphasis on technical solutions remains the standard practice [61].

2.2 Shortcomings of the technician-oriented approach

Critical scholars have documented two major failings of the technician-oriented approach to social change. First, data scientists overinvest in technology as a solution, which results in decontextualized, depoliticized, and ineffective uses of data for social justice. Second, data scientists neglect their own role as social actors, which leads them to participate in social justice efforts in distanced and disempowering ways.

2.2.1 Data scientists produce depoliticized and ineffective outputs. In trying to produce social justice through data alone, data scientists strip away the political and structural dimensions of societal challenges [61, 67, 86, 100]. This orientation toward "fixing" social injustices through data leads to narrow, incrementalist changes. For example, civic technology projects frequently ignore social, political, and economic complexities to find easy and scalable techno-fixes [109], leading to transactional democracy rather than deep and broad civic participation [40, 90].

Furthermore, efforts to produce social justice through data alone can sometimes end up perpetuating the very injustices data scientists sought to challenge. For instance, the use of data can erode opportunities for collective action [21, 32, 91]. Some technological solutions may embed values that are fundamentally in tension with the values of social justice efforts, such as prioritizing efficiency over relationality or introducing hierarchies of expertise that prevent solidarity-building [53, 98]. Purely data-based solutions may also be rendered ineffective by the very systems they are challenging. For example, capitalist structures can produce "hostile ecologies" [118] which limit the efficacy of anti-capitalist and community-based data science initiatives [40, 83, 130]. The default technician-oriented role makes it difficult for data scientists to recognize and contend with these structural factors [60].

2.2.2 Data scientists' participation in social justice efforts neglects and disempowers communities. Data scientists often participate in social justice efforts in a distanced way, lacking meaningfully engagement with directly-affected stakeholders. When data scientists develop social change projects, they often set the priorities—the problems to address and how data science will fit into addressing these problems—without including directly-affected communities in these decisions [29, 38]. When data scientists do engage communities, they do so in a consultative manner that does not provide opportunities for communities to set or contest data scientists' priorities [36, 38]. Furthermore, data scientists do not typically maintain long-term relationships with communities [38, 75, 83].

Data scientists also participate in social justice efforts in a disempowering way due to their lack of reflexivity about their privilege. Data scientists occupy a powerful social position, which often leads them to center themselves or become centered in social justice efforts [60, 71]. Data scientists are often not aware of their epistemic privilege and do not contend with the harms that they may produce [99, 116]. This lack of reflexivity can lead to extractive engagements with marginalized communities. Data scientists may prioritize contributions to their own field (i.e., potential research papers), without producing any real benefits for the communities whose epistemic labor made these gains possible [36, 71, 103]. Furthermore, data scientists generally do not directly contend with the historically extractive relationship between research institutions and communities, and thus do not preemptively try to pursue non-extractive approaches [29, 75, 114].

2.3 Attempts to reconceptualize the role of data scientists in social justice efforts

Contending with the limitations of the default technician-oriented role, critical scholars of design and data science offer guidance for how data scientists should identify positive roles to play in supporting social justice efforts. As a starting point, data scientists should directly engage with the politics of social injustices [42, 60, 61, 79]. Then, when exploring potential projects, data scientists should reject the assumption that data science provides a solution to social injustices [12, 35, 52], critically evaluate whether certain data science and design interventions are useful or needed [31, 76], and look for what solutions directly-affected communities and other advocates are already pursuing [30, 63]. Scholars push data scientists to build grassroots power for transformative change rather than to "fix" social issues [7, 13, 32, 44, 63, 79, 91]. To enable all of these efforts, data scientists should build long-term relationships with directly-affected communities and yield control over projects to them [7, 12, 30, 42, 44, 63, 75, 83, 103].

Although this scholarship explicates a broad normative vision for social-justice-oriented data science, the process of enacting these principles remains ambiguous. For example, Abebe et al. [1] helpfully compiles a list of roles that data science can play in promoting social change. However, it is unclear how data scientists should determine which role to play in a given situation or identify other roles not listed. Similarly, critical scholars often point to case studies as exemplars of these principles in action, but these case studies rarely include practical details on their process for identifying roles and developing projects.

As a result, even when data scientists attempt to follow recommendations about how to advance social justice efforts, they struggle to do so. Scholars describe grappling with ambiguities and a lack of practical guidance. For example, Tran and DiSalvo [122] describe how research proposing agonistic data practices (e.g., [32]) and refusal (e.g., [12]) does not describe how to implement the recommendations. Similarly, in their reflections on attempting to bridge academia and activism, de Castro Leal et al. [37] describe how frameworks like prefigurative design informed their approach but did not fully address some pragmatic considerations.

This paper extends prior work by developing a practice-based framework to help data scientists identify productive roles in social justice movements. We develop this framework by turning to movement lawyering—an analogous field in which practitioners have contended with the failings of technician-oriented roles and developed practices for finding better roles.

3 Methods

3.1 Turning to movement lawyering

Recognizing that the computing literature lacked concrete details on identifying productive roles to advance social justice, we looked for an analogous field that could offer practical lessons. Specifically, we looked for a field that 1) is committed to social justice, 2) analyzes the actions of individual actors or groups of actors, 3) engages with the idea of "roles" for these actors (i.e., how to situate the actors and their contributions within the goal of social justice), and 4) offers significant practical detail about how actors should determine their roles. We initially explored three fields: movement lawyering, policy formulation, and entrepreneurship. Policy formulation contains a clear connection to social justice and plenty of practical detail, but locating individual actors and their roles was difficult. Meanwhile, in the field of entrepreneurship, we could identify individual actors and approaches for determining roles, but there was no commitment to social justice.

Ultimately, we turned to movement lawyering as a particularly useful analogous field. The movement lawyering literature engages deeply and explicitly with the challenge of situating lawyers in social justice efforts. This literature includes conceptual overviews of lawyers' roles in social justice efforts (e.g., [33, 62]) and detailed case studies that describe lawyers' roles in specific efforts (e.g., [9, 27, 39, 55]). Movement lawyers are also similar in position and experience to data scientists as privileged experts who often want to support social justice. Other work has established a precedent of turning to the law as a helpful analogue for data science [5, 61].

Movement lawyering developed as a response to the dominant legal approach to social change in the United States. This approach, often referred to as "legal liberalism," is a model of "social change through law in which activist lawyers use impact litigation to advance progressive policy reform that is validated by activist courts" [33]. Legal liberalism gained prominence during the Civil Rights era, when lawyers advanced civil rights through litigation in courts. Legal liberalism suggests to lawyers that their role is to wield the law to produce social change.

Movement lawyers critique two major failings of this approach. First, they argue that law alone is ineffective in securing sustained and substantial social change [33, 51, 62]. In many cases, formal legal changes can make structural reforms harder to achieve [33]. Second, the narrow focus on

legal solutions demobilizes social movements by diverting political actions led by the collective into legal actions led by lawyers. Lawyers often take on a distanced and unaccountable relationship to the communities they are supposed to be supporting [33, 62]. They may prioritize their own career ambitions or notions of how social change should occur (i.e., primarily through the law) over a commitment to substantive social change. Furthermore, lawyer-driven efforts can make movements dependent on legal support, limiting the future power of the movement. Taken together, these failings demonstrate how the default role prescribed by legal liberalism undermines lawyers' goal of producing substantive social change.

