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Who is the algorithm? Interfacing the social, emotional, and algorithmic

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Abstract

Social media platforms have gained a firm foothold in the everyday and are increasingly important as work and civic spaces. At the same time, they are not neutral conduits for user creativity and expression; rather, they channel behavior and organize information through design and data-driven techniques. Today, algorithms have taken center stage in the discussion of platform power. In this dissertation, I interrogate the continually (re)emerging empirical landscape of algorithmic social media platforms, and the scholarly debates concerning them, at various moments and from different angles. The central puzzle motivating the investigation is that on one hand, autonomous and powerful algorithms are depicted as an exogenous force, controlling and manipulating social media users for the benefit of corporations, while on the other, algorithms and machine learning models are presented as simply reflecting human behaviors and consumer demand. In encountering their outputs, it is claimed, we are in fact coming face-to-face with ourselves and our societies.

The dissertation is comprised of four original publications and employs a mixed methods approach. Taking my methodological cue from work that situates the social relevance of algorithms in how they shape and are shaped by social action, I engage with algorithms as embedded in broader socio-technical assemblages and in the contexts in which they are used. I use computational methods, close reading of social media data, and interviews to analyze in context how platform affordances and algorithms activate public debate and subjectivity in platform-specific ways (Articles I and II). I access users' algorithm-related experiences and practices through qualitative analysis of online forum data (Article III), and engage in conceptual exploration to better understand the hybrid forms of agency emerging in and through the interactions among people, data, and algorithms (Article IV).

The four original publications enrich discussions that lie at the center of social media research, such as disinformation, social media activism, algorithmic content moderation, and human agency in relation to systems of automated decision making. The synthesized contribution of this thesis is then less about generalizing and theorizing based on a single empirical case and more about drafting a perspective to algorithmic social media platforms that applies across different cases and levels of analysis, from platform policy to everyday emotional responses to algorithms. Avoiding structural determinism on the one hand and praxeocentrism on the other, this perspective foregrounds how algorithmic social media platforms and their use(r)s mutually condition one another. However, this co-shaping takes place in an uneven landscape: if users are involved in molding algorithmic phenomena, they are only involved selectively, because they have little control over how their behavior becomes datafied and the purposes for which the algorithmic system optimizes it. A key argument of the thesis is that in light of the intimate and recursive human-algorithm relations that characterize today's digital media landscapes, we need to take seriously the generative nature of use without assuming or exaggerating its empowering qualities.

Abstrakti

Sosiaalisen median alustat ovat saaneet vankan jalansijan arjessa, ja niiden merkitys työ- ja kansalaisympäristöinä kasvaa jatkuvasti. Ne eivät kuitenkaan ole neutraaleja kanavia käyttäjien luovuudelle ja ilmaisulle, vaan myös voimakkaita taloudellisia, teknologisia ja hallinnollisia toimijoita. Algoritmit ovat nousseet keskeiseen asemaan keskustelussa alustojen vallasta. Väitöskirjan keskeinen tutkimusongelma koskee algoritmisen median paradoksaalista luonnetta. Yhtäältä tehokkaat algoritmit nähdään ulkoisena voimana, joka valvoo, kontrolloi ja manipuloi sosiaalisen median käyttäjiä yritysten eduksi. Toisaalta algoritmien ja koneoppimismallien oletetaan yksinkertaisesti heijastelevan inhimillistä käyttäytymistä ja kuluttajien kysyntää. Tästä jälkimmäisestä näkökulmasta katsoen, kohdatessamme niiden tuotokset, meidän voikin ajatella olevan tekemisissä itsemme ja yhteiskuntamme kanssa.

Väitöskirja koostuu neljästä alkuperäisjulkaisusta, joissa käytetään useita eri tutkimusmetodeja. Tarkastelen algoritmeja suhteessa laajempiin sosioteknisiin kokonaisuuksiin ja konteksteihin, joissa niitä käytetään. Nämä neljä alkuperäisjulkaisua rikastuttavat sosiaalisen median tutkimuksen keskiössä käytäviä keskusteluja, koskien disinformaatiota, aktivismia sosiaalisessa mediassa, algoritmista sisällön moderointia sekä ihmisten toimijuutta suhteessa algoritmisen päätöksenteon järjestelmiin. Väitöskirja ei siten pyri yleistämään ja teoretisoimaan yhden empiirisen tapauksen perusteella vaan osoittaa useiden erillisten tutkimusten kautta, kuinka algoritmiset sosiaalisen median alustat ja niiden käyttö

ehdollistavat toisiaan. Tämä suhde on kuitenkin epätasainen: käyttäjät pystyvät osallistumaan algoritmisten ilmiöiden muokkaamiseen vain osittain, koska heillä on vähän vaikutusvaltaa siihen, miten heidän toimintansa datafioituu ja mihin tarkoituksiin algoritminen järjestelmä sitä optimoi.

Väitöstutkimuksen perusteella sosiaalisen median algoritmiset järjestelmät ovat laajalle levittyineitä, jatkuvasti muuttuvia ja komplekseja systeemejä. Ne luovat ennalta-arvaamattomia takaisinkytkentöjä ja sosiaalisia seurauksia, kun ne oppivat ihmisten käytöksestä ja ihmiset taas osaltaan reagoivat niiden logiikkaan. Mikään yksi taho tai henkilö ei siten ole hallinnassa tai välttämättä edes tietoinen kaikista algoritmisen järjestelmän sisältämistä säännöistä, sen kehittyessä vuorovaikutuksessa sosiaalisen maailman kanssa. Tutkimus päätyykin kysymään, mitä tämänkaltainen hajautunut toimijuus tarkoittaa alustojen suunnittelulle ja hallinnalle. Tästä näkökulmasta korostuu tarve vastata nopeasti ilmeneviin haasteisiin ja eriarvoistaviin vaikutuksiin sekä oppia käyttäjien kokemuksista. Käyttäjät ovat usein ensimmäisten joukoissa havainnoimassa ja tuottamassa algoritmisten systeemien yhteiskunnallisesti merkityksellisiä vaikutuksia.

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Table of Contents

Original publications

Article I:

Savolainen L, Trilling D and Liotsiou D (2020) Delighting and detesting engagement: Emotional politics of junk news. *Social Media + Society* 6(4). DOI: 10.1177/2056305120972037.

Article II

Savolainen L, Uitermark J and Boy JD (2022) Filtering feminisms: Emergent feminist visibilities on Instagram. *New Media & Society* 24(3): 557–579. DOI: 10.1177/1461444820960074.

Article III

Savolainen L (2022) The shadow banning controversy: Perceived governance and algorithmic folklore. *Media, Culture & Society* 44(6): 1091–1109. DOI: 10.1177/01634437221077174.

Article IV

Savolainen L and Ruckenstein M (2022) Dimensions of autonomy in human-algorithm relations. *New Media & Society.* Epub ahead of print 14 June 2022. DOI: 10.1177/14614448221100802.

1 Introduction: Social media as algorithmic systems

Where to start writing a dissertation on social media and algorithms? From the empirical phenomenon, "Today, our digital lives and online practices are increasingly shaped by algorithmic decisions"? Or from the public debate animated by opposing interpretations of the phenomenon, "Social media algorithms are controversial: they give rise to hopes and fears, and questions over their ability to promote public value remain unsettled"? Or from the more erudite scholarly conversation that has turned to studying how the phenomenon is discursively constructed, "Social media algorithms have moved from being a computer science topic and into a broader cultural and regulatory concern"? Perhaps the fact that each of these tentative questions feels overly rehearsed reveals something about the saturation of the field. For social studies of algorithms, what moves are left to make? I suggest that what is needed are not necessarily new, revolutionary accounts about algorithmic power, but rather open-ended perspectives that are able to accommodate the dynamism and ambivalences of platformed social life.

The value of such a perspective is illustrated by a simple comparison between using machine learning to optimize energy use in a data center and using it to select which symbolic products to recommend or suppress. In the former example, the outcomes of using an algorithmic system are likely to be predictable, perhaps even certain, as the whole process can be modeled and controlled and its

effects measured from the outset. By contrast, the latter case immediately poses difficult, troubling challenges and introduces novel uncertainties: Who is to decide what counts as valuable and worthy of attention? How will technology affect the distribution of visibility and power? How will the actors affected by this measuring experience and reflexively react to it? This comparison suggests that with algorithmic platforms, we will continue to grapple with disagreements and unintended consequences: in social settings, algorithms "introduce complex mechanisms into already complex situations" (Rieder, 2020: 220). Social scientific research and understanding is needed to trace these processes, put disagreements into perspective, and identify techno-economic developments that need more effective societal piloting.

In this dissertation, I interrogate the continually (re)emerging empirical landscape of algorithmic platforms and the scholarly debates concerning them at different moments and from various angles. The four original publications that are part of this thesis enrich important discussions on key topics in social media research, such as disinformation, social media activism, algorithmic content moderation, and human agency in relation to systems of automated decision making. While the empirical foci of each article is different, they share a perspective on digital life in which the cultural and experiential realms are regarded as not only transformed by data, platforms, and algorithms but also as transformative of them. Weaving together these four articles, the synthesized contribution of this thesis is less about generalizing and theorizing based on a unified empirical case and more about drafting a perspective for studying social media algorithms that applies

across different cases and levels of analysis, from platform policy to everyday emotional responses to algorithms.

This specific point of view can be clarified by the notion of *interfacing*. In its most common usage, the term interface refers to the user interface, a point of contact through which a person can communicate with a computer through a command line (text-based interface) or, more commonly, symbols and visual metaphors (graphical user interface). Interfaces allow us to connect to the vast network of humans and the technology behind them, technology that is activated every time we click, browse, like, comment, or watch. From a cultural perspective, an interface can be thought of as a shared, porous boundary, drawing attention to the reciprocal nature of human-technology relations (Hookway, 2014). Both of these meanings are important for the research approach of this dissertation, which takes seriously the technological features of algorithmic systems on the one hand and focuses on the mutual shaping of human and technical agencies on the other. Moreover, the active form of interfac*ing* suggests that the action possibilities offered by algorithmic platforms are not determined by their designers but rather emerge and evolve in interaction with people's perceptions, culture, practices, and the social context in which they are immersed.

