Knowing in Algorithmic Regimes: Insights from a Roundtable Discussion on Methods, Interactions and Politics

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Abstract. This paper reports on a roundtable discussion that reflected upon the analytically productive moments of working with the concept of “algorithmic regimes” when studying the methodological, epistemological and political implications of the rise of algorithms in and for knowledge production, sense making and decision-making in contemporary societies. Focusing on knowledge and knowing, the concept of “algorithmic regimes” draws our attention beyond the mere technical nature of algorithms by acknowledging the complex and partly ambiguous entanglements of algorithmic systems as material-semiotic apparatuses with social, political, cultural and economic elements of society. Examples from our own research demonstrate the versatility of the concept of “algorithmic regimes” for studying (1) the *methods* to research and design (better) algorithmic systems, (2) the ways *interactions* become re-configured within algorithmic regimes and (3) the *politics* ingrained in algorithmic regimes. Analysing algorithmic regimes can then provide understanding for shaping desirable sociotechnical futures.

1 Algorithmic Regimes: Object of and Tool for Analysis

The starting point of our thinking about “algorithmic regimes” are the manifold observations that algorithms have risen to become one, if not *the* central technology for producing, circulating and evaluating knowledge in multiple societal arenas – in academia as well as in everyday-life, in the public as well as in the private sector: algorithmic decision-making systems are employed to assist in deciding upon who is

eligible for social welfare, they are developed to solve complex logistic problems or establish new research paradigms based on so-called data science methods (see e.g. Gillespie 2014; Beer 2018; Kitchin 2022; Jarke et al. *forthcoming*). Just as the related applications are highly heterogeneous, so are the assessments of these sociotechnical developments: on the one hand, 'knowing in algorithmic regimes' allows for new modes of participatory and collaborative knowledge-making and knowledge circulation (Milan 2013; Rajão & Jarke 2018; D'Ignazio & Klein 2020), on the other hand, knowledge production within algorithmic regimes has proven to be "violent" (McQuillan 2022) or "harmful" (Noble 2018; Eubanks 2018), with scholars and activists pointing to algorithmic discrimination (Gebru 2019; Prietl 2019; Chun 2021) or threats of surveillance and control (Lyon 2015; Zuboff 2019; Véliz 2021; Brayne 2021).

Against this background, it seems not only timely, but essential to study the implications that the observed turn to algorithms has, and will continue to have, for the epistemological, methodological and political foundations of knowledge production, sense making and decision-making in contemporary societies. In order to attend to this shift in society's "regime[s] of truth" (Foucault 1976/1980; Deleuze 1992), characterized by an "epistemic colonization" (Gillespie 2014) of computationally driven techniques and modes of knowledge production, it is necessary, however, to look beyond the mere technical nature of algorithms. We need to acknowledge and attend to the wider social, political, cultural, economic and material entanglements of algorithmic systems as they apply to the generation, accumulation, storage, connection and analysis of (big) data in the vein of producing, evaluating and circulating knowledge (e.g. Seaver 2019).

We argue that the concept of "algorithmic regimes" (Jarke et al. *forthcoming*) offers a productive analytical tool for doing so. The term *regime* thereby allows to conceptualize said transformation as "more or less stable socio-material assemblages which surface as coherent patterns of thinking and acting in the world" (Jarke et al. *forthcoming*; see also Foucault 1977, 1976/1980; Deleuze & Guattari 1987: 503). The qualifying term *algorithmic* further acknowledges that "the techniques and procedures which are valorised for obtaining truth" (Foucault 1976/1980: 93) today, are transformed due to the widespread deployment of algorithms and algorithmic systems. It allows to highlight the new quality accompanying the broad implementation of algorithmic systems across society, while at the same time keeping in mind that this current development has a history of its own, building, amongst others, upon longstanding efforts to govern the world with the help of techniques of measurement, quantification and standardization (e.g. Porter 1986). Put together, the concept of "algorithmic regimes" then draws our attention to the material-semiotic "apparatuses" (Barad 2007), cultures and practices that configure and regulate how (valid) knowledge is produced and by which means truth claims can be made in our society.

As our comprised work demonstrates, the concept of “algorithmic regimes” proves productive to study and understand (1) the *methods* necessary and adapt to research and design (better) algorithmic systems, (2) the ways *interactions* become re-configured within algorithmic regimes, and (3) the *politics* and power relations ingrained in algorithmic regimes. Throughout the remainder of this paper, we highlight some of the aspects of algorithmic regimes that stood out in our respective research, showcasing the versatility of “algorithmic regimes” as an analytical tool (section 2). Being convinced that algorithms are here to stay, we will end with some ‘speculations’ (Puig de la Bellacase 2017) about how the study of algorithmic regimes might open up pathways to desirable sociotechnical futures (section 3).