Movement lawyering is a framework of social justice lawyering that responds to the failings of legal liberalism. More specifically, "[m]ovement lawyering [...] seeks to embrace the legal liberal claim to large-scale social change while avoiding the pitfalls of lawyer overreaching and overinvestment in law" [33]. Movement lawyers start from the belief that structural social change occurs through grassroots-led collective action. They therefore collaborate with social movements to build the movements' power to achieve their demands [33, 51, 56, 62]. By social movements, movement lawyers refer to a variety of organized grassroots groups—such as community organizations, labor unions, and tenant unions—working towards specific goals of social justice. As grassroots groups, these movements are driven by ordinary people in a "bottom-up" manner, rather than being driven by elites or political leaders.

3.2 Thematic analysis of the movement lawyering literature

We began our exploration of the movement lawyering literature by compiling a library of readings. We started with an organized syllabus of readings on movement lawyering developed by an experienced movement lawyer [112]. This reading list helped us identify canonical works in the field that describe the principles of movement lawyering (e.g., [33]). To avoid over-indexing on one syllabus, we further expanded our library by finding other papers that cite these readings. We also drew citations from an influential paper on the related concept of movement law [3]. Through this process, we compiled an overall library of 40 papers.

Our library included two types of articles. The first type was theoretical work that synthesized core principles of movement lawyering (often derived from the authors' years of experience as movement lawyers). The second type was case study articles, in which authors provided detailed accounts of their participation in a specific campaign for social justice. We read all 40 papers in our library at least once. We then selected a subset of 24 articles for in-depth analysis and coding, prioritizing richness of detail, diversity of setting, and variety in the types of contributions that the lawyers made. This subset included 10 theoretical works outlining the core concepts and principles of movement lawyering [19, 25, 33, 34, 45, 51, 62, 72, 89, 106] and 14 case study articles spanning diverse domains and social justice issues [4, 6, 9, 10, 27, 39, 47, 55, 74, 82, 87, 96, 105, 108, 111].

To identify the principles and practices of movement lawyering, we conducted a thematic analysis [28] of the literature. Both authors followed independent coding processes, the first author using the full set of papers selected for coding and the second author with a subset. The first author conducted several rounds of open coding [110] and produced memos throughout. At weekly meetings, we discussed these memos, as well as other codes generated by the second author, and worked to coalesce our understandings.

Our thematic analysis approach differed for the principles and practices of movement lawyering, as the literature explicitly lays out core principles but not core practices. We derived practices through line-by-line reading of case studies, generating codes for specific practices mentioned (such as "step back when asked or needed" and "consider what litigation could offer to organizing"). Our initial reading surfaced many practices, which we iteratively grouped into higher-level categories by combining common practices that appeared consistently across both conceptual and empirical

accounts. We determined we had reached saturation when further rounds of coding did not yield any new themes or significantly change thematic groups.

3.3 Translating movement lawyering principles and practices to data science

We translated our findings about movement lawyering to data science by drawing analogies between lawyers and data scientists. Some elements of movement lawyering lent themselves to one-to-one translations. For example, movement lawyers leverage their social status to support and legitimize the claims of movements. This practice could be translated directly for data scientists, who occupy a similar social position as lawyers. Other elements of movement lawyering required more adaptation. For example, movement lawyers explore potential roles by situating their expertise within organizing goals. The general idea of exploring potential roles by situating expertise within organizing goals can be applied to data science. However, the particularities of data science expertise are different than legal expertise [46]. Lawyers work with the tools of law (like litigation), while data scientists work with tools of data (like datasets and algorithms).

We further grounded our adaptations using two resources. The first was our own positionality as data scientists and researchers who have participated directly in social movements. We were drawn to doing this work because of our prior experiences attempting—sometimes unsuccessfully—to leverage our expertise to advance social justice causes. In reflecting on these prior experiences, we considered times when we fell into the default technician role and times when we took a more expansive approach. We considered what we might have done differently if we had followed the framework of movement data science. In our brainstorming sessions for adapting movement lawyering practices to data science, we considered some of the organizing campaigns that lawyers participated in (like supporting a tenant rent strike) and, drawing from our experiences, hypothesized what we as data scientists could have done to support this organizing. These sessions were starting points for translating movement lawyering practices to data science.

The second resource we used to ground our adaptations was existing case studies of data scientists exemplifying elements of movement data science. We sought out retrospective accounts of data scientists trying to apply their data science expertise directly within grassroots social movements. We found these retrospective accounts within academic papers (e.g., [12, 71, 122, 123, 127]) and blog posts (e.g., [104]). We searched for accounts where the authors described their process for situating themselves in the movement—similar to the rich detail offered in the movement lawyering case studies—and discussed their failures, successes, and lessons learned.

We used these case studies to ideate on how data scientists could apply movement lawyering practices. While reading these accounts, we identified moments where the data scientists followed practices that align with movement data science, as well as moments where applying movement data science practices might have been helpful. Throughout our explication of movement data science, we reference these accounts as either positive examples of movement data science practices already being applied or as potential scenarios where movement data science practices could have helped. We also compiled one case—data scientists organizing for housing justice in Atlanta [122]—in more detail to demonstrate the practices of movement data science in action.

3.4 Limitations

Our methodological approach of drawing on movement lawyering has two notable limitations. First, the movement lawyering literature is largely constrained to the United States. As a general trend, legal movements and scholarship are geographically bound, as they engage with the legal structure, rules, and training within a particular jurisdiction [102]. Movement lawyering emerged in response to the US-specific dynamics of public interest lawyers pursuing social change through strategic litigation. Legal liberalism and movement lawyering are both grounded in the adversarial

nature of the US common law legal system (which is distinct from the inquisitorial nature of many other countries' civil law systems). Thus, we found only a few articles on movement lawyering in international contexts [72, 74]. We included these pieces in our review and did not observe any notable differences in principles and practices compared to the US-based pieces. However, models of social justice lawyering with a transnational focus might offer different lessons.

Second, our analysis is based on reading movement lawyering literature rather than observing or interviewing movement lawyers. We analyzed movement lawyering based on retroactive accounts captured in academic scholarship. These papers provided abundant details about movement lawyering principles and practices, often including direct reflections and quotes from movement lawyers. However, it is possible that observations or interviews would have elicited additional details about movement lawyering.

4 Movement lawyers' roles in social justice efforts

4.1 Movement lawyering principles

Movement lawyers reject the default role prescribed by legal liberalism of being legal technicians who single-handedly usher in social change. Rather than focusing on the role of law as the mechanism of social change, movement lawyers focus on *their role* in social movements. They recognize themselves as social actors engaged in relationships to support social movements; these relationships are what guide their roles. In this relational approach, movement lawyers position themselves as supporting actors in the movement. This means that the movement is the protagonist—not lawyers [56]. Accordingly, lawyers focus on building the capacity of the movement to advance its goals [9, 27]. Their role is "anchored by relationships with extant organizations that have ultimate decision-making authority" [33]—meaning that their roles are never determined in isolation, but rather worked out through a collaborative exchange with organizers [4, 9, 10, 27]. Movement lawyers see themselves as part of, acting in solidarity with, and accountable to the movement, and these relationships—not legal expertise alone—as the basis for determining their role.