So far, so familiar. Most crucial for sketching out my research perspective is the metaphorical dimension of interfacing. While we typically associate interfaces with information technology, *interfacing* has another meaning in making clothes. It is the sturdy fabric attached to a garment's underside: interfacing adds *body* to the garment. This simple metaphor carves out space for articulating the research

approach advocated more fully in this thesis. The mainstream scholarly discourse is mostly focused on digital platforms' "outside," depicting them as powerful architectures that are working as intended. Their structural role in digital ecosystems appears to grant them influence and robustness as if on its own, such as through more or less automatically unfolding systemic processes like network effects. Their algorithms are regarded as successfully subjecting informal sociality to and formatting it in accordance with economic interests (Couldry and Meijas, 2019a, 2019b; Zuboff, 2019). Meanwhile, interfacing highlights that in addition to the role of platforms as "facing outward" as influential economic and political actors, they also "face inward" as technologies with which we form practical and affective relations in our daily lives. These ongoing engagements contribute to the emergence of digital platforms as broader technological, political, and cultural constructs. Everyday behavior buttresses and renews platforms and their algorithmic logics and dynamics in ways that should not be taken as a given or viewed as determined by technology or its builders. Figuratively speaking, user engagements function as a thread that weaves together the external (technical design, algorithmic rules, economic logic) and the internal (meaningful everyday practices, emotions, subjectivities).

The task then becomes to trace this interfacing thread and to locate the points of contact where algorithms and people mutually shape one another: to be sure, this refers to the sections of neat and mechanical stitching where corporate intentions and everyday aims appear to seamlessly align. But there are also the areas that are patchy, redone, improvised, or that have unraveled. Crucially,

interfacing is also the part of the garment that is closest to the skin: metaphorically, it highlights the importance of focusing on how the affective and intimate and the technical and instrumental come together in platformed practices. In the rest of the introduction, I study the discussions on algorithms and platform power from the perspective of such interfacing.

Moving on from the algorithmic drama

The emergence of platforms as key mediators of social life and powerful political and economic actors has inspired a wide range of responses among scholars. On the level of political economy, theorists have suggested terms such as surveillance capitalism and data colonialism to make visible the exploitative and extractive logics at the core of the platform economy (Couldry and Mejias, 2019a, 2019b; Fuchs, 2018; Zuboff, 2019). These accounts point to datafication – a process in which the qualitative aspects of life are converted into quantified data – as a key concern, critically assessing the changing power and accountability relations between data subjects and owners. Meanwhile, the field of platform studies has approached the diverse technological, institutional, and market dynamics leading to concentration of power in digital ecosystems, making use of use concepts like platform society and platform infrastructuralization to expose how platforms' influence spills over into other sectors and society at large (Helmond et al., 2019; Plantin et al., 2018; Vaidhyanathan, 2011; Van Dijck et al., 2018, 2019). As a technological entity, a platform's control over the activities and connections it enables is expressed in

code and executed computationally (Helmond, 2015; Plantin et al. 2018). The field of platform studies has traditionally located user agency in the productive tension between stability and variability: platforms set boundaries around and format users' creative energies and inputs. Despite the control that platforms exert, in much of the earlier literature, they still appear as a technological and organizational form that can promote or at least allow for novelty and innovation (Baldwin and Woodard, 2009; Bogost and Montfort, 2007; Manovich, 2009).

Meanwhile, research on algorithms also appears to suggest a narrowing of the space for agency in platformed life. The critical literature discusses algorithms as constituting a "technological unconscious" whose effects in our lives and actions are concrete and real, but which we do not easily perceive because of their "sunken" and technologically embedded nature (Beer, 2009, 2017; Wood, 2017). The role of algorithms in personal and public domains is approached with terms such as algorithmic power (Beer, 2009; Bucher, 2012, 2018) or governance (e.g., Katzenbach and Ulbricht, 2019; Schwarz, 2019, 2021; Sinnreich, 2018). Algorithms are viewed as having the power to shape social reality and affect the conduct and attitudes of individuals or to increase the legibility of everyday sociality, turning it into an object of unprecedentedly intense calculation, prediction, and modulation. In other accounts, the worry is not algorithmic power as such, but more selectively the tendency of algorithmic systems to automate the historical inequalities that are contained within training data, a phenomenon known as algorithmic bias (cf. Baker and Hawn, 2022; Kordzadeh and Ghasemaghaei, 2022). In each case, algorithmic operations are thought of as particularly problematic due to the fact that they often

go unrecognized or uncriticized. Even if users were to know that algorithms are at play, it is suspected that their decisions might possess a certain authority: people rarely inquire about their politics, because in cultural imagination data, calculation and technology are associated with a reduction in human bias and error. The technological introduction of qualitatively novel kinds of errors, uncertainties, and risks is less discussed, although it is widely recognized and extensively debated in the sociological literature.

The critical data and algorithm research outlined above has created a sense of urgency around algorithmic developments, setting the scene for public debate and regulation. It has associated various social ills with algorithms, from mass manipulation and the proliferation of biased, gendered, and racialized ways of ranking and profiling people to the automation of previously qualitative human judgments regarding value and quality in ways that may have harmful consequences. However, these fields of inquiry are often characterized by what Malte Ziewitz (2016) calls "algorithmic drama": they reinforce a narrative about algorithms as agentic, potent, and consequential as well as inherently opaque and not accountable for their decisions. Moreover, while algorithms are viewed as acting on society in various ways, the reverse is discussed less often. Quoting a number of influential articles and books, Ziewitz illustrates how algorithms are depicted as operating autonomously and without societal pushback. They appear as a coherent analytical category rather than as an entangled part of distributed, socio-technical decision-making practices. These tendencies are problematic, not least because tracing actual empirical developments illustrates that many of the

algorithm-related risks stem from unintended consequences due to malfunction, error, or user appropriation. The "algorithmic drama" risks losing sight of such occurrences and actualities, given that they relate to the vulnerabilities, fallibility and contextuality of algorithmic systems rather than to their potency and autonomy.

Have we since moved on from the algorithmic drama, though? As often happens with the study of new, powerful (media) technologies, after an initial fearful and moralizing response (Livingstone, 2019), the tide appear to be turning. Scholars such as Louise Amoore (2020) and Nick Seaver (2017) have influentially pushed back on notions of algorithms as wholly unaccountable or inaccessible, pointing toward how algorithmic systems and decisions involve various points of entry. And if much of the platform and algorithm studies literature was initially focused on what algorithms do, more and more researchers are instead turning their gaze to what is done *to* and *with* algorithms in practice, thus bringing people back into the picture. Qualitatively oriented researchers have begun to analyze and contextualize the myriad ways in which users make sense of, act on, and critically evaluate algorithms, despite their direct inscrutability as code (e.g., Andersen, 2020; Bishop, 2019; Velkova and Kaun, 2021; Ytre-Arne and Moe, 2021). Drawing from fields like audience research and material culture studies, researchers have described these moves toward studying human agency as shifting the focus from *encoding* to *decoding* algorithms, from top-down aims baked into algorithms by platforms and toward the varied ways in which users make sense of algorithms in daily life (Lomborg and Kapsch, 2020). Using other terms, there has been a shift

from regarding algorithms *in* culture to algorithms *as* culture, from external, technological forces changing some "properly" cultural domains toward algorithms as cultural artifacts in and of themselves, both reflecting their designers' worlds of reference and being appropriated in various meaningful social and cultural practices by users (Seaver, 2017).

While foregrounding the interpretive agency and cultural resourcefulness of users is a classic countermove to cultural criticism leveled at media technologies and media "effects," it has been become newly relevant by the observation that with self-learning technologies, users' interpretations and practices are not limited to the personal or domestic sphere but are directly and materially feedback-looped with the systems themselves (Bishop, 2019; Rader and Gray, 2015). One can, however, raise the question of whether user- or audience-oriented research has fully addressed the implications of its own observations. If algorithms reflect the ways in which users appropriate and respond to them, *contra* concerns of algorithmic power and control, a counterargument can always be forwarded: *the algorithm is us*. For an effective critique of algorithmic power, we appear to need a more nuanced and innovative understanding of agency itself, to which this dissertation also sets out to contribute.

Despite this caveat, the everyday-oriented literature has opened up vistas into the multiplicity of algorithms as they are enacted in practice, and it has been important in taking stock of and informing researchers about the state of differently positioned users' algorithmic literacy and "expertise" (Bishop, 2019). I concur with Schulz (2022), according to whom the next step should be to find ways

to theorize and study processes of platformization and algorithmization without reverting to either structural determinism or praxeocentrism and instead reconnect the two perspectives or levels of analysis in order to describe how technology and its use mutually shape each other. Put another way, we need to examine how decoding recursively influences encoding and the other way around. For instance, precisely because automated decision making is not applied to a static world but to one where users respond and react to it in creative and antagonistic ways (cf. Cameron and Rahman, 2022; Gregory and Maldonado, 2020; Heemsbergen et al., 2022), platforms need to continuously adjust their algorithms. Furthermore, in so doing, they have to "negotiate the multiple interests of divergent user groups, advertisers, third parties and developers" (Marres and Gerlitz, 2016: 27), meaning that their algorithms cannot be viewed as straightforward materializations of corporate aims but as complex systems that interface multifarious purposes, values, and interests and creating economic value all the while (Van Dijck et al., 2018).

Keeping these criticisms in mind, this dissertation seeks to contribute to the current discussion by interrogating linkages between everyday platformed experiences, emotions, and interactions and broader social-algorithmic patterns, logics, and dynamics. It thus highlights how even controversial technological processes – from the algorithmic ranking of social status to the viral spread of disinformation – are coproduced in meaningful and reflexive social activity. If the very challenge of designing better platforms and algorithms lies in understanding the complex ways in which technical and social systems interact with and mutually

condition one another, this thesis takes a humble step in that direction. Through several case studies, the articles that comprise it seek to understand why socially embedded actors engage with algorithmic social media in the ways they do, how their agency and participation are algorithmically formatted, enhanced, or undermined in the process, and what kinds of broader political and ethical questions their experiences bring to light.

In early research, the internet was thought of as a realm separate from daily life; today, it is clear that no such separation exists. The structural position of the biggest digital services, including social media platforms, enables them to coordinate and optimize network effects and extract value from the circulations and interactions of participatory digital culture on a nearly global scale (Langley and Leyshon, 2016). These socio-technical intermediaries and economic arrangements do not merely recommend content, they distribute it; they do not just represent public sentiment or measure consumer demand, but steer them; and their algorithmic logics have come to shape cultural production all the way through. The policies of their corporate owners and the algorithms that implement them matter for the rights and values that constitute democratic societies, such as freedom of expression, privacy, and autonomy. Thus, algorithmic decisions touch upon us not only as consumers or customers but also as citizens. In sum, social media platforms have become so influential that we must critically assess their algorithmic operations and the effect they are having on us. This is no longer a question of academic interest, but an issue of indisputable and acute public relevance.