2 The Versatility of Algorithmic Regimes: Highlighting Methods, Interactions and Politics

In the course of our joint roundtable discussion we reflected upon the analytically productive moments of working with the concept of “algorithmic regimes”. The following depiction highlights some of the aspects of algorithmic regimes that this analytical tool helped us shed light on in our respective research.

2.1 Algorithmic Regimes and their Monsters

Juliane Jarke – drawing on her chapter with Hendrik Heuer – explored the trope of the black box as a *method* to study algorithmic regimes (see Jarke & Heuer *forthcoming*). The starting point of their argument is the observation that in many cases algorithmic systems are experienced as encountering and having to deal with black boxes (e.g. Pasquale 2015; Innerarity 2021; Noble & Roberts 2017; Heuer et al. 2021). Referring to black boxes in these instances covers two aspects: (1) an understanding of algorithmic systems as devices that produce and record data for further use, similar to data-monitoring systems in planes, trains or cars; and (2) an understanding of algorithmic systems that are – to some extent – unknown or “unknowable” (Seaver 2017: 5) and can only be grasped in relation to their inputs and outputs. One example is the current discourse around algorithmic transparency and algorithmic accountability which views algorithmic systems as black boxes that need to be “opened” and “unpacked” and as something whose inner workings ought to be made visible to outside observers and auditors (e.g. Bucher 2018; Pasquale 2015). For “opening” or “unpacking” these algorithmic black boxes, it is important to distinguish between algorithmic systems based on imperative programming and algorithmic systems that are based on machine learning (ML). In the second case, the code of ML-based systems cannot be studied as

instructional text in which the intentions of the programming subjects are inscribed, but requires a different approach (see also Heuer et al. 2021).

Jarke and Heuer (*forthcoming*) attend to this challenge and propose to understand algorithmic black boxes not as "a *thing* that we can encounter out there in the field" (Straube 2019: 178; original emphasis), but as a mode of *inquiry* and boundary making *knowledge practice*. They explore what exactly critical algorithm studies scholars aim to unpack when they examine the black box of machine learning (ML), what they consider to be within the boundaries of this black box and what is "othered" – or appears "monstrous" (Bloomfield & Vurdubakis 1999; Law 1991). To do so, Jarke and Heuer review three distinct modes: (1) the black box of ML data, (2) the black box of ML algorithms and trained models and (3) the black box of ML-based systems in practice. In reconstructing these three ML black boxes, Jarke and Heuer demonstrate different ways of accounting, relating, connecting and folding spaces, times and (social) actors through algorithmic systems. In sum, approaching black boxing as a method rather than a thing, allows to reconstruct different ways in which our social and technical realities come to be enfolded into algorithmic regimes.

2.2 Breaks and Frictions of Algorithmic Regimes

Stefanie Büchner – referring to a chapter co-authored with Henrik Dosdall and Ioanna Constantiou – highlighted the necessity to consider "organizations as active context" when studying algorithmic regimes (see Büchner et al. *forthcoming*). Using the case of predictive policing in Germany, they argue that organizations are more than just implementation sites or facilitators for algorithmic regimes. This "more", as they propose, can be explored with a lens of organizational sociology that analyses organizations as complex social systems (Büchner 2018; Luhmann 2018: Büchner & Dosdall 2021). In the case of predictive policing in Germany, the authors show that organizations like the police do not only enable but also restrict and relativise how algorithmic regimes unfold. Focussing on three organizational dimensions – goals, differentiation and goal conflicts – organizations come into view as active elements of algorithmic regimes.

In the German case of predictive policing, the impact of the algorithmic system deployed to prevent burglaries is limited because prevention turns out to be only a subordinate goal of police organizations. Instead, fighting crime and immediately reacting to incoming calls and emergencies are leading formal goals of the organziation and also have a higher reputation within the police culture. Also goals in organizations are not harmonistic elements that structure procedures without friction. When it comes to the algorithmic prevention of burglaries, a severe goal conflict weakens the algorithmic regime: The need for manual data work of the police force increased while, at the same time, the broad range of tasks was not reduced. As organizational datafication is often accompanied with

such non-automatable data production and holds organizational members accountable to do data work (Jarke et al. 2022), this goal conflict is very likely to intensify across organizational types in the future.