This relational conception of roles results in two key principles for movement lawyers. First, movement lawyers reconceptualize the bounds and breadth of their expertise. They recognize the limits of their expertise, especially related to movement organizing and the issues that movements are combating, and accordingly orient towards learning from movements [4]. Simultaneously, movement lawyers recognize that their expertise is more expansive than just the ability to craft legal arguments. Their expertise encompasses their broad knowledge associated with legal training and practice—including their fluency with the legal system and its institutional history, their understanding of which people and institutions hold power, and their communication skills (e.g., facilitation, public speaking, and writing) [6, 27, 62]. They further recognize that their legal expertise includes their *social position* as experts with influence, connections, and legitimacy [6, 27].

Second, movement lawyers understand their role to be contextually-determined, based on a movement's broader strategy of social change. The core question that movement lawyers grapple with is not "what legal levers can I use to fix this problem," but "how can I put the group in a position to achieve its goals" [56]. With a more nuanced understanding of their expertise, they situate their potential contributions as part of a dynamic, multi-faceted approach for social change—never presuming that any contribution they make would secure social justice on its own [27, 55].

4.2 Movement lawyering practices

The reorientation in roles presented by movement lawyering raises uncertainty for movement lawyers: their roles become much more open-ended and varied. How should lawyers handle this ambiguity and figure out how to be useful as supporting actors in social movements?

From our thematic analysis of the movement lawyering scholarship, we identified four practices that movement lawyers use to define their roles. These practices are: 1) being immersed in the movement, 2) situating expertise within organizing goals, 3) selecting tactics based on organizing goals, and 4) flexibly adapting tactics when needed.

4.2.1 Be immersed in the movement. Movement lawyers actively situate themselves in movements as participants in the struggle. They participate not as special experts, but as fellow participants: with direct, committed, and humble engagement [4, 27]. This means sitting in organizing meetings, without expecting a leading or speaking role, in an effort to learn about the movement and its strategies [4, 39, 62]. By participating in movement activities, movement lawyers start internalizing the movement's goals and analyses. They learn to shed a legal-centric lens on the issues that communities face. In its place, they begin to see social injustices in terms of power differentials which are produced and sustained by systems of oppression [4, 39, 51]. In turn, movement lawyers internalize the goal to remedy social injustices by transforming power differentials [51].

Direct participation in the movement provides the foundation for movement lawyers to form trusting and collaborative relationships with organizers [4, 10, 27, 39, 111]. These relationships are built around shared commitments to the movement's organizing goals and to equality among all participants. Movement lawyers do not simply defer to organizers, nor do they claim superior status as saviors for the movement. They struggle alongside organizers through humble, open-minded, and long-term engagement.

In order to develop this solidarity, movement lawyers exercise reflexivity. They directly confront the distance that their status creates between them and others in the movement [4, 39, 111]. Lawyers often come from backgrounds of socio-economic privilege and are afforded the privileges that come with being seen as an expert (such as access to restricted spaces, financial resources, and people in power). Movement lawyers seek to learn from others in the movement who come from different backgrounds and to redistribute the resources they gain from their privileged status whenever possible. Material acts of redistribution and humble, open-minded engagement allow movement lawyers to demonstrate that they respect movement organizers as equals, which allows for solidaristic bonds to form.

4.2.2 Explore potential roles by situating expertise within organizing goals. As movement lawyers become immersed in the movement, they explore potential roles they could play by situating their expertise within the organizing goals. They begin with initial contributions that are directed by the movement. These contributions are often simple and time-constrained, like direct legal services for individuals within the movement [4, 39, 47, 62] or simply being present at meetings with powerful actors (like city council members) to lend their privilege to back up the movement [6, 39]. Movement lawyers pursue these activities to demonstrate that they are acting in solidarity with movements rather than in pursuit of a high-profile role [6].

As movement lawyers build trust with movements, they coordinate with organizers to explore more substantive uses of their expertise to advance organizing goals—like sharing their knowledge of the legal system [6], considering strategic relationships they could help build [4], or potentially pursuing litigation [27, 39, 62]. Through a two-way dialogue, movement lawyers and organizers collectively process the limits and benefits of movement lawyers' expertise.

At times, organizers might suggest particular roles for movement lawyers. These roles could be based on solutionist impulses about the role of the law; organizers might, for example, ask movement lawyers to pursue a lawsuit in the hopes that it will remedy social injustices. Movement lawyers do not uncritically accept these suggestions, but rather leverage their expertise to contextualize these suggestions within the movement's overall strategy [9]. They talk with organizers about the limitations of relying on lawsuits and explore the potential uses that lawsuits could have for

building power [27, 62, 111]. Other times, movement lawyers may suggest or select specific roles themselves. In these cases, movement lawyers rely on their internal commitments to the movement and their relationships with organizers to be held accountable to the movement strategy [9, 10].

4.2.3 Select roles to build power for organizing goals. Within the context of specific organizing efforts, movement lawyers select roles to build power for organizing goals [4, 27, 39]. Importantly, they do not presume that any contribution they make could alone achieve organizing goals [4, 6, 27, 39, 47, 62]. Instead, they consider potential roles holistically, situating them alongside the organizing efforts that would actually make these roles effective [4, 27, 39, 47].

Movement lawyers determine what role to play based on the movement's current needs. This can mean engaging in activities that do not look like "lawyering" [9, 39]. If a movement's priority is to build grassroots power, then movement lawyers select roles focused on building grassroots connections, acting more as organizers than as lawyers. They might connect clients who are experiencing similar issues to one another and plant the seeds for grassroots connections [62, 105], or they might leverage their networks to help build coalitional relationships with other grassroots groups [33, 105]. If a movement's priority is to build media power, movement lawyers might support the movement by providing media training [105]. Exemplifying the creative approach of movement lawyering, there may be other instances where movement lawyers engage in "typical" lawyering activities but in non-traditional ways. For example, in the case of needing to build media power, movement lawyers might determine that they could use litigation to create a focal point for public attention—as a forum for organizing, rather than an end in itself [27, 39, 47, 62].

4.2.4 Flexibly adapt roles when needed. Movement lawyers recognize that their roles are not fixed: roles need to be dynamic because the conditions that movements face are dynamic [4, 9, 10, 27, 39, 47]. Movements might face evolving political conditions that necessitate new priorities or tactics; accordingly, movement lawyers adjust their roles to support these new priorities and tactics [10, 39]. Movements might face direct counter-responses to their actions; in response, movement lawyers adjust their roles to focus on defending the movement. Movements might win gains because of their actions—but these gains do not guarantee sustained change [55]. Movement lawyers, then, shift their roles to enforce and build on these wins.