2 Social relevance of algorithms

Previously, social media posts were organized in chronological order. On platforms like Instagram or Twitter, the reach of content was determined more strongly by the number of one's subscribers or whether those subscribers shared that content with still other recipients (Narayanan, 2023). According to platform companies, this meant that users missed much of the content they would have liked to see – and arguably spent less time on their services as a result. Today, social media platforms employ sophisticated algorithmic systems for personalizing experiences and governing information. They rely heavily on automated tools to rank and recommend information to people and people to one another. Machine learning algorithms are used to find patterns in behavioral data, select what is worthy of attention and for whom, and enact content policies and guidelines (cf. Bucher, 2018: 25). Indeed, many leading machine learning scholars are employed by platform companies like Meta and Google, and these companies have their own, richly resourced departments for artificial intelligence (AI) research and development.

To contextualize the discussion on algorithms in digital media, in this chapter, I explore ways in which researchers have unpacked algorithms on a more conceptual level. Algorithms have quickly moved to center stage in social research (Ziewitz, 2016), with studies focusing on the role of algorithms in, among others, financial crises (Karppi and Crawford, 2016), security (Amoore and Raley, 2017), activism (Velkova and Kaun, 2021), search engines (Noble, 2018), popular culture (Hallinan and Striphas, 2016), and the provision of public services (Dencik and

Kaun, 2020; Hintz et al., 2019; O'Neil, 2016). Below, I flesh out what makes algorithms an important topic of social scientific inquiry. In so doing, I present an expanded understanding of algorithms as algorithmic systems and argue that the social relevance of algorithms originates from their role as the responsive, performative, decision-making parts of code. This discussion also lends support to the argument regarding why it is important to separate "algorithms" from "platforms" as overlapping yet separable entities, in particular stressing their malleability, liveliness, and complexity.

2.1 Algorithms: From ideas to systems

Algorithms are typically understood as a set of rules that process input (instructions and/or data) to computationally produce a desired outcome (Kitchin, 2017: 16; Miyazaki, 2012). We are often told the first algorithm was created in 300 BCE by the ancient Greek mathematician Euclid, who discovered a formula for recursively calculating the greatest common divisor of two integers (Russell and Norvig, 2010: 8). (The origins of the word algorithm, though, come from the name of al'Khwārizmī, a Persian mathematician from the ninth century CE). An algorithm is often compared to a recipe and has a similar meaning to words such as procedure, technique, or routine (Knuth, 1997), reflecting the nature of algorithms as procedural, consistent, and governed by rules. While these metaphors are useful, it should be noted that in computer science, there are further constraints and requirements for a computational method to count as an algorithm. These include *definiteness*, which refers to how each rule should have a precise, unambiguous, and

computer-implementable definition, *finiteness*, meaning that an algorithm should terminate after a finite number of steps, and *effectiveness* with regard to computational resources (Knuth, 1997).

Strictly speaking, in these classical definitions, an algorithm need not be realized in a program or software but can exist as an idea or proposition about how to solve a problem. Therefore, one should be able to express a specific algorithm in both words and symbols or in any computer language. As Colburn puts it, an algorithm is "an abstraction of a problem solution in the form of a terminating sequence of steps" (2000: 168). There are a plethora of well-known algorithms for common problem types such as sorting, graphing, or searching. Data scientists rarely create algorithms from scratch, which also means that although digital platforms' systems for ranking content are opaque and their algorithms' technical specifications are unknowable for various reasons, the concepts and ideas they lean on and their general logics and histories are often available for social scientific analysis (cf. A Mackenzie, 2015; Rieder, 2020).

Today, machine learning algorithms are increasingly important. They are at the heart of current attempts to build AI, as they enable machines to gain an increased level of autonomy through "identifying and extracting patterns from large datasets that accurately map from sets of complex inputs to good decision outcomes" (Kelleher, 2019: 4). In traditional programming, the precise solution to the problem is known in advance, and the computer follows manually coded rules to arrive at the desired output. A simple example is sorting an alphabetized list based on if-then rules (Bucher, 2018). Meanwhile, in machine learning, the machine

"learns" to solve a task by itself, enabling computers to tackle more complex problems and facilitating computer programs that rely on data rather than engineers' intuitions, purportedly saving effort from human programmers (Domingos, 2012; Kelleher, 2019). Learning can be said to happen if the system's performance in the task improves with "experience" (Mitchell, 1997), which is understood as "a dataset of historic events" (Kelleher, 2019: 253). For instance, in 2010, Facebook's EdgeRank algorithm was still a manually programmed recipe for ordering the posts users saw on their news feeds (Narayanan, 2023). Before long, that technique was replaced by machine learning. Documents leaked in 2021 shed light on the formula according to which posts were then scored. At the core of the algorithm is a machine learning model that predicts engagement; more specifically, the likelihood that a given user will interact with a post in a specific way, with different interactions given different weights (Narayanan, 2023).

Machine learning is typically divided into rough categories depending on the type of guidance and desired output involved. In *supervised learning*, the system learns from pre-categorized data to extract the relationship between "input features and output categories or target variables" (Rieder, 2020: 250). In the computer science literature, this mapping is called a function or model (Kelleher, 2019). With the model, new inputs can be classified, such as whether incoming email is likely to be spam. In *unsupervised learning*, the training set is not categorized according to desired outputs, and the aim is typically to discover patterns or find some sort of structure in the data, such as clusters. *Reinforcement learning* refers to systems that learn to solve problems and act in an environment through positive

and negative feedback, seeking to maximize total cumulative reward (Bhatt, 2018). The technique is used, among other purposes, in online control tasks like robot control or game playing (Kelleher, 2019: 28). Note that these categories are analytical separations, with actual systems often blending their features: semi-supervised learning, for instance, combines supervised and unsupervised methods to classify new datasets with less reliance on pre-labeled data (Bucher, 2018).

The notion of learning algorithms is important from a social science standpoint: as Airoldi notes, "particular historical conditions, cultural dispositions and social structures" become encoded into algorithmic systems as they are trained in socially structured data contexts and by people who use them in ways that may be difficult to foresee (2021: 45, 66). As a result, both computer scientists and social scientists agree that the behavior and social and ethical consequences of algorithmic systems in operation cannot be "read" or deduced from code alone (cf. Rahwan et al., 2019). In practice, algorithms and social actors are constantly influencing one another, creating multiple levels and various patterns of feedback (Nathan and Wright, 2022). Indeed, digital sociologist Deborah Lupton (2018) calls data assemblages "lively," foregrounding their heterogeneous, contingent, and continuously evolving character. Interestingly, while first-order cybernetics regarded feedback as a mechanism of control and constancy, keeping the system in a static state, in light of algorithms embedded in messy, reflexive social environments, the notion today appears to point toward unpredictable and emergent behaviors instead (Amoore, 2019b). And while most of this discussion is focused specifically on machine learning, Rieder (2020) reminds us that even

non-learning algorithms that follow deterministic principles can yield non-deterministic, uncertain, and unintended outcomes.

As noted above, algorithms as problem-solving formulas are more than their concrete, executable implementations; they also exist as propositions (Dourish, 2016: 2). But they are also *less* than their concrete instantiations (Dourish, 2016) because to become operational, algorithms need to be "implemented in a programming language [that] issues a list of computer instructions which carry out the solution steps" (Colburn, 2000: 168), and "work in tandem not only with data structures but also with a whole assemblage of elements, including data types, databases, compilers, hardware, CPU, and so forth" (Bucher, 2018: 22; Kitchin, 2017). As suggested, specific machine learning algorithms would be useless without the data on which they have been trained. Moreover, social scientists have emphasized the human work involved in the production and functioning of algorithmic systems (cf. Kitchin, 2017; Seaver, 2018). For instance, incorporating an algorithm into a real-world operating environment requires making a multiplicity of consequential decisions and specifications, from making modifications to input data to adjusting various parameter values and model settings (Amoore and Raley, 2017; Rieder, 2020; Seaver, 2018). In sum, while algorithms as conceptual entities are logical formulas with clear beginnings and ends, algorithms as systems are ongoing socio-technical gatherings that intertwine dynamic relationships between not just technical objects like code and datasets but also people and their goals. Seaver's eloquent description of how recommendation systems are tweaked illustrates this point especially well:

> Whenever something goes wrong – a public scandal breaks out, a key metric crashes, a manager gets a bad recommendation – the fabric is rewoven, altered by a cascade of human actions. Although this weaving can take many forms, everywhere there are people making little stitches, tacking software to the social world. (2018: 377)

And while an algorithm is an idea about how to solve a problem, real-world algorithmic systems such as those involved in recommendation might need to solve several problems at once, from suppressing inappropriate content to recommending content based on behavioral inferences. These goals could also be in conflict, as illustrated by the observation that social media posts experienced as harmful by some might also be highly popular, engaging, and widely circulated (Roberts, 2018) and thus viewed as profitable by others. A working system should be viewed as an outcome of complex negotiations between different technical, social, and economic commitments.

Social researchers thus study algorithms in operation as embedded in, linking with, and preconfiguring wider socio-technical assemblages from financial markets (Karppi and Crawford, 2016; Seyfert, 2016) and material infrastructures (Crawford, 2021; Hogan, 2015) to gendered digital production (Bishop, 2019). It is not the algorithm as a conceptual entity, its precise instructions, or underlying theorem that has real-world impacts, but the systems of which it is part and the ways in which it is "incorporated within specific sociomaterial practices" (Bucher, 2018: 39). To study algorithms in society, one must factor in the sociomaterial contexts of design, application, and use. It is crucial to consider where and to what ends

algorithms are employed, who has engineered them, the data with which they have been trained, and the forms of knowledge about human behavior they incorporate. Social researchers have found this more holistic approach to algorithms to enable a broader set of sociologically relevant questions – relating, for instance, to how algorithms are "reconfiguring how systems operate, enacting new forms of algorithmic governance and enabling new forms of capital accumulation" (Kitchin, 2017: 26), who is able to influence algorithmic operations and how, what kinds of political and material interests are involved, and how algorithmic operations are lived with, imagined, experienced, and responded to in daily life (Bishop, 2019; Lomborg and Kapsch, 2020; Ruckenstein, 2023; Siles et al., 2020; see Article IV).

2.2 Decisive algorithms

One might wonder about the use of the very notion of an algorithm if the perspective is broadened from algorithms as concepts all the way to algorithms as layered and heterogenous socio-technical systems. Why retain the notion of algorithm in the first place? Why do algorithms matter as a conceptual category in social research? Put another way, what makes algorithmic techniques, practices, and phenomena analytically specific? Algorithms concern operations performed on data, but from the social perspective, they do not perform just any kind of operation. Researchers have located the social relevance of algorithms in their nature as the performative, decision-making parts of code (Amoore and Raley, 2017; Beer, 2017; Schwarz, 2021). An observation follows: If algorithms, in their decisiveness, are able to alter sequences of events or influence human choices, they

thus have the power to shape social reality (Beer, 2017; Bucher, 2018; Schwarz, 2021). More specifically, algorithmic decisions can inform and even influence human decisions; in systems characterized by high degrees of automation, they can replace them completely.

