Assembling Expertise:

Taming Problematic Algorithms in New York City

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ABSTRACT

Algorithms are increasingly employed in organizations to automate all kinds of expert work. At the same time, these algorithmic systems have been found to perpetuate old biases and generate new ones. Policy-makers thus recently began to push for algorithmic accountability and oversight – modes of governance that inevitably require new experts. To better understand the twisted role of expertise in the governance of algorithmic systems, we present an in-depth case study of attempts to establish a new regime for algorithm governance in New York City. Building on recent studies that present expert work as a collaborative and co-creative rather than competitive and isolated process, we show how actors in NYC engage in three forms of relational work to create a new form of expertise: creating a void, assembling networks, and maintaining distance. With our study, we show that the assembling of expertise as an important, yet mostly neglected antecedent to the creation of new occupational mandates. We further show that 'expertise' is not just an analytical category to analyze authority at the workplace, but that when facing the uncertainty of emerging technologies, actors can mobilize 'expertise' as a governance resource.

Assembling Expertise: Emerging Governance of Algorithmic Systems in New York City

Algorithmic systems pose an interesting conundrum. On the one hand, they are increasingly employed in organizations to automate all kinds of expert work. Using novel computational techniques like machine learning, AI, and large-scale data analytics, these systems are deployed to make more accurate decisions, predict behavior, and be more reliable than human judgment (Faraj, Pachidi, & Sayegh, 2018; Schildt, 2017; von Krogh, 2018). Recent examples include the use of software models in bail decisions (###), automated hiring platforms (###), and performance measures in the workplace (Rosenblat, 2018). On the other hand, the growing use of these technologies has raised a number of concerns. As researchers have shown, algorithmic systems can perpetuate old biases and generate new ones, often in ways that are not obvious to the naked eye (Eubanks, 2018; Pasquale, 2015; Sweeney, 2013). Policy-makers have thus begun to push for algorithmic accountability and oversight – a task which almost inevitably requires experts that understand and evaluate these technologies. In other words, the more we substitute machines for human experts, the more we are in need of experts that can help us govern these machines. So what is the nature of this new form of expertise and who might be able to provide it?

The answer to this question is not an obvious one. Neither algorithm audit nor AI risk analysis are currently 'professions' in any sense of the term. Rather, such activities tend to involve a range of individuals and institutions that lay claim to expertise, including lawyers, computer scientists, and social scientists. In addition, a new cast of so-called 'domain experts' has entered the scene, i.e. people who specialize in the specific field of action in which the system is deployed. As a result, what counts as 'expertise' in regulating algorithmic systems is largely up for grabs – an 'interstitial' (Eyal & Pok, 2015, p. 43; Furnari, 2014), 'speculative' (Hilgartner & Lewenstein, 2004, p. 1), and 'agonistic' (Crawford, 2016, p. 77) space found at the edges of technological systems.

In this paper, we aim to better understand how expertise is being organized, achieved, and challenged in the context of emerging algorithmic systems. Drawing on an in-depth case study of attempts to establish a new regime for algorithm governance in New York City, we explore how expertise has become a focal point for organizing the governance of algorithmic systems. Unpacking the process, we show the different forms of relational work through which actors lay claim to expertise and try to establish their positions. In doing so, we expand the literature on occupational emergence and show how the work of assembling expertise is a process that underpins (yet not necessarily determine) the creation of an occupational mandate. We further show that expertise is not just a response to an emerging technology, but also a resource that is actively mobilized for shaping the emerging governance of such technologies. Expertise, then, is both in need of organizing and an organizing principle by itself.

The paper is organized as follows. After a brief review of work in organization studies and science and technology studies (STS) that has addressed the idea of expertise as both an analytic resource and a topic for inquiry, we find that a relational approach is particularly useful for theorizing struggles over expertise outside established occupations and professions. We then use this analytic

lens to present a case study of recent attempts at governing algorithmic systems in New York City's departments. We show how between 2013 and 2018 the question whether and how an automated decision system in NYC should be regulated centrally revolved around the question of who had what kind of expertise to do so.