Movement lawyers leverage their immersion in the movement and their expansive understanding of their expertise in order to be flexible. Their immersion in the movement helps them quickly recognize shifts in political conditions and anticipate potential risks. Movement lawyers' expansive understanding of their expertise also makes them more adaptable. They recognize that they have a diverse skill set, with many tools to choose from depending on what situation the movement faces. Movement lawyers are also willing to learn new skills if needed, seeking to grow their skill set in whatever ways are useful for the movement [4, 19, 39].

4.3 Case study: United Farm Workers (UFW)

To illustrate movement lawyering practices in action, we turn to the example of the lawyers for the United Farm Workers labor union (UFW).[2] This case is often cited as a foundational example of

[2]This case study was selected and analyzed in August 2025; in March 2026, revelations surfaced that UFW co-founder Cesar Chavez sexually abused numerous girls and women while leading the union [48]. Upon reflection, we decided to keep the case study in the paper because, as one of these women, UFW co-founder Dolores Huerta notes, "The farmworker movement has always been bigger and far more important than any one individual. Cesar's actions do not diminish the permanent improvements achieved for farmworkers with the help of thousands of people" [68]. This case study never centrally featured Chavez, but we have removed all references to him. These allegations highlight the importance of not defining any social movement by a single person—whether that is a famed organizer, a lawyer, or anyone else.

movement lawyering [33, 55]. The following case illustrates how the four practices of movement lawyering reinforce one another in practice rather than operating as discrete steps.

Throughout the 1960s and 1970s, UFW farm workers in California won landmark victories for agricultural workers. UFW lawyers played a critical role in supporting these victories. Foundational to the UFW lawyers' success was their deep immersion in the union and the strong, collaborative relationships they had with organizers. UFW lawyers were often part of the union for many years and were present in every aspect of the union: in the fields, in the courtrooms, at the bargaining table. Through this immersion, lawyers became "experienced with the local legal context and imbued with the feel and goals of the UFW's everyday work" [55], which helped UFW lawyers identify the roles they could play to advance that work.

Through this immersion, UFW lawyers were able to develop a collaborative, mutually trusting relationship with UFW organizers. This relationship was built over time; there were often missteps, where lawyers acted based on their impulses towards legal fixes. For example, early in Jerry Cohen's tenure as UFW's chief legal counsel, the union's right to use bullhorns on the picket line was taken away by a judge. Cohen immediately went to court to win a reversal of this order—acting on the legalistic impulse trained into him in law school. However, the UFW organizers argued that, from an organizing perspective, the best response to that situation would have been for them to use a bullhorn in violation of the order and get thrown in jail. This would attract publicity and support for the union's cause, bolstering their ongoing strike.

Experiences like this were formative in building the relationship between UFW lawyers and organizers. Cohen learned to consult organizers to situate potential legal moves within the broader organizing strategy. He also internalized farm workers' militancy, beginning to analyze potential legal moves in terms of the power they would build, rather than purely as legal fixes.

Anchored in these relationships, UFW lawyers leveraged their expertise in creative ways to support farm worker organizing. Coordinating with organizers, UFW lawyers combined the organizing and legal strategies together—so that legal actions would support organizing and that organizing would make essential legal victories more possible. For example, when organizers launched a consumer boycott to place pressure on growers to remedy unsafe working conditions, UFW lawyers coordinated a lawsuit against growers to create additional financial and legal pressure. They used the deposition phase of this lawsuit to collect key information about the growers (e.g., their subsidiaries, geographic base, and number of non-unionized workers), which organizers could use to support the boycott. This was one of many instances where the legal win or loss was irrelevant to the movement; the organizers and lawyers had crafted a strategy where any legal outcome could still result in the movement building power.

There were other moments when legal victories were essential for the movement—such as securing the release of farm workers who had been arrested on strike and achieving legislation to enshrine protections for farm workers. UFW lawyers coordinated with organizers to make these legal victories possible. For example, when arrested farm workers had court hearings, organizers turned union members out, packing the court to place pressure on the judge. The legal strategy to defend farm workers was, much like the legal strategy to advance the boycott, a creative combination of legal and organizing strategies, rooted in the relationships that UFW lawyers developed with organizers through their constant presence on the farms.

UFW lawyers adapted their roles in alignment with shifts in farm workers' leverage and tactics. Farm workers' power—and accordingly, their tactics—shifted seasonally. During the growing season, the farm workers had more leverage, so they used militant tactics like strikes to pressure growers. In these times, UFW lawyers played a defensive role, protecting the union to help sustain farm worker strikes. They lived close to workers and were often next to the picket lines—so that if a worker was arrested, they could immediately jump to the worker's defense. Outside of the growing

season, the farm workers had less leverage, so they relied on other tactics, like consumer boycotts, to place pressure on growers. During these periods, UFW lawyers shifted into a more offensive mode, leveraging litigation to build pressure on growers and support boycotts.

5 Movement data science: Adapting the lessons of movement lawyering for data science

To address the challenges that data scientists face when trying to support social justice, we suggest that data scientists adopt lessons from movement lawyering about how to situate their role in such efforts. In this section, we theorize what this new approach for data science—which we call **movement data science**—could look like. Following the structure of Section 4, we begin by laying out the core principles of how movement data scientists should conceptualize their role in social justice efforts. Then, we describe practices that enable data scientists to identify productive roles within specific social movements. We conclude with an illustrative case study.

5.1 Movement data science principles

Data scientists seeking to advance social justice should orient towards a relational conception of roles. Following the lessons of movement lawyering, they should reject the default role of technicians, singlehandedly ushering in social change through a well-crafted algorithm or data visualization. Instead, they should ground their efforts to advance social change in sustained and solidaristic relationships with grassroots social movements. They should position themselves as supporting actors in the movement, and the terms of their involvement in the movement should be determined through coordination of movement organizers. This relational orientation ensures that data scientists build capacity for the movement rather than demobilize it. Following this orientation, movement data scientists should take up two guiding principles for their roles.

First, movement data scientists should reconceptualize the bounds and breadth of their expertise: narrower in some ways, but also much broader in other ways. They should recognize that they have limited expertise related to social movement strategy and the issues communities face, and should therefore orient towards learning from movements. However, movement data scientists should simultaneously recognize that their expertise is not limited to building algorithms or analyzing data. Rather, their expertise encompasses their broad knowledge related to data, much of which they may take for granted: how to work with spreadsheets, how to collect and manage data, and how the tech development ecosystem operates. They should also recognize that their expertise encompasses their privileged social position. Data scientists often have access to powerful and well-resourced institutions (like universities, companies, and nonprofits), and are granted legitimacy within those spaces due to their technical knowledge.

Second, movement data scientists should approach their role as something to be determined contextually, based on the movement's social change strategy. The relational view of their role orients them toward understanding the value of their expertise based on how it might advance the movement's strategy for social change. Rather than asking, "what tool should I build for this movement," movement data scientists should ask, "how can I apply my expertise to build the movement's power?" They should grapple with data science's limitations as a singular solution to social injustices, situating potential contributions as part of a multi-faceted approach for social change. They should accept that their role could be wide-ranging, dynamic, and potentially not involving technical work at all, depending on the needs of the movement.