While social studies of technology have a long history of exploring the technologically mediated and shaped character of human behavior, there appears to be something novel about a situation where "what is delegated to material objects is not the realization of decision but deliberation and decision making itself" (Schwarz, 2021: 83). What might this novelty be? For a long time, we have given control to laws and bureaucratic processes that effectively make decisions for us, and they too can be viewed as algorithms in that they rely on procedures and rules. However, these rules are debated and agreed on in advance, can be decoded after a decision is made, and typically leave room for human discretion. Especially with automated decision making involving machine learning, novelty might then relate to the opacity, to the scalability of automated errors and biases as opposed to human ones, and to changes in the distribution of responsibility.

In addition to procedural and ethical concerns related to algorithmic decision making, social researchers have stressed that the ordering of people, information, or cultural products is a political activity in and of itself. Taina Bucher (2018) discusses the politics of algorithms in the context of social media as relating to their symbolic power to conjure up worlds in particular ways, "dictating systematic prominence for some sites, systematic invisibility for others" (Introna and Nissenbaum, 2000: 171). When it comes to quantifying multidimensional

qualitative phenomena, algorithms – despite their technicality – are not neutral but clearly value-laden tools. The algorithmic ranking of "trending" topics, "newsworthy" articles, or "compatible" dating partners all frame the domain of application in ways that imply "various kinds of conceptual and normative commitments" (Rieder, 2020: 11). For instance, the above-mentioned scoring of posts by Facebook sought to keep users engaged by highlighting "meaningful" content, operationalized as the affinity of the poster to the receiver on the one hand and predicted engagement on the other. However, the latter was given greater weight, leading to the algorithmic propagation of divisive and controversial content (see section 6.1).

At the same time, as the broadened conception of algorithms as systems involving various kinds of actions suggests, algorithmic decisions can neither be wholly reduced to those of their designers nor to values that are themselves non-technical in nature. Media theorist Bernhard Rieder argues convincingly that algorithms' "capacity to run billions of data points through billions of iterations of small calculative steps means that they 'think' in ways that are not only opaque, but potentially strange and hard to fit into established categories" (Rieder, 2020: 12). This point is well illustrated by the debate around AI "hallucinations," the term for outputs that have a high confidence level but do not meet user expectations. According to research in the field of image detection, outputs that seem unintuitive or erroneous to humans may sometimes be caused by the ability of algorithms to perceive microscopic patterns that people do not, despite their predictive nature (Ilyas et al., 2019; see also Nakkiran, 2019). This and other fundamental differences

between human and machine interpretation calls into question whether even computer scientists can always "explain how their algorithms make decisions" (Matsakis, 2019).

In their ability to extract knowledge from amounts of information that far exceed human-scale reasoning and process millions of features[1] at once to arrive at an output, algorithmic decisions are often regarded as having a certain authority. This is reflected, for instance, in popular discourses about algorithms knowing us better than we know ourselves, whether as individuals or as collectives. However, I believe that it is important to resist such claims because it is not self-evident that these systems actually deliver profound insights about messy social phenomena (cf. Narayanan, 2019). Take sentiment analysis, for example: it typically operates by ranking words based on their "polarity" (negative or positive emotional valence). Early versions simply employed a dictionary of words scored between -5 and +5 regardless of their context within a sentence of larger text (see senti-strength http://sentistrength.wlv.ac.uk/). Even more sophisticated machine learning-based versions of the method still routinely fail to identify sarcasm or irony.

To be sure, sentiment analysis might enable a firm to glean the kind of light in which a given topic is being discussed by Twitter users in the aggregate, but it arguably neither involves nor is interested in a more theoretical discussion regarding the role of affect and emotion in social life and related conceptual distinctions; see Benbouzid (2019) for a similar argument in the context of predictive policing. In short, when algorithmic techniques are applied, what is at

[1] Features refer to the measurable properties of a phenomenon; they are related to what are called independent variables in statistics.

stake is not necessarily comprehension (Andrejevic, 2013) but efficiency: a solution that makes useful predictions in relation to some functional purpose (Lowrie, 2017). What passes as a good solution is, of course, sensitive to context and contingent on the goal that is being optimized. In domains like targeted advertising, for instance, the algorithm needs to get the prediction right in only a fraction of cases to create value, making the endeavor seem more like betting on future behavior (Zuboff, 2019) and less like a practice with meaningful epistemic significance; that is, being able to explain or understand the phenomenon in question.

From the organizational perspective, prediction is profitable: it is thought to reduce uncertainty and thus to grant institutions more power over social activity (Schwarz, 2021). Yet, as has been pointed out, whether or not the predictions made by algorithms are correct or describe some pre-existing reality is often somewhat beside the point. Algorithms are world-making precisely because they not only represent but also actively intervene. They enable connecting prediction directly and immediately with a set of predefined responses such as directing content for human review, removing it from the recommendation pipeline, or amplifying its reach. The notion of algorithmic decision making thus comes down to this: the system acts on its assessment of a situation. Moreover, because algorithmic decisions come with degrees of certainty, to decide means not just choosing between options but choosing between possible *futures* (Amoore, 2019a). When upgrading content based on a prediction of its success or marking a person as a high-risk lender based on the calculated probability of a loan default, machine learning algorithms become implicated in social processes, steering them along

certain trajectories instead of others that could well have been possible, although they were less probable based on past data.

The key takeaway of this chapter has been to suggest that algorithmic decision making enables socio-technical systems to take on an increasing level of responsivity in channeling social and economic activities (Hayles, 2020). They process data and react to it in accordance with desired outcomes, molding them simultaneously. Thus, algorithms represent key operational techniques in systems that connect code, people, and data with a predefined end goal or target, but their real-world outcomes may and often are unpredictable or unintended. In the next chapter, I follow this line of argument, and expand the perspective from algorithmic decision making to how algorithms are enrolled in social and economic ordering in digital platforms. Here, algorithmic decision making points to the exercise of (platform) power: platforms use data and algorithms to influence the course of events and conduct of others in line with institutional goals (Schwarz, 2021).

3 Modes of algorithmic power

While algorithms are "inert" in and of themselves (Gillespie, 2014: 169), they become powerful ordering devices when interacting with data, people, and digital environments. They deliver effective ways to "continuously establish, organize and modulate the relationships between datafied entities in service of strategic goals" (Rieder, 2017b: 111) and thereby to subject individuals to "institutional projects

intended to shape action and interaction" (Schwarz, 2021). As terms like algorithmic control (Krivý, 2018; Ramizo, 2022), governance (Katzenbach and Ulbricht, 2019), and management (Lee, 2018) suggest, algorithms have been situated in the lineage of power–knowledge and impersonal, rule-based bureaucratic authority (Beer, 2016; Bucher, 2018; Fourcade and Healy, 2017; Lehdonvirta, 2022; Ruppert et al., 2017). While the messiness, contextuality, and complexity of everyday life makes the social world inherently challenging to quantify and standardize, ruling bodies have sought since ancient times to make that world more legible through numerical representation (Hald, 2003). The very making of the modern state has been a process deeply intertwined with the increasing coding and standardization of social life and practices (Scott, 2008). In the nineteenth century, the advent of what Foucault (1978) and his followers term biopolitics unleashed the ruling classes' thirst for numbers. Statistics were used to make visible the population, the body politic, with the aim of bringing it under rational management and thereby promoting a stable social order required by industrializing states (Desrosières, 1998; Hacking, 1991). Today, digital data are increasingly accumulating in the hands of platform companies. However, the history of statistics and bureaucratic management as integral to the "technology of power in a modern state" (Hacking, 1991: 181) sheds light on the contemporary intimate connection between data, algorithms, and control.

Algorithms are clearly media of power, but of what kind? In social research, algorithmic power is often discussed in a fairly undifferentiated manner, with algorithms regarded as having a "capacity to shape social and cultural formations

and impact directly on individual lives" (Beer, 2009: 994). However, I suggest that in order to understand how algorithmic decision making is bound up with aims of influencing and ordering conduct in social media, it is necessary to recognize that algorithmic power may embody various modalities; that is, ways of legitimizing and exercising power. Algorithmic power can manifest as authoritarian "power over," as when an algorithmic system removes a post or bans a user who has broken arbitrary or discriminatory rules (Are, 2022). At the same time, algorithmic power also takes on more positive forms, where algorithms persuade users and orchestrate their energies and efficiencies in specific ways (Van Doorn, 2014). Sometimes, algorithmic power works through disciplinary motifs, encouraging individuals to subjectify behavioral norms that benefit platform companies (Bucher, 2012). At other times, it is discussed as post-disciplinary or post-hegemonic, relying on rules sunken in infrastructures and the control of information flows (Andrejevic, 2020; Schwarz, 2021; Article III).

To thematize the existing literature, I discuss in this section algorithmic power in three different modes: market, ruler, and game. Consequently, my focus is no longer on algorithmic systems as such or on deconstructing the moment of the algorithmic decision but on analyzing how algorithms order social behavior and interaction on digital platforms; in other words, how they put "people, representations, and information … into mathematical/systematic relationships with each other" and assign them "value based on calculated assessments about them" (Gillespie, 2016: 201). What differs between these three modes are the balance between power and agency, the aims and outcomes (whether intentional or not) of

ordering, and their political implications. To be clear, these modes provide a conceptual framing device that allows me to foreground the different ways in which I identify algorithmic power to be imagined in social scientific research and, to some extent, by users and companies, given that the existing literature builds on information from and about them. As such, the three modes provide a background to the more specific contributions of this thesis.

3.1 Market

The market as a key mode of algorithmic ordering appears obvious in view of the distinctly entrepreneurial and neoliberal discourses surrounding digital production that is extensively discussed in research on digital culture. While these discourses are arguably influenced by broader cultural-economic conditions, they appear to have special resonance in the context of algorithmic media. Bishop (2020), for instance, analyzes "algorithmic experts" – online personalities who give social media users advice on how to increase their algorithmic visibility and create content that "sells" (2020: 3). She argues that these personalities' success attests to "how neoliberal logics of individual responsibility encourage rational subjects to engage with experts and … sustain that anyone can make it if they engage the right expertise, and work hard enough" (2020: 9). Indeed, research terms practices of cultural production in social media as forms of "aspirational labor" and "hope labor" (Duffy, 2016; Kuehn and Corrigan, 2013: 21): forward-looking, optimistic efforts made in the hope of gaining visibility and status or reaping professional or economic benefits in the uncertain future. The vast majority of aspirants will

remain peripheral nodes, but a few will acquire an influential network position. The aforementioned literature paints algorithmic power as a neoliberal type of governmentality, where individuals are encouraged and empowered to work on themselves in line with the demands and valuations communicated by the market (Duffy et al., 2021; Article II; see also Dean, 1999: 160) and thus to participate in systems of economic power that are unequal and stratifying in reality.