Paying attention to these shades of influence allows for a more nuanced understanding of the *organizational layer* of algorithmic regimes. This complex layer or active context that organizations form, consists not only of general characteristics but also of those typical for some but not all organizational types (Dosdall 2023; Dosdall & Löckmann 2023). This perspective encourages analysis to pay more attention to the relational analysis of organizational constellations to better understand what typical organizational constellations foster influential or less influential algorithmic regimes.

Paying attention to effects that are not only catalysing, but also causing frictions and breaks within algorithmic regimes can help to prevent over- as well as underestimating the ways that algorithmic regimes re-configure *interactions.* Studying the complex role of organizations as elements with own complexities within algorithmic regimes, then, complements approaches of keeping 'humans in the loop' (Danaher 2016).

2.3 The Logics behind Algorithms

Nikolaus Poechhacker – drawing on his chapter with Marcus Burkhardt and Jan-Hendrik Passoth – called upon us to look at the "principle of algorithmic systems" to analyze the *logics behind* algorithms in order to understand their impact (see Poechhacker et al. *forthcoming*). The contribution highlights how different algorithmic techniques (Rieder 2017) specifically require and order interactions within the wider algorithmic regime. This ordering power rests on the inscribed interaction assumptions in algorithmic approaches, and which actors and items are being related toward each other via an algorithmic logic. To showcase this, Poechhacker, Burkhardt and Passoth discuss the implications of two different algorithmic techniques within recommender systems: content-based filtering and collaborative filtering, and how they produce what has been called "calculated publics" (Gillespie 2014). This also raises immediately the more abstract yet important societal dimension of these ordering efforts: How can we understand algorithmic regimes as being part of a democratic public discourse?

Search engines and increasingly recommender systems have been identified as a problem for democratic societies as they supposedly fragment public discourse into what has been called "filter bubbles" (Pariser 2012). While information filtering is a necessary function within the ever-growing information ecosystem of our increasingly digital societies, it may also lead to political echo-chambers (Sunstein 2009), where democratic exchange between different political positions comes to a halt – and results in polarization. Or in other words: The algorithmic regime with recommender systems as a

central element orders interaction in a way that constructs a fragmented and potentially polarized public sphere – creating multiple, parallel and hardly or not intersecting publics instead of a common interaction and communication space.

While this is undoubtedly an issue for democratic systems[34], the insight that public discourse exists of multiple publics is not new. Dewey (2006/1927) already argued in the early 20th century that publics emerge in the plural. In his view, however, this was not a problem but a pragmatist possibility for bottom-up democracy. The question was – and is – then, how the emergence of different publics is accompanied and mediated. This raises especially questions for societies that rely increasingly on digital technology and digital media (see e.g. Marres 2007, 2017). Applying these insights to algorithms then raises the question of what the algorithmic logic is that mediates the formation of publics and how we can manage them in a democratic discourse. Having a closer look at two different techniques of recommender algorithms can illustrate this point. In their contribution Poechhacker, Burkhardt and Passoth discuss two ideal-typical approaches to recommendations: content-based filtering and collaborative filtering (Aggarwal, 2016). In both approaches the similarity of items is being calculated via a mathematical function. However, how they do so differs. Content-based filtering utilizes the available meta-data and/or descriptive data for the items. Thus, the algorithm mediates between the practices of (meta)data producers, within broadcasters mostly editors, and the consumption practices of the user. Collaborative filtering on the other hand tries to identify similar consumption patterns between users. Thus, the mode of comparison targets different users and relates their practices with each other. The latter approach does not rely on any form of meta-data, yet requires an extensive tracking data-set of the users to be able to compare them with each other. Both approaches of recommendations follow their very own approach to produce similarity of items – and thus recommendations – and how they assume and order the interactions within he broader algorithmic regime. The chain of relations connects users, producers, tracking software, meta-data databases, etc. – depending on which approach one would follow. Based on what technique is being utilized, different actors are becoming relevant and their interactions are being ordered based on the algorithms specific logic – which then results in different modi of the production of publics. How publics emerge and how we can shape them into a public sphere is thus also determined by the algorithmic techniques we deploy.