5.2 Movement data science practices

Rejecting their default role as technicians creates uncertainty for movement data scientists about what roles to play in social movements. To navigate this uncertainty, they should adapt the four

Practice	Movement lawyering example [55]	Movement data science example [123]
Be immersed in the movement: Actively participate in the movement and internalize the movement's organizing goals as your own goals.	Lawyers participated in all aspects of the union without being in the way, enabling them to internalize the movement's goals.	Researchers directly participated in housing justice organizing (like taking shifts in a tenant aid hotline) to better understand the movement's priorities.
Explore potential roles by situating expertise within organizing goals: Identify potential roles by considering organizing goals, power differentials, and how your expertise (construed broadly) could empower the movement.	Lawyers identified potential roles for supporting a union's strike by considering the union's broader strategy, which revealed creative roles (like using the deposition phase of a lawsuit to get information to power the strike).	Researchers worked with tenant organizers to identify how data could support anti-eviction campaigns, focusing on mapping properties owned by a specific landlord.
Select roles to build power for organizing goals: Select the roles that, when combined with organizing, will be most effective at any given moment in building power for the movement.	Lawyers coordinated with organizers to use court hearings for arrested striking workers as opportunities for building the union's power and placing pressure on the judge.	Researchers supported an active effort to protect tenants from an exploitative landlord by creating a map of the landlord's properties, which helped organizers connect with those tenants.
Flexibly adapt roles when needed: Adapt roles in response to shifting priorities or external conditions.	Lawyers shifted between defensive approaches during strikes, aggressive litigation to build the union's power during periods of less leverage, and enforcing the movement's wins after strikes and boycotts.	Researchers abandoned a data tool they had created which was no longer useful, and pivoted to support active organizing against a specific exploitative landlord.

Table 1. The four practices for situating one's role in social movements, with examples of how the practices apply to both movement lawyering and movement data science.

practices from movement lawyering for situating roles through a dynamic, contextual, and collaborative process (Table 1). Collectively, these practices provide a guide for how data scientists can progress from an initial position of distance from movements toward building strong relationships with organizers and ultimately identifying productive ways to empower social justice efforts.

5.2.1 Be immersed in the movement. Movement data scientists should directly participate in social movements as agents of the struggle. When they first enter social movements, movement data scientists should participate directly in the movement as any other person would: regularly attending organizing meetings without expectation of a speaking or leadership role; participating in organizing activities, like canvassing or phone-banking; and showing up to the movement's actions. These activities are opportunities for movement data scientists to gain a deeper contextual understanding of the movement and to form solidaristic bonds with organizers in the movement.

Immersion in the movement is not simply a matter of showing up, though. Immersion means showing up with the intention to become part of the movement. This means that movement data scientists should recognize that they have limited expertise about social movements and the issues that communities face. When they begin participating, they should abandon preconceived notions of their role in the movement and instead aim to learn from and about the movement. Furthermore,

to become part of the movement, movement data scientists should work to build relationships with movement organizers. Like any other relationship, building meaningful relationships with organizers requires showing up consistently and humbly over a long period of time. Doing so allows movement data scientists to concretely demonstrate to organizers that they are committed to acting as accomplices, seeking to advance the movement's goals rather than their own.

Crucially, in order to become immersed in the movement, movement data scientists need to practice reflexivity. They should consciously check their impulse to offer quick technical solutions to issues that movements face, and instead maintain an orientation toward learning from the movement. They also need to be aware of their relative power and privilege. Data scientists are typically perceived as experts and lauded as innovators, while grassroots movements' capacities and labor are under-recognized. Contending with this positionality requires movement data scientists to redistribute power whenever possible. Doing so is a means of becoming part of the movement—of actively positioning themselves as agents of the struggle, leveraging all resources at their disposal to advance the movement's goals.

As an example of this practice, Graziani and Shi [58] reflect on their long-term participation in the Anti-Eviction Mapping Project (AEMP), a grassroots countermapping project challenging tech-industry-driven gentrification in areas like San Francisco and Los Angeles. Graziani and Shi discuss the active efforts they take to continually position themselves as activist scholars, navigating the tensions that arise from straddling academia and activism. Rather than maintaining distance between themselves and organizers, Graziani and Shi blurred these boundaries by frequently participating directly in grassroots actions, such as canvassing with a local renters' coalition to collect signatures to put rent control on the ballot. By working alongside organizers in these activities, they developed relationships and a shared understanding of the movement's goals.

5.2.2 Explore potential roles by situating expertise within organizing goals. As they develop a deeper understanding of the movement's organizing goals, movement data scientists should then explore potential roles they could play. They should begin with smaller tangible activities—potentially directly determined by the movement itself. These contributions could focus on building basic technical capacity for the movement, like setting up audio-visual equipment or organizing databases. These contributions would demonstrate data scientists' commitment to prioritizing the movement's needs and goals rather than flashy projects that center the data scientists. These initial contributions could also be entry points for deeper immersion; by offering to set up audio-visual equipment at key movement meetings, for example, data scientists might begin attending those meetings and thus learn more about the movement's culture and goals.

As movement data scientists build trust with the movement, they can start to consider more in-depth applications of their expertise, like leveraging their knowledge about data and technology to enhance the movement's strategy. Data scientists should engage in a two-way dialogue with movement organizers to collectively process the limits and value of data expertise. Data scientists should not simply look to organizers for a blueprint of what to do, nor should they assert a pre-made plan for what their role should be. Instead, movement data scientists should work with organizers to collectively determine the best use of data expertise to advance the movement's organizing goals. Importantly, the value of this practice lies not only in identifying potential roles. Conversations between data scientists and organizers about how expertise might support organizing can themselves strengthen movement strategy by clarifying demands, identifying strategic targets, and refining potential tactics.

One potential starting point for data scientists is to help the movement understand how technologies affect the issues they care about. Data and algorithms now touch all aspects of society and

harm marginalized groups in multifaceted ways. Even groups that do not traditionally focus on technology are facing threats, from environmental justice groups opposing data centers to immigrant rights groups dealing with surveillance to anti-war activists fighting against technology-facilitated warfare. Data scientists can help arm these organizations with information, knowledge, and narratives that help them fight back. They can answer questions such as: What are the capabilities of this technological system? Who is this company, CEO, or thought leader who is hailing the benefits of the technological system? Who else is involved in funding or supporting this technological system? How do we push back against the narratives presented by policymakers, technology companies, and journalists that justify the technological system? By answering these questions together, movement data scientists and movement organizers can cohere on a shared analysis of potential demands, targets for these demands, and strategies for winning these demands.

Sometimes, organizers may suggest specific roles for data scientists that are narrow and solutionist, such as conducting data analysis in the hopes that this data will convince decision-makers to change their policies. In these moments, movement data scientists should analyze these suggestions within the context of the movement's overall strategy—and, importantly, they should draw organizers into this analysis. They should not outright reject the ideas brought forward by the movement, nor should they uncritically accept these ideas. Instead, they should orient the movement back towards questions of building power, such as: What information, if collected, could be agitating for the movement, or reveal new organizing goals? In asking these questions, both data scientists and organizers might develop a better understanding of the power differentials the movement is trying to change. The conversations that data scientists have with organizers in moments like this are opportunities for developing a shared collective understanding of the limits of relying on data-based solutions, identifying more productive uses of data scientists' expertise, and refining the movement's strategy.