Markets are present on media platforms on multiple levels and linked with them in complex ways. Social media are not just markets for content; they are also spaces of self-promotion and marketing, where people communicate about and enhance their value in labor markets, and where firms seek to benefit from the brand and audience relationships of creators (Article II). Importantly, they are markets for advertising, quite literally setting up auctions for user attention (https://www.facebook.com/business/help/163066663757985). The largest social media platforms make their money by selling targeted advertising such as promoted posts or commercials embedded in feeds or reward- or payment-based creator content. Scholars have made these various dimensions visible from different perspectives, such as inquiring into the commodification of the self that is involved in social media self-branding or conceptualizing platforms as multi-sided markets where algorithms essentially act as matchmakers between different market actors. This latter association is also made by platform companies themselves, who promote algorithms as a kind of "market device": technologies that enable and take part in the construction and shaping of markets (Muniesa et al., 2007). Consider the following statement by Adam Mosseri (2021), the head of Instagram who was also

formerly in charge of Facebook's news feed. Mosseri was addressing users' suspicions regarding why some of their posts appear to garner more attention than others:

> We cannot guarantee that you are always going to reach the same number of people. Even when ranking doesn't change at all, too much else changes in the world. What people are interested in changes. What you are competing with changes. On Mother's Day, you're competing against a lot of photos, a lot of moms, people saying that they're grateful. Which is a tough thing to compete with. (2021)

Note how Mosseri depicts Instagram's algorithmic system as more or less stable and neutral: change results from fluctuations in supply and demand – for instance, people's wavering desires and interests – which the system is implied to objectively measure and represent. In his rhetoric, the legitimacy of Instagram's algorithmic decision making stems from the system's ability to process information about dispersed offers, needs, and desires, matching them with the right producers and content. This idea is reflected in digital culture more broadly: users, content creators, and the aforementioned "experts" who produce advice on how to succeed in the platform economy's "visibility markets" (MacDonald, 2023) tend to subscribe to a meritocratic idea of algorithms as lifting talent to the top (Bishop, 2020). My own research on users' experiences and beliefs about recommendation algorithms likewise suggests that algorithmic visibility is often thought of as a signal of quality (Article III).

Free markets (with effective rules) have long been idealized as having an informational or communicative character that is able to give rise to a social order without the need for "oppressive" or flawed centralized decision making (Nik-Khah and Mirowski, 2019). Indeed, Rieder likens algorithmic systems that rank and filter content on digital platforms to what he calls Hayekian "'epistemological' neoliberalism," where markets are viewed as "not just a calculative device, but an *ordering device* that coordinates activities and flows, picks winners and losers, identifies what is worthy of attention" and in doing so creates "the information that will allow and incite participants to make the best decisions concerning investment, production, and distribution" (2017a: 14).

It is worth noting that the market as a mode of algorithmic ordering is yet another reincarnation of the notion of the market as an invisible hand that somehow produces public good without anyone necessarily intending that outcome. In addition, the idea that the invisible hand would pick out the products and phenomena worthy of attention can be criticized. That something becomes viral need not be explained by its being inherently more interesting or valuable than anything else. The phenomenon can be explained by implementing some form of peer influence in models that are well known to network theorists and are also used to study more basic biological phenomena (e.g., Salganik et al., 2006; Watts 2002). It is interesting in this regard that social media have implemented precisely this kind of peer influence in terms of recommendations, likes, and follows, thus providing fertile ground for cascading viral phenomena of one kind or another, especially when they are combined with another common network characteristic:

preferential attachment that leads to a formation of strongly connected hubs (Albert and Barabasi, 2002). (And yes, we have to ask whether more than half of humanity know the Kardashians because they are worth that much attention).

As network science makes evident, when people interact with content and one another on digital platforms, they can simultaneously be analyzed in terms of various mathematical representations (Fourcade and Healy, 2017). The market as a mode of algorithmic ordering then directs attention to social media platforms as sensing environments that strive to probe and unveil consumers' supposed desires – which again become communicated to content producers through visibility metrics and social media analytics and to other users in terms of recommendations, likes, and follows. If previous practices of forming target audiences relied on predetermined and fixed demographic categories, the algorithmically organized market for content is inevitably "a place of emergence" (Rieder, 2017a) where concrete interactions between consumers and content generate novel phenomena and information about users, producing efflorescent cultural and consumption niches.

3.1.2 Captivating design in markets

Social media algorithms promote emotionally engaging symbolic products as they seek to maximize the time and interactions expended on the platform. Journalists, marketers, and politicians have long known that emotions play an important role in shaping our decision making and behavior as consumers and citizens (Campbell, 1987; Pantti, 2010). From curiosity, moral indignation, and fear to empathy and

beyond, affects and emotions promote involvement with stories, brands, and public figures. In general, feelings guide how humans navigate the world and make decisions amidst complexity and uncertainty. However, researchers agree that with data-driven personalization and social media, emotion increasingly and more intensively becomes an "animating principle" in the emerging relationships between consumers and information (Beckett and Deuze, 2016; Nikunen, 2019; Wahl-Jorgensen, 2019). Social media makes the consumption of information more personal and social through individualized recommendations and rendering social feedback visible (Beckett and Deuze, 2016). Over the years, emotional motifs have proliferated on digital platforms and devices (Wahl-Jorgensen, 2019; Article I). Most importantly, researchers emphasize how companies can now use vast masses of data and real-time algorithmic processing to manipulate users' choice architectures and align affective processes with corporate aims (e.g., Yeung, 2017).

The learning, responsive machine is able to hone its technique as the interaction goes forward; with data and feedback flowing in, the "target" of persuasion – that is, the user – comes into ever sharper focus (Article IV). Thus, in contrast to traditional marketing methods and media, algorithmic technologies can cultivate much closer relationships with consumers through responsiveness and personalization based on confidential data, (Fourcade and Healy, 2017; Ruckenstein and Granroth, 2020; Article IV). For instance, TikTok's interface is geared toward revealing dynamic and intimate data about each user's instinctual patterns of behavior (Narayanan, 2022). Instead of giving the user a selection of thumbnails from which to more or less consciously choose, videos start playing automatically.

Moreover, the system not only feeds the user content with which she predictably engages but keeps trying new topics in an effort to get to know the user more comprehensively (Narayanan, 2022).

In view of responsive computing, social scientists have drawn attention to the design ideologies and epistemologies that reign among developers of algorithmic systems in areas such as social media, recommendation engines, and personalized health. In seeking to steer users' actions and experience in predictable ways, designers make use of the behavioral sciences and speak of "hooking" and "addicting" users as their goal (Seaver, 2019). According to Nick Seaver, contemporary software design is increasingly "mind-oriented": instilling habits and changing behaviors "requires thinking of users not as customers choosing among various commodities, but as instinctual minds, susceptible to subtle outside influences" (2019: 3; see also Stark, 2018). Yet despite its orientation to the mind, behaviorism cares relatively little about what people think. Instead, self-aware and deliberated decisions are seen as *secondary* to preferences that are revealed through concrete exchanges and actions (Article IV). The focus is precisely on mapping and modeling the predictably irrational nature of behavior in order to override deliberation and exploit moments and situations before or between self-reflection. For instance, algorithmic systems make use of the brain's hypothesized reward systems, with affective peaks and dips hooking users into repetitive activities (Schüll, 2012). Following Natasha Dow Schüll, we are increasingly drawn to digital media applications not to fill our pre-existing informational, communicative, or practical needs but for the affective experience or "zone" that is created in intensive

human-machine interaction. Thus, and as suggested above, what people "want" does not necessarily predate using digital services in any meaningful sense. More accurately, our desires and aims are created and performed in interaction with the system.

The emotional and behavioral principles underlying the design of algorithmic infrastructures have raised concerns, from driving affective polarization to causing mental health issues by promoting upward social comparison. Many of the stories we tell about algorithmic social media and emotions are, however, reductive and too linear. For instance, algorithmic systems have not enclosed us in homogeneous informational silos or so-called filter bubbles, but by and large, their impact on media consumption seems to be the opposite, with individuals encountering more diverse information and points of view than before (cf. Törnberg, 2022). The consequences and impacts of affective social media algorithms may relate less to social media technology itself and more to who is using the systems and how. However, understanding the complex ways in which public culture and personal practices are mediated by social media requires departing from straightforward understandings of social media as a new form of the public sphere or algorithms as cold and logical and instead foregrounding their intimate, persuasive, and affective aspects.

3.2 Ruler

In the rhetoric of digital platforms, algorithms feature as ordering devices whose decision making helps match supply and demand in an effective way for the benefit

and pleasure of the consumer. This image relies on the idea of platforms as neutral intermediaries that are open to all. The platform directly intervenes or makes value judgments only in rare and exceptional cases of infringement (such as removing terroristic content). However, in practice, all markets are socially constructed and never neutral. Supply and demand can be connected according to very different rules; as Rieder puts it, "market mechanisms – or algorithms – are the result of implicit or explicit engineering and can take a wide variety of forms" (2017a, 16). The image of algorithms as instantiating information markets that would be somehow neutral in how they cater to consumer demand or interest is simply misguided. Algorithms as ordering devices "move from the natural domain into the domain of ethics and politics" (Rieder, 2017a: 16). For instance, according to Taina Bucher's analysis (2012), Facebook deployed the (now obsolete) EdgeRank algorithm to produce subjects and enforce behavior norms that were useful to the company.

Lehdonvirta (2022) documents how digital platforms as authorities and rule-makers in the online realm arose from the chaos and conflict of the early internet and its marketplaces. While the initiators of the likes of eBay, Amazon, and even the infamous Silk Road were often cyberlibertarian idealists longing for freedom from governments and brokers, they soon realized that as (typically pseudonymous) online communities kept growing, informal and affective forms of sustaining order like interpersonal trust broke down (Lehdonvirta, 2022). Over time, their initially hesitant and even awkward moves to centrally enforce rules grew into formal institutions and practices of governance (Schwarz, 2019). Today, we may be critical of the "walled gardens" we find online, but it is important to

remember that they developed in part to serve much-needed purposes like dispute resolution, without which reaping the benefits of large-scale networks of exchange would be impossible. Though Lehdonvirta's argument is based on an analysis of the evolution of online marketplaces, it also holds true for social media. Facebook, for example, removes between 55 and 100 million posts containing bullying and harassment, violence, and sexual activity every quarter. Without such centralized efforts at maintaining social order, the experience of using social media platforms would likely be much more chaotic and unpleasant.