HOW NEW EXPERTISE COMES ABOUT

How can existing work in organization studies and STS help us think about the politics of expertise in governing algorithmic systems? In the following we trace how thinking about experts and expertise has broadened from a focus on personal skill and group membership to a perspective that looks at the networked relations between people, objects, concepts, and problems. We thereby show how different conceptions of what makes expertise change the way we think about how and why new expertise comes about. In doing so, we attempt to capture the intriguing ambiguity that expertise brings about with regards to emerging technologies: expertise as a capacity to organize such technologies, as well as a principle around which organizing takes place. [For the purpose of this short paper we excluded the next two sections "Expertise as Individual Skill" and "Expertise as Collective Claim"]

Expertise as Networked Relations

Reviewing more than a century of literature on occupations and professions, Anteby et al. (2016) find that scholars increasingly study expertise as co-creation and as a collaborative rather than competitive practice. A similar emphasis on relationality has been found in the literature on jobs, roles, and tasks as well (Grant & Parker, 2009). Above we saw how this relational understanding of expertise informed studies on the work of professional experts in organizations (Huising, 2015), or the creation of occupational mandates (Fayard, Stigliani, & Bechky, 2017). Recently, scholars began to examine expertise through a relational lens in arenas that include but span individuals, groups and organizations. In many ways, this turn answers Zald and Lounsbury's (2010, p. 963) call that organization studies should loosen its focus on clearly defined expert groups in organizations, and also scrutinize "how the dynamics of economy and society are fundamentally shaped by various elites, new forms of expertise and their command posts". To "demystify the wizardry of experts" (p. 964) they argue, we need to understand what counts as expertise in a certain context and how different actors can affect this evaluation.

Especially the field of Science and Technology Studies has shown how expertise is not possessed by individuals in isolation, but emerges through relational practices in a heterogeneous network of actors, objects, and institutions (Carr, 2010; Eyal & Pok, 2015; Latour, 1987). In his study on the precipitous rise of autism diagnoses, Gil Eyal (2013) shows that although some medical professionals were convinced that autism is severely under-diagnosed already in 1943, only by 1989 the relations within the heterogeneous network of actors (including parents, therapists, behavioral protocols) had changed in a way that allowed autism diagnoses (expert statements) to

be made in great numbers. Studying knowledge-intensive processes not through the lens of experts but expertise makes visible how people (including experts and those that strive to become experts), objects, techniques, and devices are assembled into a "network" or "apparatus" that "produces, reproduces, and disseminates expert statements and performances" (p. 872).

This "sociology of expertise" (Eyal, 2013) or "sociology of intervention" (Eyal & Buchholz, 2010) takes a very similar ontological stance to the studies on relational work and expertise in an occupational context described above, yet tends to focus particularly on expertise in a value-laden and public or at least semi-public context. For example, scholars showed that computer scientists only become effective experts in critical infrastructure security as their technical knowledge is integrated into a network of control system operators, managers, machinery, and organizations (Slayton & Clark-Ginsberg, 2018). Similarly, Summerson Carr (2010) has used the notion of *enactment* to emphasize that expertise is *done* rather than *possessed*.

Thinking about expertise as an individual skill of a collective claim helps us imagine how the expertise needed to govern algorithms could be acquired and how groups turn their expert skill into an authoritative or even juridical claim. However, both perspectives assume a stable form of expertise to be mobilized. The perspective of expertise as networked relations makes visible the piecemeal work that is needed to create a new form of expertise. In the case of algorithmic systems, policy-makers and scholars agree that new expertise and maybe even new occupational groups or professions are needed to govern this highly influential emerging technology. The concept of expertise seems a promising sensitizing device to understand the emerging governance of algorithmic systems. We therefore pose the research question: *How do actors lay claim to expertise as a response to emerging organizational technologies?*

EMPIRICAL CONTEXT: PROBLEMATIC ALGORITHMS IN NEW YORK CITY

Over the past decade, the New York City (NYC) government has adopted a range of new technologies to improve and support decision making. Although many of these systems are developed and deployed behind closed doors, procurement documents and media investigations have surface information on their application in a wide array of administrative domains.