In other cases, data scientists may find themselves drawn to their default role. *They* may be the ones to suggest doing data analysis to appeal to those in power or otherwise "solve" the challenges the movement faces. In these cases, the relationships they have built with organizers, rooted in trust and accountability, would help ensure that data scientists refocus on the movement's organizing goals. These relationships would ensure that organizers feel capable of pushing back on data scientists and that data scientists take organizers' challenges to heart. Barabas [12] describes such an experience when she and her colleagues attempted to build relationships with bail fund organizers in Massachusetts. In an initial meeting with the organizers, the team shared several ideas for potential uses of the data the bail fund collected. The bail fund organizers explicitly pushed back against the proposed projects, describing how they reinforced harmful assumptions about the people that the bail fund supports (for example, dividing them into categories of "deserving" and "undeserving"). This began a mutual dialogue that taught the data scientists how to collaborate equitably with community organizers and proactively undo harmful tendencies.

These examples highlight the importance of relationships for facilitating movement data science practices. If movement data scientists do not build relationships with organizers early on, moments of miscommunication and gaps in vision can lead to frustration and ineffective projects. But if there are trusting and respectful relationships, the different perspectives of movement data scientists and organizers can become a source of synergy rather than breakdown. In fact, the conversations that occur when conflicting perspectives emerge can themselves be further opportunities to strengthen existing relationships.

5.2.3 Select roles to build power for organizing goals. Movement data scientists should coordinate with organizers to select roles that build the movement's power and capacity. Importantly, movement data scientists should not presume that any role they play would, in isolation, shift power

dynamics to win the movement's demands. Instead, they should situate their role alongside other organizing tactics.

Movement data scientists should analyze potential contributions based on the power that they would build for the movement, such as new grassroots relationship, increased media attention, or greater financial resources. In some cases, this may involve activities that are not typically considered data science work. For example, if organizers want to develop a stronger public presence, movement data scientists might help coordinate relationships with journalists, contribute to media outreach, or speak publicly on behalf of the campaign if the movement deemed that appropriate.

In other cases, movement data scientists may identify technical contributions that can help build power. For example, if organizers want to increase the visibility of a campaign, building a website to publicize the effort may be an effective contribution. Similarly, if an organizing campaign required building stronger relationships with other groups, movement data scientists might use data analysis to help grassroots organizations visualize connections among groups and identify opportunities for collaboration. However, they should recognize that technical artifacts alone are unlikely to build power. Their role may also extend to outreach, relationship-building, or leveraging existing connections to help initiate collaboration. Movement data scientists should therefore evaluate both technical artifacts and the broader organizing processes surrounding them, considering how each can contribute to building power for the movement.

A group of data scientists in the New Haven chapter of Science for the People demonstrate this practice in action [104]. They formed a collaboration with a local tenants union that was organizing to pressure their landlord to fix lead and mold issues in their building. Through conversations with organizers, the scientists identified that they could support the union by integrating data from lead inspection tests with data about organizing efforts. This synthesized information helped the union build power by making it easier for the tenants to identify good targets for future door-knocking sessions in the building. In this example, the data scientists treated the task of collecting and analyzing data as a process of relationship-building, rather than a simple matter of reporting ground truth values.

5.2.4 Flexibly adapt roles when needed. Movement data scientists should view their role as flexible rather than fixed. Because they are embedded within ongoing organizing campaigns, they should be prepared to adapt their contributions in response to changing conditions. Organizing priorities may shift as political opportunities emerge, campaigns evolve, or movements identify new goals. In these situations, movement data scientists should be willing to abandon projects that are no longer useful and redirect their efforts toward higher-priority work. They should also recognize that their own data work is dynamic: data sources may become obsolete, tools may be appropriated and used in unexpected ways, and the process of data production itself may surface new organizing needs. Rather than treating these developments as failures or deviations from a plan, movement data scientists should view them as opportunities to better align their work with the movement's evolving priorities.

Data scientists participating in a grassroots campaign against "smart streetlights" in San Diego demonstrate this dynamism in action [127]. One of their initial contributions was a dystopian hackathon, which they conceived as a way to concretize the movement's claims about how the streetlights could expand surveillance. However, the researchers found that the demos they produced were not particularly useful for the coalition's organizing—what was useful were the conversations and analyses that producing the demos enabled. The demos also revealed an unexpected insight about the streetlights: only a handful of the streetlights actually reported the pedestrian data that the city government had promised would be used to improve mobility. This realization thus suggested a way to refine organizing goals—the coalition could politicize the broken data to de-legitimize

the streetlights and urge the city to stop funding the program. The researchers shifted their role to supporting this new organizing goal; they wrote a report exposing the broken promises of the smart streetlights and worked with organizers to distribute this report to the press.

5.3 Case study: Anti-eviction organizing with data in Atlanta

To illustrate how movement data science can help data scientists advance social justice, we discuss a case study in which data science researchers in Atlanta supported a housing justice organization (as documented in an article written by the researchers [123]). We interpret the data scientists' activities through the lens of movement data science, highlighting how the data scientists were able to support the housing justice effort by adopting practices that resemble movement data science. The following case illustrates how movement data scientists iteratively applied the four practices while adapting to changing organizing needs.

When the data scientists first approached the housing justice organization, they embodied the typical technician role focused on data analysis. The data scientists had found a dataset on court eviction proceedings and proposed analyses like combining the court data with eviction data that the organization had collected through a tenant mutual aid hotline. They began by organizing a participatory design workshop aimed at identifying uses for the data. However, these conversations were unfruitful. Contrary to the researchers' expectations, the organizers saw no use for the data itself. Instead, they raised broader normative questions such as what political identities are most conducive to tenant organizing; these questions were much more relevant to their organizing and could not be addressed merely through analysis of the court data. The movement's priorities did not match the researchers' understanding of what might be important.

In response, the researchers shifted their approach, starting by becoming more immersed in the movement. Over several years, they attended weekly organizing meetings, participated in direct actions (often as technical support), canvassed in neighborhoods, and worked shifts on the organization's tenant mutual aid hotline. During the COVID-19 pandemic, they helped support organizing efforts shaped by federal eviction protections, including the hotline and the distribution of eviction-defense manuals to tenants. Their involvement gradually deepened; they moved from working shifts on the hotline to helping manage it.

Through this long-term engagement within the movement—including activities not typically considered data science—the researchers internalized key movement commitments, such as housing as a human right, evictions as a form of violence, and grassroots tenant power as essential for challenging landlords. They came to understand activities like the hotline not merely as mechanisms for collecting information, but as forms of relationship-building and political organizing.