Against this backdrop, it is no wonder that both users and platforms regularly frame their relationship as a political relationship of governance (Schwarz, 2019). In recent years, we have witnessed various mobilizations to organize against and appeal to "platform princes" (Lehdonvirta, 2022): from laborers of the Amazon-owned micro-working platform Mechanical Turk demanding a "voice in the platform's decision-making" (Lehdonvirta, 2022: 171) to Facebook-using mothers advocating against the platform's policy of removing breastfeeding images, sparking a wider discussion around how social media platforms govern women's bodies and visibility (Gillespie, 2018). However, the social contract underlying this political relation is different than the one to which at least Western citizens are accustomed. According to Rebecca MacKinnon's analysis, the real name identification policies at Facebook and Google manifest a "Hobbesian approach to governance," where "people agree to relinquish a certain amount of freedom to a benevolent sovereign who in turn provides security and other services" (2012: 164). To the everyday user, this is perhaps most clearly illustrated by

the terms of service documents that one-sidedly lay out the conditions a person must accept in order to access the platform's offerings. And despite users sometimes successfully politicizing platform rules as a common affair, there are no guarantees that their pleas will be considered: platform politics remain an "autocratic politics for now" (Lehdonvirta, 2022: 172; see also Schwarz, 2019).

Reflecting these insights, there has been a shift in approaches to algorithmic power from the neoliberal motifs of the production of aspiration or the structuring of choice discussed above, toward discipline, restriction, censorship, and even threat and punishment (Bucher, 2018; Lehdonvirta, 2022; Schwarz, 2019). Researchers have drawn attention to platform laborers' and content producers' work under the "tyranny" of faceless algorithms that assign them work and visibility (Chan and Humphreys, 2019; Duffy et al., 2021). Another important body of literature concerns people's negative experiences of algorithmic content moderation (Gerrard and Thornham, 2020; Nurik, 2019; Roberts, 2018; Witt et al., 2019); that is, the organized practice of screening user-generated content (Roberts, 2018). Moderation is directly and obviously related to governance, because it involves the explicit setting of policy and its enactment (Article III). Critical researchers argue that moderation rules and practices are not designed with a sense of responsibility toward vulnerable user groups and their rights but rather aim at controlling the environment so as to make it palatable for advertisers and, to a lesser degree, placating regulators enough to keep them from taking too close a look (Hogan, 2022; see also Doctorow, 2023) – suggesting that in governance by platforms, what is at stake is the market becoming the ruler.

Yet, from the point of view of platforms-as-rulers, what exactly do algorithms do? Like states, platforms are constituted of "institutional infrastructures – a set of rules" (Lehdonvirta, 2022: 220). In this architecture, algorithms have at least a double role: on the one hand and perhaps more obviously executive or administrative and on the other and perhaps less obviously legislative (cf. Schwarz, 2019; Sinnreich, 2018). I have already hinted at the analogy between algorithms and bureaucracy (Bucher, 2018; Fourcade and Healy, 2017; Lehdonvirta, 2022; Ruppert et al., 2017). Like (idealized) bureaucrats, algorithms follow general rules and principles to solve specific cases. However, in the case of digital platforms, these rules are only partially and selectively published to subjects. Moreover, algorithms can be viewed as enforcing human-made and centrally determined policies only to a certain extent. As discussed in the previous section, machine learning systems learn decision-making principles from data. In doing so, they start to appear as autocrats in their own right, responsible for not only executing but also setting and interpreting the rules. In Article III, I examine the governance implications of machine rules from the perspective of the user experience.

All in all, it has become increasingly difficult to ignore the breadth and significance of platforms' algorithmic self-governance: as gateways in online ecosystems and to the digital public sphere, platforms can be viewed as "central points of control on the Internet" (DeNardis and Hackl, 2015: 769). They make the design choices and policies regulating platformed interactions more or less as sovereigns, with their "privatized governance directly enacting rights and

regulating the flow of information online" (DeNardis and Hackl, 2015: 762). From this vantage point, order through algorithms begins to look less diffuse and positive as its centralized, restrictive, and explicitly political dimensions come to light.

3.3 Game

The modes of the market and ruler differ in that in the former, order through the algorithm appears as a decentralized and objective phenomenon, while the latter approaches order in terms of governance, as a political relation in which platform companies use their dominant position to make and enforce policy regarding matters of public relevance. What unites both of these modes of algorithmic power are linearity and intentionality – platformization, digital mediation, and algorithmic intervention are viewed either as successfully enabling the application of market mechanisms and "devices" to digital culture (Muniesa et al., 2007) or as empowering what is ultimately centralized governance of online environments by increasing its efficiency and scope. In this section, I identify a third way in which the role of algorithms in creating social orders is discussed in the literature: the increasingly popular game metaphor (Chan and Humphreys, 2019; Cotter, 2019; Haapoja et al., 2020; Kear, 2017) that highlights the more unintentional, distributed, and nonlinear aspects of algorithmic power.

When analyzing her data about Instagram influencers' experiences of using that platform, Cotter observed that their "pursuit of influence … resembled a *game* constructed around rules embedded in algorithms that regulate visibility" (2019: 896). The platform did appear as the "game master" that established and inscribed

these rules. However, what is central about the game as a mode of algorithmic ordering is that games are not just constituted by the "totality of their rules"; the intentionality of the players is also crucial (Mosca, 2017: 592). A key feature of games is that they simultaneously present the agent with a system of constraints and free movement, the interaction of which makes playing creative and genuinely playful. Indeed, a common theme in work that uses the game metaphor as a perspective on algorithmic platforms is that algorithms transform from an infrastructural or implicit element to a consciously exploited feature that people can use "for their own advantage" (Haapoja et al., 2020). Not knowing the rules of the game might very well be the default setting, but by exploring the kind of activity that becomes rewarded or punished by the algorithmic system, users start to identify "possibilities within the regulatory structure" (Cotter, 2019: 908). Instagram influencers seek to create engagement around their posts and profiles to have their content pushed to new audiences (Cotter, 2019). Marginalized American consumers play the "credit score game" for a better score and consequently a cheaper loan (Kear, 2017). Fringe online communities find ways of circumventing and gaming algorithmic content moderation (Haapoja et al., 2020). Uber's algorithmic system distributes work based on driver rankings; therefore, drivers seek to please customers in creative ways in order to improve their metrics and earn more gigs (Chan and Humphreys, 2019).

Approaching the algorithmic system as a game undoubtedly points to how platforms steer user behavior by making use of motivational structures, distributing rewards and punishments, and embedding game-playing features,

such as competition with other players, goals and objectives, the scoring of points, and rules of play (Schüll, 2012; Van Nuenen and Scarles, 2021: 125). Reactive user practices are to some extent encouraged by system operators; after all, all metrics are simultaneously aspiring to be objective measures of what is, while also – and somewhat paradoxically – functioning as public benchmarks of what ought to be (Ziewitz, 2019). However, the game metaphor also evokes something subtle yet meaningful about agency. Users do not necessarily internalize the moral economies of algorithmic regimes. Rather, they can consciously align their tactics with or intentionally play against them. Thus, rather than subjectifying the rules and logics that algorithms encode, users can sometimes be viewed as *instrumentalizing* them. More than mere subjects of algorithmic rules, users appear as competent and reflexive agents with goals and plans to reach them. The game perspective illustrates that while algorithms structure behavior, they do not determine it. Algorithmic rules leave room for multiple interpretations and afford a whole host of tactical moves, some of which are encouraged, while others are unintended by designers.

In contrast to dystopian narratives about all-encompassing and opaque algorithmic control, the irreflexive and material nature of algorithmic rules can even prove situationally empowering (Chan and Humphreys, 2019; Cotter, 2019; Haapoja et al., 2020; Kear, 2017). Perhaps there is something egalitarian about algorithmic as opposed to social gatekeeping. Convincing a rule-based machine of the worth and relevance of one's content may feel more straightforward than doing so with a person with their subjective preferences and personal history. Users

indeed associate successful playing of algorithms with positive meanings such as "innovation, the ability to problem solve, independent achievement, and accumulating capital" (Cotter, 2019: 906). These observations suggest a more moderate view of the distribution of power between platforms and users. The game metaphor brings into view unpredictable and temporally unfolding aspects of platform power. It highlights order through the algorithm as a (continuously evolving) outcome of strategic moves made by various interdependent actors: not only the platform company but also users with different objectives and interpretations of the game (Cotter, 2019).

4 Shaping the tools that make us

The previous chapter focused primarily on research on the corporate aims reflected by social media algorithms and more marginally on users' reactions to them. This bias reflects how digital platforms have largely been approached as novel technical and economic structures whose data troves, machine learning algorithms, and central position in digital ecosystems are viewed as reallocating power in society in important ways. Thus, it has been urgent to analyze how they wield this power through algorithms and what possibilities users have to mold or counteract it. Indeed, bodies of empirical work are beginning to emerge around key concepts such as "algorithmic resistance" or "algorithmic antagonisms," focusing on oppositional user strategies and engagements (Ganesh and Moss, 2022; Heemsbergen et al., 2022; Velkova and Kaun, 2021). However, by centering what

algorithms as external power structures do to people or – almost symmetrically – how people can reject or resist their control, we may lose sight of the richness of everyday experiences and meanings associated with technology, as well as the fuller spectrum of user agency. For instance, the game metaphor introduced in the previous chapter appears to lack a more embedded conceptualization of technology use, being instead a perspective for analyzing a very specific type or dimension of algorithmic engagements: the instrumental, the rational, and the highly self-conscious. Yet, in light of the broadened notion of algorithms as lively and learning systems discussed in Chapter 2, human-algorithm relations are more intimate, diverse, and entangled than perspectives stressing either power or resistance acknowledge.

In this chapter, I employ science and technology studies (STS), cultural approaches in media studies and post-phenomenology as innovative resources for illustrating technology use as a profoundly generative location where both people and algorithmic power become transformed. The value of these theoretical approaches lies in placing the empirical findings into a broader discursive context and in thinking about user agency and user-algorithm relations in less adversarial terms. Drawing on STS and media studies, I first discuss algorithms from the perspective of the messiness of everyday life (as partial, contextual, improvised, and emergent) rather than addressing people from the point of view of algorithms (as instrumental, logical, and optimizing). These STS and cultural perspectives highlight the productive nature of use and, relatedly, the importance of understanding how technology becomes embedded in practice and is made

meaningful by users. Post-phenomenology, meanwhile, not only foregrounds the intimacy and mutual shaping of humans and technology but also helps us reach beyond praxeocentrism and understand how it is that while technologies possess interpretive flexibility and are thus contextual, their interaction with humans may still give rise to experiences with a distinct pattern and shape. The task then becomes tracing these mediations and examining their ethical and political implications. Overall, the aim of this section is to revive our imagination in how we think about the social enmeshing of algorithmic systems, beyond instrumental metaphors or extrapolating corporate aims.