Problematic algorithms became a matter of political debate when in August 2017 local representative James Vacca introduced the 'algorithm bill' (Int. No. 1696) to the New York City Council. The bill was brief but far-reaching in its demand: Within 120 days, all city agencies should make publicly available the entire source code of their algorithmic systems. A few weeks later, a public hearing on the bill was held in front of the City Council's Technology Committee. In sharp contrast to other hearings in front of this body, the room was filled up to the last seat and "latecomers had to stand shoulder to shoulder at the back of the room" (Mckenzie, 2017). On that day, 18 people gave testimony, 16 of which spoke in favor of the proposed bill. The opposing

speakers (from the city government and a lobby organization for NYC's technology industry) raised concerns regarding individual privacy, public safety, and the protection of trade secrets.

Following a few more weeks of backroom negotiations between Vacca's team and the city government, the councilman reintroduced a completely revised version of the algorithm bill. The City Council passed Int. No. 1696-A unanimously on December 11, 2017. In May 2018, Mayor Bill de Blasio announced the Automated Decision Systems (ADS) Task Force. He appointed two government chairs, invited twelve non-government members, and named six city agencies that would send staff members to the task force meetings. At the time of writing (December 2018), the ADS task force had met a few times. It also had formed sub-groups to address the specific tasks mandated by the local law. However, the debate was by no means limited to these formal meetings and procedures. Much of the task force's design and work was influenced by a much broader field of actors. Among other things, this broader field included specialized research and policy institutes, a so-called "shadow task force" of loosely organized civic advocates, and a transdisciplinary academic community interested in the nexus of algorithms and society. [More detailed descriptions of these actors have been excluded]

METHODS

[This section is strongly shortened for the purpose of this short paper]

Research Design and Data Collection

Documents. We collected media reports on the matter of problematic algorithms in NYC, the algorithm bill, and the creation and work of the ADS task force. We also included social media data, such as posts from Facebook groups (e.g. "Civic Technology and Open Government") or Tweets that included the hashtag #NYCalgorithms (created alongside the first open letter of the shadow task force). We also collected official documents such as draft bills, hearing transcripts or press releases by the city government. Many media reports and official documents made references to policy reports (e.g. by AI Now), which we included in our case database as well. Finally, we also read academic books and research articles that were frequently referred to in other documents, such as *Black Box Society* (Pasquale, 2015), *Weapons of Math Destruction* (O'Neil, 2017), or *Automating Inequality* (Eubanks, 2018).

Videos. Conferences and workshops play an important role for the configuration of professional fields (Lampel & Meyer, 2008). They hence seemed a promising vista into the study of expertise as well. To identify relevant events, we looked for those that involved members of the ADS task force or actors who significantly contributed to its establishment and work from the outside. We eventually selected four types of events: Presentations at public symposia hosted by AI Now (2016-2018), panel discussions on algorithms and discrimination from a civil society conference in NYC (2017, 2018), a panel discussion at the FAT* workshop in NYC (2016), and public lectures on algorithm bias and fairness at Data & Society (2016-2018). Complete video recordings of all these events were downloaded from Youtube and transcribed verbatim. The first

author additionally attended the 2018 AI Now symposium in NYC and took field notes on space and atmosphere that were added to the transcript.

Interviews. Semi-structured interviews allowed us to understand and compare how different actors in NYC interpreted the 'algorithm situation' at hand. As potential interview partners, we considered all those people who actively engaged in the policy process in some meaningful way, for example by publishing, commenting, lobbying or advising. In an initial fieldwork phase in spring 2018, the first author conducted twelve interviews. The first author conducted twelve interviews in spring and another 17 in fall 2018. The interview partners included city employees, civil rights advocates, consultants, entrepreneurs, journalists, legal professionals, politicians, as well as researchers from a variety of disciplines. Most interviews were conducted in person, with some conducted via VoIP. All interviews were audio-recorded and transcribed verbatim.