As they became more immersed in the movement, the researchers began exploring potential roles. This process was not without missteps. For example, after learning that organizers struggle to identify drop-off sites for eviction defense manuals, researchers proposed building a tool for tracking evictions based on addresses. The organizers were excited about this tool's potential; one suggested a feature for identifying the landlords of addresses with the highest eviction rates, which could be ideal sites for dropping off manuals. However, when the researchers began developing the tool, they found that existing housing data could not provide the actionable information organizers needed. The tracker largely confirmed what organizers already knew—that evictions were concentrated in Black and brown neighborhoods—and could not reliably identify the landlords responsible for the highest eviction rates. Although the tool did not ultimately become a productive contribution, both researchers and organizers gained a better understanding of the opportunities and limitations of housing data for supporting organizing efforts. This misstep helped the researchers and organizers develop a shared understanding that data expertise was only useful insofar as it could generate actionable insights that supported ongoing organizing campaigns.

Through further engagement and conversations, the researchers identified roles that would more effectively support organizing goals. The organizers launched a campaign to prevent a large private equity firm from evicting a tenant who had lived in her home for decades. The firm's practices were opaque, obfuscated by financial maneuvering; the organizers learned the firm's name only through canvassing the neighborhood. Investigating this landlord became a priority in order to defend the tenant and other tenants at risk of eviction. The researchers realized that they could use their data analysis skills to strip past these layers of obfuscation and map the landlord's properties. This mapping supported organizing against this specific landlord, directly informing future canvassing efforts. Moreover, seeing the landlord's properties mapped helped the organizers make sense of how corporate landlords were gaining power in the city. In response to this new perspective, the movement shifted from reactively responding to emergent crises to proactively organizing against corporate landlords' unaccountable power.

In order to find effective roles, the researchers maintained a flexible approach, responding to the immediate political conditions the movement faced. For example, the address-based eviction tracker emerged during a period when organizers were focused on eviction defense, operating a tenant hotline, and distributing eviction-defense manuals tailored to federal eviction protections. When those protections were overturned and the movement's priorities shifted, the researchers abandoned the tracker and redirected their efforts toward more pressing organizing needs. The researchers similarly recognized that other contributions would have a limited lifespan. For example, the map they generated of a private equity firm's properties was useful for identifying canvassing targets and supporting organizing against that specific landlord, but its value would diminish as firms bought and sold properties over time. Rather than treating any particular tool as a permanent solution, the researchers remained prepared to update their contributions or shift to entirely new roles as the movement's needs evolved.

6 Discussion: A relational approach to roles

The core tenet of movement data science is that, in order to promote social justice, data scientists need to focus on building relationships rather than building tools. They must explicitly consider their role as social actors working in concert with other people. This relational conception of roles stands in contrast to data scientists' typical view of themselves as technicians who build tools that advance social change. Instead, data scientists should approach their roles as collaborative, contextual, and dynamic. Their roles must be collaborative, grounded in solidarity with marginalized groups. Their roles must be contextual, determined based on the particular struggles in which those groups are engaged. Their roles must be dynamic, shifting over time as conditions evolve. Following these principles, some data scientists will still end up building technical tools to support social movements. However, many will take on other roles, such as helping movements build connections with other grassroots groups and testifying on behalf of movements to the media.

Movement data science supports this shift in roles by providing a process to help data scientists situate their roles in social movements. This process consists of concrete practices that guide data scientists from an initial position of distance from communities to an engaged role of active support for communities. Importantly, this process is not a formula. This is a limitation of movement data science, as it does not provide a straightforward blueprint or checklist for data scientists to apply. Yet it is also a strength, as this open-ended approach is essential for enabling data scientists to identify collaborative, contextual, and dynamic roles within social justice efforts. Fighting for social justice is inherently difficult and uncertain. To support social justice efforts, therefore, data scientists need to accept that the process will involve ambiguity and lack a linear path to success. Approaching this process with flexibility and an open mind is essential.

6.1 Reshaping participatory data science: Centering movements, decentering data scientists

Movement data science aligns with prior research that explores participatory data science, such as literature on community-engaged data science [7, 12, 30, 36, 41, 42, 83, 103], action research [64, 65], and citizen science [16, 18, 113]. Like other work, we suggest that data scientists should build long-term and close relationships with directly-affected communities [7, 12, 30, 36, 41, 42, 75, 83, 103]. Like other frameworks, movement data science democratizes the process of producing scientific knowledge and developing technology by inviting directly-affected communities to set the priorities of research and development [7, 12, 64, 83, 103, 113]. It echoes calls for reflexivity and humility as core elements of equitable participation [12, 65, 83, 103].

Movement data science extends prior work in two directions as a result of its emphasis on grassroots social movements. First, by focusing on organized social movements, movement data science recasts participants from an individualistic to a collective frame. Most efforts at community-engaged data science involve data scientists recruiting individual users or individual members of a community [38]. In contrast, movement data science involves working with an organized group of people who work collectively and have pre-existing relationships with one another. This approach better aligns with the goal of social justice, as organized groups have greater capacity to effect change than isolated individuals.

In this spirit, movement data science requires recognizing communities as agents of social change with expertise and power. Movement data science therefore extends recent work calling for technologists to take an "assets-based" approach rather than a "deficit-based" or "needs-based" approach to community engagement [40, 54, 101, 131]. It suggests that movement data scientists should not merely acknowledge that directly-affected communities possess capacities for collective action, which they can exercise to effect change. Instead, the goal of movement data scientists should be to enhance the community's collective capacity. Future work should explore how methods for participatory research apply when the participants are part of a pre-existing community already engaged in a collective project.

Second, movement data science reverses the standard model of participation in community-engaged data science: instead of positioning communities as participants in data science projects, *movement data science positions data scientists as participants within community-led movements*. Most other participatory frameworks (such as action research or citizen science) aim to democratize initiatives where the central activity is technology development or scientific knowledge production [17, 64–66]. They do so by shifting the researcher into a facilitator role and inviting directly-affected communities into decision-making processes. In contrast, movement data science centers the social movement's activism and decenters technology development and scientific knowledge production. Put otherwise, movement data science does not only decenter the researcher (like action research and citizen science)—it decenters research itself. Data scientists enter the fold as participants in the social movement's activism, with a primary goal to support the activism. They do not walk in with the specific goal of running a research study or building a tool. They adapt their expertise to align with the movement's priorities, refraining from technical development unless it is useful.

In several of the movement data science examples discussed in Section 5, the researchers began with more traditional participatory design methods. They used participatory design workshops to elicit input about potential research projects [123, 127]. However, these methods did not lead to productive roles or useful contributions because they centered research as the primary activity. The researchers were able to make more useful contributions when they shifted to viewing activism as the central activity. This approach looks less like action research and more, as Tran and DiSalvo [122] put it, like "direct action supported by research practices."

Decentering technology development and scientific knowledge production does not mean that movement data scientists should never produce technology or scientific knowledge. As the examples of movement data science highlight, technology development can provide valuable support to social movements (and can also lead to academic publications). However, movement data science broadens what counts as legitimate technology development and knowledge production. Less flashy projects—like updating databases, developing websites, and producing reports—can be impactful outputs of participatory engagements with social movements. Moreover, movement data science highlights the need for new types of knowledge production within data science, focused on topics such as how to identify social movements worth supporting, how to develop relationships with movement organizers, and how to evaluate projects motivated by social justice.