4.1 Using and producing

As suggested above, empirical research has begun to inquire into the active role users play in responding to and counteracting algorithmic logics and outputs, modifying their impacts on themselves and others (Cotter, 2019; Kear, 2017; Lomborg and Kapsch, 2020; Velkova and Kaun, 2021). This move toward studying how people make sense of and engage with algorithmic systems is indebted to longer research lineages in STS and media studies. Although both fields have emphasized the significance of production, they also have a history of approaching (media) use as a locus of creativity, agency, and innovation. A guiding observation has been that while technologies shape behavior, they do not determine it, as "there is no one essential use that can be deduced from the artifact itself" (Oudshoorn and Pinch, 2003: 2). Designers *configure* users: they embed specific ideas about future

uses and users (their contexts, competences, and responsibilities) into the technical design of products (Woolgar, 1991). Following Akrich's (1992) semiotic terminology, technologies come with *scripts* that prescribe social action. However, users may deviate from these scripts or interpret them in unpredictable ways. In everyday life, people learn about technologies, develop new practices of use, and integrate technologies into symbolic systems that, again, shape patterns of consumption and engagement.

The concept of domestication, first introduced by Roger Silverstone, centers on these patterns of cognitive, practical, and symbolic work that characterize the embedding of technology into everyday practice (Lie and Sorensen, 1996; Sorensen et al., 2000). It differs from the semiotic approaches of Akrich and Woolgar discussed above in its emphasis on the mundane and personal domains of technology engagement (Silverstone and Hirsch, 1992). Instead of focusing on designers' user-related representations and strategies, domestication points to the importance of starting from the daily life of a culture that is already teeming with meanings, practices, and differences. In the context of algorithm studies, researchers have explored how people make meaning of algorithmic systems despite their oft-cited opacity, such as translating algorithmically produced outputs back into "traditional" social parameters like gender (Bolin and Schwarz, 2015). Another emerging stream of research highlights the fragility, provisionality, and relationality of algorithmic systems in practice (Pink et al., 2018; Schwennesen, 2017, 2019). The seemingly smooth and autonomous operation of algorithms is filled with fits and starts. Algorithmic technologies' ability to deliver on their promises of

convenience, personalization, or optimization in fact depends on users' continuous yet mundane and easily overlooked efforts, such as their ability to improvise and bear with systems that do not function as intended. Such user practices clearly exemplify what I mean by the metaphor of interfacing as the work of weaving technology into the fabric of everyday life.

In a similar vein, Pink et al. remind us that the everyday should not be regarded as a site where "the more extraordinary flows of power or technological innovation" merely land (2017: 4). Instead, users are proper agents of socio-technical change, a theme that the sociological literature on technology has long emphasized. Constructivist approaches to technology and society have foregrounded the social processes behind technological development, with users playing an important role. Pinch and Bijker's (1984; see also Bijker, 1995) influential exploration of the social construction of the bicycle serves as a helpful example. The authors approach the development of technical artifacts as a socially contingent process of selection from a range of variations. Selections take place at moments when problems and controversies arise. According to the authors, in the early stages of technological development, different social groups and organizations may construct a technology in radically different ways. The assumption is that over time, technological controversies will become settled, and the artifact's meaning and features will stabilize through social processes of negotiation, debate, and adjustment. As a result, one predominant meaning and use will take hold.

Other scholars have complemented this view by arguing that because of active, contextual, and creative character use, technologies may have various and

evolving context-dependent meanings and identities (Ihde, 1990; Verbeek, 2011). In line with this insight and in the context of algorithmic media, Lomborg and Kapsch (2020) have developed Stuart Hall's influential encoding-decoding model of communication, illustrating how the meaning of algorithms can be stabilized in line with designers' intentions among some user groups while being continually problematized among others who seek to engage with surveillance technologies in critical ways (Siles et al., 2020). These meaning-making processes are not haphazard but are typically influenced by broader cultural and social structures like gender, race, or class. In sum, the social processes of meaning-making around technologies shape how an object is imagined and perceived and, consequently, how its technical features become embedded (or not) into everyday life and social action (Nagy and Neff, 2015; Article II). Use is, then, productive in various ways: users make sense of, bear with, and embed emerging technologies in daily life and shape technological products not only through activism and collective resistance but also through the more mundane acts of selective use and interpretation.

By laying out the classical work in STS and media studies, the discussion above indicates that the distinction between the production and consumption of (media) technology has always been artificial. However, with the proliferation of smart and responsive techno-social environments and objects, it begins to collapse altogether. The move to software-as-a-service, cloud computing, and agile software development, which are characterized by continuous testing, data capture, and user centricity, means that online production and consumption are increasingly one and the same (Gürses and van Hoboken, 2017). On social media, users contribute not

only content but also the data based on which algorithms learn to make predictions and assessments about the relevance and value of content (Airoldi, 2021). This information is nothing short of constitutive of digital infrastructures (Lash, 2007). Thus, the ways in which algorithmic technologies shape perception, action, and social worlds are not pre-established: they do not flow from the technological artifact itself but "emerge through relational encounters" (Bhavnani and Haraway, 1994, quoted in Lupton, 2016: 2; Bucher, 2018; Latour, 2007; Verbeek, 2011). A key question that remains – and that I return to in the discussion – is how we should rethink the productive nature of use in light of this liveliness and complexity (see also the discussion in Chapter 2) of algorithmic systems, while remaining critical of the power asymmetries that characterize platform ecosystems (Chapter 3).

4.2 Algorithmic mediation

Examining algorithms in the everyday from an STS-inspired, practice-oriented perspective has led scholars to conclude that algorithms are in fact multiple: interpreted and enacted in different ways in different situations, depending on the agents involved and their worlds of reference (Bucher, 2018; Seaver, 2017). Yet, if technologies are always coproduced in interpretive and concrete actions by users and always contextual, how is it that they still appear to give rise to specific patterns of experience, social behavior, and practice? Even when stressing contextuality, it must be borne in mind that the very reason why social scientists are interested in technology is that technologies are viewed as tools that have

power to configure and shape human behavior, as emphasized by the literature discussed in Chapter 3. To this end, in this final section of the literature review, I draw on post-phenomenology to center the role technologies play in mediating human experience and practices in patterned, meaningful, and consequential ways. Importantly, the fact that technological mediations are not unique to each moment or situation but have specific patterns is what allows us to empirically inquire into their political and ethical implications.

Post-phenomenology was initially developed as a perspective in the philosophy of technology (Ihde, 1990, 1993, 1998; Rosenberger and Verbeek, 2015 Selinger, 2006). It borrows from traditional phenomenology its emphasis on embodied, perspectival experience, and human-world relations, but it is distinguished from it by an empirical focus on particular technologies and their interaction with human beings. In this latter orientation, post-phenomenology is aligned with STS, which likewise highlights the importance of technological specificity and asserts that human agency incorporates nonhuman elements that contribute specific features and characteristics: both people and technology gain agency in the human-nonhuman associations into which they enter into or are enrolled. However, while STS typically decenters the human, treating all actors symmetrically, post-phenomenology is *explicitly focused on how human experience, practices, and meaning become reconfigured in interaction with technologies and with what social and ethical implications*. Importantly, if "emerging sciences and technologies may affect existing practices … the internal (moral) rules, values and virtues implied therein" are also influenced (Swierstra, 2015: 15).

Through the notion of mediation, post-phenomenology develops a particularly nuanced and appealing approach to the technological shaping of subjectivity and social behavior. The concept has been influentially discussed by STS scholar Bruno Latour, according to whom technologies are never neutral carriers of human intentionality – so-called *intermediaries* – but *mediators* that have an active presence in contexts and situations of use. The key point here is that technologies simultaneously transform the activity they help carry out. Building on Latour's work from a post-phenomenological perspective by bringing it into dialogue with the work of philosopher Don Ihde, Peter-Paul Verbeek (2011) discusses technological systems as mediating our "being-in-the-world." According to Verbeek, this mediation concerns *perception* on the one hand and *action* on the other. Perceptually, technologies transform our embodied relationship with our environment. This transformation has a structure of *amplification* and *reduction*. Technologies are directed at certain aspects of reality, making them (more) visible for humans: in so doing, they add their own kind of intentionality or "directness" to human perception. Here, Verbeek draws from Ihde's analyses on the hermeneutic dimensions of human-technology-world relationships. In terms of action – and this is where Verbeek develops Latour's work on mediation and translation – technologies can be viewed to *invite* some practices and activities while *inhibiting* others. In this way, material artifacts can either forcibly exert influence, as if from the outside (such as a speed bump) or can become incorporated as bodily or cognitive extensions. In the latter case, when technologies translate our programs of action from the kind of ready-to-hand position that human and technological

intentions mutually constitute, we may not even notice that our action is being technologically co-created.

From this vantage point, social media algorithms can be viewed as molding our realities and relationships by rendering people and things experientially accessible, amplifying the weight or relevance of certain things over others. They thus shape both how the social world appears to us and how we may practically engage with it. While algorithmic systems come with control and rule-based logics baked into them, they need not be viewed as flattening everyday life. Rather, in interaction with the social, algorithmic systems become generative of novel subjectivities and cultural patterns, experiences, and practices. For example, the (audio)visual medium of platforms such as Instagram and TikTok emphasizes the role and importance of visuality in everyday life, contributing to the development of not only aesthetic niches and ideals and the acceleration of fashions but also, for instance, political discourse and what it means to participate in it.