FINDINGS

[For the purpose of this short paper, we included all three high-level relational practices, but excluded some of the lower level categories and shortened others]

Constructing a Void

The case of algorithms in NYC showed that emerging technologies can also be mobilized to construct a void. Actors constructed a void by relating algorithms (or some of their characteristics) with widely accepted problems of public life, such as discrimination or limited accountability. These relations worked like hooks, whereby a greater number of hooks that pull in different directions enlarge and stabilize a void in which expertise can emerge.

Changed nature of technology. We sometimes speculate or even gossip about the character of our human co-workers. When algorithms, as non-human co-workers, moved into the limelight in NYC people began to make claims about their inner workings, too. In contrast to the intimate watercooler chat about the colleague next door, many of these thoughts were aired in more public setting. In the hearing for the algorithm bill, councilman James Vacca delivered an opening statement and explains that his bill is motivated by deep concerns regarding the inner workings of such systems:

> In our city, it is not always clear when and why agencies deploy algorithms, and when they do, it is often unclear what assumptions they are based upon and what data they even consider. This partially results from *algorithms natural complexity* […]. (emphasis added)

After Vacca's statement, 18 other people gave testimony at the hearing. Most of them prepared and submitted a comprehensive letter from which they presented a selection of arguments to the audience in the room. An interdisciplinary group of scholars generally supported the bill, but in their letter and presentation also included some critical remarks. One of them referred to the aspect of the bill that would allow citizens to "submit data into such system for self-testing" and to

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"receive the results of having such data processed by such system" (Int. No. 1696). Like Vacca, the scholars tie their criticism to the 'nature' of algorithms:

> The requirement as proposed is likely to be administratively burdensome on agencies, to the point of potential impracticality, *given the dynamism of automated systems*, and the fact that effective black-box testing in the public interest can require thousands of queries (or more), depending on the context […]. (emphasis added)

While Vacca framed the problem with algorithms as one of accountability, the trio of scholars linked their nature to the accepted problem of wasteful public spending.

Invasive movement of technology. Tales of invasion and conquest were another prominent theme that people in NYC mobilized to construct a void for algorithm expertise. Algorithms, in these accounts, have moved from some contained location into clueless, unprepared and defenseless places. Through expert intervention, however, the wild algorithms might be tamed and the invaded contexts protected. In one of their policy reports, AI Now diagnosed that "AI moves into diverse social and institutional domains, influencing increasingly high stakes decisions" and recommended that software vendors should address this problem through more diverse staff. In another AI Now report the void of expertise is created through the related notion of context. In different ways, the report suggested that an ongoing movement of algorithms from their original to some other context might bring about unanticipated problems:

> The increasingly use of AI has increased the prominence of emerging fields like "machine ethics," "data ethics," and "AI ethics." These terms […] highlight the complexity of automated tasks and outputs where the original context is removed or difficult to define.

> The diverse range of contexts in which AI systems are already being used – from medical devices to insurance premiums to personalized ad delivery – have led some to ask if the deployment of these systems necessitates a revision of existing ethical frameworks.

Throughout this theme, the contours of the void for expertise were more and more articulated. Not only was there a need for expert judgement on the nature of algorithms. The expertise also needed to be able to – other than the 'ordinary citizen' – span contexts like the invasive algorithms do.

Assembling a Network

New expertise can fill voids, yet the selection and relations of elements from which this new expertise might emanate are contingent. The way a void has been constructed provides some orientation, yet does not replace actors' efforts to assemble "relations of complementarity" (Eyal, 2013, p. 873). To create a new form of expertise, people in NYC highlight some components of algorithms while moving others to the back ('shaping the object'), they search and compete for attention ('building audiences'), and they try to connect established modes of inquiry into technical systems ('folding knowledge').