The goal of this short description is not to argue that algorithms and their regimes are all-powerful structures or actors that need to be abolished. Quite to the contrary, the contribution argues that identifying the logics behind algorithms and how the algorithmic

[34] This is of varying degrees true for “classical” theories of public discourse and democracy where Habermas is the most prominent scholar, but also for other political philosophies that are following the approach of radical democracy. For a detailed discussion see Helberger (2019) or Poechhacker (*forthcoming*).

system within organizes interactions, becomes an important vantage point for future interventions. For example, knowing that content-based filtering relates practices of editors and users via the production of meta-data, allows us to think about other moments of change than this would be the case in collaborative filtering. To build systems differently and to intervene in a wider algorithmic regime, it is important to understand how algorithmic systems mediate *interactions* – not only but especially regarding questions of democracy.

2.4 Power-Knowledge Nexus

Simon Egbert – by drawing on his theoretical conceptualization of predictive regimes as part of algorithmic regimes – drew our attention to the power-knowledge nexus and the limits of knowing in algorithmic regimes as well as the pre-structured nature of algorithmically generated knowledge (see Egbert *forthcoming*). In doing so, he especially highlighted two facets of 'knowing in algorithmic regimes': first, the general tendency of predictive analytics to focus on behavioral data and, second, their conservative tendency.

Like many other types and forms of algorithmic analysis, predictive algorithms use primarily data sets that mainly comprise behavioural data and do not contain any information on the underlying interests and motives of the persons concerned. In the case of recommender systems in online shopping, for example, this means that one can only read out from the existing data *that* a person has bought a certain product together with another item, but not *why* they have done so. Following Krasmann (2020), this implies a "logic of the surface", underlining that algorithms do not understand the things they are analysing in an hermeneutical way. Rather, "the world of algorithms (…) is flat" (Krasmann 2020: 2102), reducing human behaviour to a purely behavioural level: If I do this, then they do that. This is why Rouvroy (2013: 143), while analysing predictive algorithms, speaks of "data behavioralism" as a "new way of knowledge production about future preferences [*sic*] attitudes, behaviours, or events without considering the subject's psychological motivations, speeches, or narratives, but rather relying on data." This implies that predictive algorithms are only able to process certain kinds of data and, hence, that they are able to see the world only in a specially distored way, rendering opaque many of the things that make the world complex and heterogeneous.

Second, Egbert highlighted the fact that predictive algorithms tend to have a conservative tendency, since they neceassarily rely on data from the past, extrapolating this data into the future by assuming that the future will be like or similar to the past (e.g. Kaufmann et al. 2019: 685–686). This "conservative or reactionary nature" of predictive analytics is indeed signifying its "intrinsic weakness", because it makes it incapable "to apprehend the new, the abnormal or the spontaneous" (Lazaro & Rizzi 2023: 83), thus being inherently ad odds with social change (Prietl 2019).

Before this backdrop and following literature from governmentality studies (e.g. Dean 1999; Miller & Rose 2008), Egbert proposed to understand predictive algorithms as "rendering devices" in order to enable a focussed analysis of the field of vision these tools, as knowledge production tools, are equipped with. And these fields of vision are always and inevitably also fields of the invisible, since making something visible also means that other things are left in the dark (Bröckling et al. 2011). This selection in many cases lies in the conscious and unconscious decisions of people, which is why algorithms are ultimately always *political*, which again marks the close reference to power and knowledge, already highlighted in Foucault's (1976/1980) account of governmentality.

2.5 Possibilities and Politics of Algorithmic Regimes from the Inside

Katharina Kinder-Kurlanda – referring to her chapter co-authored with Miriam Fahimi – highlights the "various possibilities and problems of intervening in algorithmic regimes from the inside" and how we need to understand the politics involved in efforts to change algorithmic systems for the better.

In their chapter, Kinder-Kurlanda and Fahimi (*forthcoming*) look at those who are trying to improve on some of the well-documented issues of bias and discrimination that arise with algorithms. Specifically, they use a computer science-led project as a case study to investigate in more detail efforts of fixing the problems that many see with algorithmic regimes: an interdisciplinary EU project on developing bias-aware algorithms. The project addresses fairness issues mostly – but not only – at a technical level. Its setup is interdisciplinary and the project also offers spaces for both legal scholars and social scientists to participate in the projects' efforts to intervene in algorithmic regimes. This intervention results in a collective attempt to achieve better understanding of algorithmic bias and fairness issues and, out of this understanding, to develop solutions to mitigate bias issues for possible use by industrial partners involved in the project. The project is thus trying to change the algorithmic regime 'from the inside'.