6.2 Putting movement data science into practice

Data scientists who try to enact movement data science will face practical challenges related to both working with movements and operating within the professional structures of data science. Future work examining efforts to practice movement data science across contexts would be extremely helpful for exploring strategies to overcome these challenges.

6.2.1 Movement-related challenges. When attempting to support social justice, data scientists might struggle to find a movement. In some cases, there may not be an organized coalition responding to a particular issue, especially if the issue is relatively new. In these situations, data scientists should actively connect with related organizations with the intention of forming relationships that could be leveraged to directly address the issue. This is the approach taken by the researchers organizing against smart streetlights in San Diego [127]. At the outset, no coalition had formed to challenge the smart streetlights specifically—even though there were many groups whose agendas and concerns related to the smart streetlights (such as taxi workers unions, tech worker organizations, and immigrant justice organizations). The researchers participated in forming a coalition to challenge the streetlight program, supported by their practice of being generally engaged with different groups in their community.

Additionally, there may be cases where a movement exists but is not well-organized. The movement might lack a clear internal structure or contain factions that prioritize different goals and strategies. These conditions can make it difficult for data scientists to build relationships, understand the movement's vision, and explore potential roles to play. Data scientists are unlikely to resolve these internal organizational issues in movements. However, by maintaining an expansive conception of their role, they can navigate these situations and still effectively support movements. For example, they might be able to help the movement navigate disputes by generating analyses that illuminate potential organizing strategies. In these situations, it is particularly crucial that data scientists leverage their reflexivity to avoid centering themselves and pushing the movement toward data-centric solutions. Though, if the movement's internal struggles are too severe, data scientists may find it more productive to search for other groups or coalitions to support.

6.2.2 Professional challenges. Few data scientists will find work to act as "movement data scientists"; instead, most work in contexts such as academia, government, nonprofits, and the tech industry. In each of these settings, data scientists face challenges in practicing movement data science. The strongest conflicts exist in industry, given the lack of emphasis on social justice within most companies [92, 129]. Meanwhile, although government agencies are (at least nominally) oriented around the public interest, many pursue technology initiatives that hurt, rather than support, marginalized communities [59]. Data scientists in the public sector and civil society have had to push back against technosolutionist imperatives from politicians and funders [16, 94].

Academia is the most promising context for movement data science—all of the projects we reference in Section 5 were produced by data scientists with an academic affiliation—but nonetheless presents its own challenges. Academic publication expectations make it difficult for data scientists to build long-term relationships with social movements and take their time figuring out how to best support those movements [37, 43, 81]. Moreover, the research community's emphasis on technical solutions and novelty undervalues the types of projects that will often result from movement data science efforts [14, 61, 78]. Data science researchers already struggle to find sustainable funding to support community-engaged work—especially when that work does not center around building flashy technologies [58, 118].

Addressing these challenges will require new institutional forms that support movement data science. Worthwhile initiatives include workplace organizing to enhance data scientists' autonomy over their work [15, 115, 133], research collectives organized around the principles of movement data science [7, 37, 114, 125], and publication venues that value case studies of movement data science projects and analyses of movement data science practices. As more data scientists pursue movement-centered projects and publish articles about their work, they can gradually shift the field's boundaries around what types of projects and outputs are worthwhile.

Another way to circumvent these professional constraints is for data scientists to support social movements as volunteers, outside of their jobs. Indeed, many data scientists already support social justice projects in their off time [109]. Although volunteer work is limited by the time that data scientists have outside work, such efforts enable data scientists to collaborate with organizers without needing to justify their efforts to an employer.

6.3 Teaching movement data science

Movement data science suggests a major departure from traditional conceptualizations of data science. It therefore requires skills and capacities that few data scientists are taught. Traditional data science education has been critiqued for asserting technosolutionist impulses [84, 124], producing a culture of disengagement from social welfare [22, 88], discounting non-technical disciplines [107], and excluding reflection on the political role of data scientists as professional actors [60, 80, 120].

Movement lawyering offers helpful starting points for reforming data science training, because legal education, like data science education, does not traditionally train lawyers to support social justice [11, 77]. Legal educators have developed pedagogical methods that cultivate critical reflexivity, political awareness, and more equitable collaboration with grassroots communities [2, 69, 73]. Data science education should, similarly, cultivate a commitment to social justice and emphasize the politics inherent to their field. Data science students should learn how to critically assess whether technical solutions are appropriate, collaborate with non-technical actors, understand sociotechnical systems, analyze power structures, and recognize the limits of technical knowledge [84]. Beyond the classroom, data science students should also receive greater institutional support for finding justice-aligned internships and jobs. Some computing educators have already begun developing pedagogical methods that foster these capacities [49, 84, 95, 119].

One particularly important method for training movement data scientists is clinical education. In law schools, clinics have become particularly important sites for teaching movement lawyering because law students gain direct experience working with social movements and confronting the ambiguities of their roles [8, 11, 20, 50]. Many of the movement lawyers whose work we reviewed highlighted clinics as key sites of education (e.g., [27]). Similar clinic models have begun to emerge in computing education, with promising results [5, 24, 26]. Future data science clinics could partner directly with social movements, giving students practical experience building relationships with organizers, navigating political uncertainty, and grappling with the limits of technical interventions.

7 Conclusion

Movement data science presents a new approach for data scientists to leverage their expertise in service of social justice. Although movement data science does not provide a formula or blueprint for data scientists to follow, it can help them identify ways to support social justice beyond simply developing technical tools. Instead of focusing on the role of data science in promoting social change, data scientists should focus on their own role as social actors who can promote social change through a wide range of activities. This approach should be grounded in sustained and solidaristic relationships with social movements. In this sense, movement data science provides a new way to think about participatory and justice-oriented data science: data scientists should be participants in social movements, rather than community members being participants in data science projects.

Future work should elaborate on the applications and practices of movement data science. Although we identified several projects that exemplify movement data science, it is unclear how well our framework can guide data scientists who adopt it at the outset of a project. Case study articles, in which data scientists who apply movement data science reflect on the challenges they faced, would help expose the framework's limits and ambiguities, as well as strategies for overcoming those challenges. In addition, those reflections may provide useful lessons about how to reform pedagogy in ways that prepare data scientists for the types of mindsets and activities that movement data science suggests. Finally, it would be helpful to explore the perspectives of social movement actors on whether, when, and how they want data scientists to participate.

The work of advancing social justice is uncertain, difficult, and full of setbacks. However, movement data science offers a new North Star for data scientists. Data scientists should not orient their work around the impossible task of identifying a technical tool that will, on its own, advance social justice. Instead, data scientists should orient their work around building solidaristic relationships with people engaged in struggles to produce equitable and just social conditions. Those bonds will illuminate how data scientists can best contribute to social justice. Although there are no easy answers or simple solutions, rooting their efforts in relationships rather than technology will propel data scientists toward more meaningful participation in collective efforts to transform society.

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