Shaping the object. In NYC, we found that the more intensely people "picked up" algorithms, the more they tended to "break apart" (Seaver, 2017, p. 2). The decomposition of algorithms allowed actors to position the different parts at different places in the void. Most illustrative for this dynamic is how people in NYC backgrounded "the model" and foregrounded "the data". Towards the beginning of our observation period, many people described algorithms as a set of rules, oftentimes by referring to definitions from seminal computer science textbooks (e.g. Russell & Norvig, 1995). As the construction of the void proceeded, more and more people began to forge a distinction between the peripheral models and crucial data that algorithms consist of. When we reached out to a statistician who had provided public comment on problematic algorithms in NYC, she agreed to meet for an interview but raised some concerns about our research object via mail:

> I think the issue is about *models*, very much not about *algorithms*. The distinction is that by talking about models, we highlight that the predictions come from data, not from the algorithm by itself. I think it is an error -- technically and in policy terms -- to talk about algorithms when we mean that models are causing social harm. (emphasis in original)

The focus on data as the main object of expert judgement was shaped by the dynamics of the legislative process in NYC as well. The hearing and the subsequent backroom negotiations revealed to observers of this process that algorithm vendors will not be willing to make their models (i.e. the source code) publicly available, and that the city government will not lever their bargaining power as a mayor customer either (i.e. by including public source code into their procurement guidelines). In contrast to the proprietary models, most of the data is collected and stored by city agencies and thus subject to different forms of transparency legislation (e.g. Freedom of Information). By moving the model into the back and the data to the fore, people in NYC hence repositioned these components in a way that opened new avenues for the fabrication of expert statements on algorithms.

Building audiences. When expertise is well-established, experts and their audiences form a relationship that seems almost inevitable. The assemblage of expertise in NYC reveals that these relationships require efforts in at least two ways: Building an audience that is 'relevant' enough to confirm new expertise vis-à-vis the public, and making sure that the expert statements presented to this audience are consistent. In NYC the work that goes into building audiences for new expertise becomes salient in the struggles in which a group that we call "algorithm reformers" gained a central position in the emerging network of expertise, pushing the group of "algorithm abolitionists" towards the fringes of the "apparatus" (Eyal, 2013, p. 872).

A prime example for an algorithm reformer in NYC was the AI Now Institute at New York University. In its mission statement, AI Now described its goal as "understanding the social implications of artificial intelligence". Reading through the organizations output, it became clear that "understanding" was not limited to the academic mode of inquiry and the publication of peer-

reviewed articles. Since its launch in 2016, AI Now had organized a number of high-profile symposia and expert workshops, which usually were followed by comprehensive documentation and dissemination of results to the public. The underlying message of these outputs was that more work needed to be done to "ensure that the benefits of AI will be shared broadly, and that risks can be identified and mitigated" (AI Now 2017 Report).

Algorithm reformers like AI Now managed to build relevant audiences for their demonstrations of expertise. In turn, the constantly reinforcing position of AI Now and other reformers made is increasingly difficult for "algorithm abolitionists" to present their opinion as a legitimate expert judgement. Several of our interlocutors in NYC expressed their concern that in one way or the other they got sidelined in the larger policy process due to their opinion that certain algorithms, or algorithms in general, should be banned from socially meaningful decision-making processes in NYC agencies altogether:

> My general opinion is that we shouldn't be using these models at all. […] Fixing it is just an exercise and moving the problem around. […] And I suspect it's this hard-liner position which got me not invited to that [ADS task force]. Because I'm not willing to sit around and pretend that this stuff's going to work because it's not.

Folding knowledge. Besides these emerging relations between new actors and concepts, we also found that people in NYC tried to forge relations between large and established forms of inquiry into technical systems. Some of these efforts tried to bring together academic domains such as computer science, law and philosophy, but also involved field such as media studies or what some refer to as 'critical algorithm studies' (Gillespie & Seaver, 2016). We found that people did locate new expertise not in the brokerage between such domains, but in the "structural folds" (Vedres & Stark, 2010), the overlaps between these domains. These overlaps can be individuals as well as organizations or other groups. Efforts to fold knowledge in NYC becomes most salient when taking a close look at the FAT community. In our interview with a longtime member of the FAT research community, we spoke about how he perceived the community and how it had developed over the years:

> To have very, like… substantive conversations about some of these things it really requires expertise in many different domains, right? Much of the more recent work is very technical, and to even read the papers, you have to have some background in computer science. At the same time, to have any meaningful, normative debate, you'd need to be somewhat conversant in the law and some of the principals from philosophy. And so, there are very few people who like have the training or time to become able to navigate these different fields.