In their chapter, Kinder-Kurlanda and Fahimi reflect on the interdisciplinary process of negotiating terms, concepts and decisions between the involved project participants, who were all part of different epistemic communities. These communities were also changing, with the topic of fair AI both becoming a focus of new, emerging communities and also effecting change upon methods and approaches in existing disciplines. The project as an interdisciplinary effort within this setting was in itself what the authors call 'a negotiated compromise' within the algorithmic regime. It imposed a certain vocabulary and defined what could be researched, how to recruit, what to disseminate and so on, building on existing and new ideas of how research was to be accomplished within the area of fair AI. In this, it turned out that project participants were often limited by the demands of discipline-specific expectations, methods and approaches of what successful academic

work meant within their specific career situation, e.g. as a PhD student in computer science or as a principal investigator in the social sciences. There were thus limits to what 'intervention' could be achieved for everyone within the project. For example, in interviews and observations of the interdisciplinary process, the authors found that the available methods for mitigating bias for the computer science PhD students could not necessarily satisfy their goal of achieving 'real fairness'. These students were thus finding ways to engage with wider perspectives on fairness and human rights, struggling to achieve strategic research goals while doing something 'meaningful'. The possibilities for intervention seemed limited and pre-structured for all involved in the project. At the same time, some ways of acting seemed easier than others and specific types of knowledge seemed to be easier to produce, e.g. cleaning a dataset in such a way that it did not contain gender bias. Such 'technical fixes' were seen to be very productive and promised success in publications, funding and gaining interest from industry.

The chapter therefore also highlights how those who are trying to 'fix' algorithms, also have a role in contributing to a new algorithmic regime – addressing bias may not suffice to make the algorithmic regime 'fair'. The new regime may again serve to allow some actors (and not others), to profit and to extend their control within specific settings – but it may also offer new and different ways for building fair algorithms and for intervening in unfair settings. Kinder-Kurlanda and Fahimi, thus, show how attempts to intervene in the algorithmic regime play out, by taking the intervention as a starting point to consider the *politics* of algorithms and the politics of *intervention*. Looking towards the present and the future, we may then ask how other attempts to intervene, especially regulation, facilitate very specific ways of addressing issues of bias and fairness and which ways of making algorithms fair become productive or successful, and what new inclusions or exclusion thus may be created.

3 Pathways to Desirable Sociotechnical Futures: Translating Algorithmic Regimes

Considering the manifold challenges, risks, and dangers accompanying the digital transformation of society, especially the "violent" and "harmful" effects of 'knowing in algorithmic regimes', the question arises of how studying algorithmic regimes can open up pathways to desirable sociotechnical futures. Committed to the idea that we need to think about how to (better) design, use and live with algorithmic systems, we think that current efforts to regulate said systems by ethics and/or legislation are too narrow as they strongly focus on individuals to be fixed – be it bad algorithms, biased data sets or incautious programmers and developers. This technosolutionist approach underpinning

current efforts to regulate algorithmic systems seems too limited and in the worst case may even stabilize the very algorithmic regimes set out to change 'for the better' (see also Prietl 2021). Instead we need more holistic interventions in algorithmic regimes that go beyond 'fixing' the algorithms.

Reaching beyond the algorithms first of all calls for us to attend to the whole algorithmic regime, the material-semiotic apparatuses, sociocultural norms and practices involved in bringing about algorithmic knowledge, and ask for where and how to intervene in order to bring about change. Put differently, it is not enough to focus on the technology, and how it may be fixed (again with technological means), but to consider the different elements of algorithmic regimes as potential points of departure for their reconfiguration. Such interventions in algorithmic regimes should be as democratic, inclusive, and participatory as possible. We therefore think that we can learn from the tradition of participatory design (see e.g. Costanza-Chock 2020; Mucha et al. 2022) for how to involve different social groups and communities in developing, and deploying algorithmic systems – and the pitfalls of such approaches, such as participation requirements that constitute uneven barriers to access for different groups of people. An essential prerequisite for establishing a broad societal exchange about the design, and use of algorithmic systems seems to be "data literacy" or more generally: the knowledge necessary to partake in such debates (see also Storms & Alvarado *forthcoming*). This is not necessarily technical knowledge and certainly not limited to technical expertise; instead what seems important is an understanding of the complex entanglements of the material-semiotic elements of algorithmic systems and their sociocultural, political, economic and environmental implications. In creating said understanding, (STS-)scholars can do important "translation work", to re-frame a term coined by Latour (1999). The concept of "algorithmic regimes" can contribute to such translation work by guiding research that allows for clarifying and making transparent the complex and ambiguous relationalities implied in 'knowing in algorithmic regimes'.

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