Maintaining Distance

Established occupational or professional groups can mystify the nature of their expertise, for example, by restricting access to its enactment (e.g. in an operating theatre) and by controlling

when and how new members are socialized (e.g. by conducting bar exams). These tactics were not available to people in NYC who still struggled to create a new form of expertise that might build the basis for future jobs, roles and occupations. However, people in NYC also engaged in buffering practices that maintained a distance between the emerging expertise and the public. Maintaining this distance allowed people in NYC to do two things: On the one hand is served as a tentative boundary around a new type of work, thereby delineating it from other forms. On the other hand, the distance allowed people to evade the auspices of the public and continue figuring out what this work was about.

Disavowing competence. One of the capacities associated with expertise is, that it can provide clear judgement in situations that others cannot. For new and fragile forms of expertise, it is therefore of great importance to evoke this impression and to avoid direct exposure to scrutiny. In some situations, disavowing competence is directed at the protection of new expertise as a collective project. By referring to an abstract group of experts, rather than self-identifying as an expert oneself, existence of this abstract group is made more credible without having to demonstrate any expert skill vis-à-vis an audience. At a civil society conference in NYC a speaker on an expert panel about problematic algorithms shared his research findings on predictive policing algorithms in another large US city. After presenting his analysis of police arrests in that city, he concluded that a mayor issue with predictive policing is its tendency to use and produce racially biased crime data, but at the same time disavowed his competence to speak his opinion on the problem of racial discrimination:

> That's important, not only as a problem for criminal justice in a larger sense, which I'll leave to other, more experts to discuss, but it's a problem for the data. [...] We create data that makes people of color look much more dangerous in this sense than white people.

Disavowing competence is not limited to the technical domain, where reference to other experts could be explained through a particularly high degree of specialization. At a public policy conference, a high ranking public servant from the NYC administration addressed the audience and spoke about the potentials, but also the discriminatory effects of algorithms:

> As the nation's largest city, we're not blind to this and we're certainly not going to turn a blind eye to these issues. Again, I'm not an expert in the field, but as a government official, my ears perk up when I read stuff in the paper like this [lists examples of problematic algorithms].

Disavowing one's own competence, allows speakers to make the credible claim that expertise does exist, yet is located at a distance too large to be "account-able" (Neyland, 2016) right now, but short enough to perform expert judgement in the near future.

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FIGURE 1

Data Structure

First-Order Categories	Second-Order Themes	Aggregate Dimensions

1. Algorithms are non-trivial and inherently complex.
2. Algorithms are more dynamic than previous technologies.
3. Properties of algorithms make existing problems more tangible.

4. Algorithms have entered social and institutional domains, where stakes are higher than at the point of departure.
5. More diverse contexts challenge uniform view on algorithms.

6. City agencies refuse to inform about algorithms to cover up misconduct and maintain democratic and façade.
7. Software vendors reinterpret trade law to withhold algorithms.

8. Compartmentalizing and foregrounding some while backgrounding other components of algorithms.
9. Importing and translating tools and techniques from other fields.

10. Creating new organizations and coalitions for 'algorithm reformers' while sidelining 'algorithm abolitionists'.

11. Relating desirable outcomes with algorithm components.
12. Relating different academic disciplines, foremost computer science, law, or philosophy.
13. Relating elite groups with constituents and victims.

14. Controlling the participatory discourse during staged performances.
15. Promoting diversity of secluded decision-making process.

16. Being ambiguous about one's own expert role.
17. Referring to 'real' experts when speaking in an expert role.

Second-Order Themes:

- Changed nature of technology
- Invasive movement of technology
- Intensified disguise of technology

- Shaping the object
- Building audiences
- Folding knowledge

- Bounding inclusiveness
- Disavowing competence

Aggregate Dimensions:

- Constructing a void
- Assembling a network
- Maintaining distance