Verbeek's discussion of the relationship between technology and human practice bears a resemblance to the concept of affordance that originated in the field of ecological psychology (Gibson, 1979) and relates to the possibilities and constraints for action that emerge in the interactions between agent and technology (Nagy and Neff, 2015). However, by emphasizing the role of technology "in shaping human existence and experience" (Rosenberger and Verbeek, 2015: 11), a post-phenomenological sensibility helps in reaching beyond instrumental or functional depictions of (human engagements with) technology, and in

foregrounding their existential and ethical dimensions. At the core of the post-phenomenological approach are relational questions such as

> How will specific technologies mediate the relation between actors and stakeholders? Will they help these stakeholders to make themselves heard, or will those stakeholders be all but silenced? Will the technologies make us more or less aware of the consequences of our choices? Will the technologies create new opportunities, and if so, what new claims regarding rights, obligations, and responsibilities can be expected to accompany those novel opportunities? (Swierstra, 2015: 15)

Moreover, in light of the previous section's emphasis on productive use, the aforementioned structures of amplification and reduction and invitation and inhibition are not technologically determined but hinge on the ways in which technologies and their specific features become embedded into human-technology associations (Verbeek, 2011). Indeed, a key post-phenomenological insight is that technological impacts or effects – in other words, how technologies mediate human practices and values and with what consequences – are often co-determined by users (Swierstra, 2015), again underlining the relevance of the metaphorical notion of interfacing.

Before outlining my research approach, materials, and methods, a quick overview of the ground covered so far and a summary of key concepts is in order. First, I defined platforms as socio-technical intermediaries and economic arrangements whose infrastructural position enables them to coordinate and

optimize network effects and extract value from the circulations and interactions of digital culture. Second, I approached algorithms as systems that weave dynamic and productive relationships between code, datasets, goals, and people and that thus need to be studied in context. I argued that algorithms are key infrastructural elements on social media due to their nature as the performative, decision-making parts of code; they enable connecting (machine) perception directly and immediately with a set of predefined responses. From there, I went on to discuss how algorithms are enrolled into systems of social ordering on digital platforms and suggested that algorithmic power embodies various modalities that move in and out of sight situationally and relationally. I did this by exploring three of its modes – market, ruler and game – that thematized different perspectives on algorithmic power found in existing literature.

In section 4.1, I changed my point of view from corporate aims and characteristics of technology to user agency and the reciprocal nature of technology engagements. I argued that STS and media studies perspectives that have emphasized the productive and interpretive nature of use are made newly relevant by learning systems that translate user activities into novel inputs**.** Meanwhile, a post-phenomenological sensibility can help us appreciate the perceptual and praxical relations supported by technology. In technological mediation, what is being mediated – such as participation in or governance of public discourse – is simultaneously transformed and configured, and so I discussed the implications of these mediations in terms of human experience and values (cf. Swierstra, 2015;

Verbeek, 2011). These theoretical resources allow for rich and embedded views into the interfacing of messy, complex everyday life and algorithmic technology.

5 Research approach, objectives, and methods

In this chapter, I discuss the broader research approach, objectives, and questions of the thesis. I then describe the methods and materials used in the four original publications, which approach the interfacings of the social, emotional, and algorithmic through several empirical cases and from different angles.

5.1 Research approach of the thesis

As already noted, one of the major reasons why social scientists study digital platforms and their algorithms is that we believe that these constructs have power to steer and shape social action in consequential ways. However, there is a caveat to this type of an inquiry: much of the underlying technology – in whose social impacts we are interested – is invisible. Seemingly paradoxically, while social research on algorithms is booming, it is a common complaint that social media algorithms are insufficiently transparent. People, including researchers, typically encounter algorithms in real-world use, where they are entangled with datasets, hardware, and user behaviors. In other words, we cannot access their logics or agencies directly but only through interfaces and as already enmeshed with

countless other actors, having become an ingrained part of everyday practices and meanings.

But is this necessarily an issue from the social scientific standpoint? For a sociologist, it would make little sense to try to understand a person without asking about the relationships that have been formative of her life, her worlds of reference, her passions and projects, and the practices, groups, and institutions of which she is part and to which she contributes: that is, her social shaping and attachments. If we think of technologies as socio-technical systems, it seems appropriate to study them similarly, as embedded in a social context. Only then can we begin to sketch out and understand their social life. Indeed, looking at the machine learning algorithm as coded instructions on a computer screen, purified of social context, would reveal little about what interests sociologists, such as how algorithms transform social practices and hierarchies, cultural patterns, and forms of governance, or how the figure of the algorithm is mobilized in everyday imaginations and political discourse in interested ways, which may be more or less connected with technical and mathematical realities.

Given the social embeddedness and distributed nature of algorithms, Seaver argues that it is possible to study and theorize algorithms in ways that "do not depend on pinning down a singular 'algorithm' or achieving 'access,' but which rather work from the partial and mobile position of an outsider" (2017: 1). What I find appealing about Seaver's ethnographic approach to algorithms is the way it embraces an incomplete picture. As discussed throughout the literature review, algorithms are enacted in various ways by different communities of practice and

emerge as part of heterogeneous socio-technical systems. Therefore, it might even be unproductive to try to depict the whole or strive to find the source. Algorithms are continuously in the making, learning from new inputs, and being fixed and tweaked by both their designers and users. Therefore, our inquiries should likewise be processual and open, leaving room to identify new developments and addressing how systems grow, change, break down, and are renewed. The key aspect of such an approach is to take seriously the everyday practices of not only engineers but also the laypeople who "constitute [algorithms] and keep them working and changing" (Seaver, 2017: 6).

Methodologically, this dissertation is very much in line with the qualitative approaches to algorithms sketched out by Seaver and others (Bishop, 2019; Bucher, 2016) that emphasize the "entanglement between algorithms put into practice and the social tactics of users who take them up" (Gillespie, 2014: 183; Articles III–IV). However, the focus of my inquiry is not always explicitly on how people make sense of and act on algorithms. Instead, I am also interested in the more implicit ways in which algorithms and people play together to give rise to dynamics of visibility and prominence on social media (Articles I and II). These dynamics emerge at the interface between various elements, from users' personal goals, meaning-making, and desires to the platform's technical aspects and user culture. Understanding them requires delving into the worlds of the users and analyzing how algorithmic mediation begins to amplify some aspects of their worlds, behaviors, and selves over others. To this end, I have engaged various methodologies, from analyzing the affective dynamics of algorithmically mediated public debate with the help of mixed

methods (Article I) to using interviews and visual analysis to study how human and algorithmic decision making and evaluation mesh as people choose which facets of themselves and their lives to enhance and display on digital platforms (Article II). In each case, algorithmic mediation itself has to be traced back and abducted, but it does not need to be uncovered in isolation, because in algorithmic culture, there is no "pure" algorithmic; what motivates the research approach is precisely the fact that the algorithmic is entwined and co-evolves with social elements and actors. Before discussing the methodological choices of each article in greater detail, I first introduce the broader research objectives to which the separate studies collectively contribute.

5.2 Research questions and objectives

The four articles in this thesis have distinct research designs and questions. Accordingly, the research objectives below should not be understood as having guided my doctoral research from the very start. Rather, they represent and synthesize the knowledge and questions that the four different studies have collectively produced. These objectives have morphed and developed into their current form, along with the rest of the dissertation, as I have pondered and probed what I can and want to say based on my empirical studies and their specific findings. This is how I found the research questions: through an iterative process of immersing myself in the literature, empirical materials, and writing.

I do not believe research to be a linear pipeline; nor do I think it can ever provide a full or fixed picture of the realities studied, especially when addressing constantly unfolding socio-technical processes. Therefore, the research questions should not be read as expected to produce an exhaustive answer. Rather, they are offered to be queried again and again in an attempt to keep up with technological developments and their social implications. What can be expected are concepts and perspectives that seek to capture and describe user-algorithm dynamics in their very liveliness. Indeed, any grasp of an algorithmic system at moment A may mean very little just hours later, because hundreds of updates can be run on them on a daily basis (Savor, 2016). Thus, my research questions are not focused on specific features or technical details. Rather, they target the broader logics and dynamics of algorithmic media and their public significance, illustrating how issues of social relationships, affect, agency, and world-making are at stake in algorithmic interfacings.

The first research objective relates to the co-shaping of algorithmic orders and visibilities, understood as the patterned ways in which the world appears to us, and as we appear to others on social media platforms. As discussed above, much existing research is focused on the platform side: through algorithms, platforms decide what we see and do not see according to their economic interests, shaping our lifeworld as a technological unconscious. On the other hand, there are widely circulating narratives of empowerment: social media algorithms are said to remove human gatekeeping, reflect the desires of consumers, and allow anyone to become seen and heard. This dissertation seeks a middle ground in this regard, admitting

the open causality of societally relevant technological impacts while seeking to uncover their particular patterns and logics. Following the research streams discussed in previous chapters, the sub-questions particularly target the emotional and relational aspects of platforms. The first research objective divides into research questions as follows:

1. How are algorithmic orders and visibilities coproduced in meaningful social activity?
    a. How do social media algorithms appeal to affects and emotions? (Articles I, IV)
    b. How do social media algorithms relate and attach users to one another? (Articles I–IV)

Moving from the first set of questions, the second research objective adopts a more reflective and political mode, positioning knowledge about how social media platforms organize interactions and set terms of access and use into a broader societal perspective. Big social media platforms are increasingly the connective nodes in digital networks. Their practices have significance from daily life to public debate and online regulation. Scholars are increasingly asking for public values in a digital realm characterized by corporate rule, information asymmetries, and pervasive automation (Stucke, 2018; van Dijck et al., 2018; Zuboff, 2019). Aligning with this literature, the second research objective probes how algorithmic mediation in the governance and recommendation of content reformulates and energizes questions concerning public values. I am particularly interested in how

the decisive, distributed, and "lively" (Lupton, 2018) nature of algorithmic systems mediates user experiences and practices, challenging their agency and attempts at control. The second research objective is translated into research questions:

2. How does algorithmic decision making on social media address and energize questions concerning public values?
    a. What can user experiences tell about the tensions of contemporary algorithmic platform governance? (Article III)
    b. How does the deep entwinement of human and machine agents in algorithmic social media challenge meaningful user agency? (Articles III, IV)

5.3 The sub-studies and their methods

I discuss below the research approaches and methods used in each article that make up this dissertation while highlighting broader methodological questions and reflections than were possible in the journal article format.

5.3.1 At the interface

"Delighting and Detesting Engagement: Emotional Politics of Junk News" was co-authored with Assistant Professor Damian Trilling (University of Amsterdam) and Dr. Dimitra Liotsiou (Oxford Internet Institute). The article emerged from a research visit to the University of Amsterdam, the aim of which was to hone my computational skills under the supervision of Trilling, who works on computational

social science. The paper addresses a particularly problematic and highly spreadable form of public debate: social media engagement with politically biased and misleading news. Junk news is particularly fit for opening the empirical section of this dissertation, given that along with issues such as algorithmic bias and discrimination, concerns about the spread of disinformation has been formative of the political life of algorithms, shaping the public, scholarly, and regulatory imagination about algorithms and their societal effects.

The paper investigates three research questions: How do audiences make sense of and interact with political junk news on Facebook? How does the platform's architecture intervene in these sense-making, interactive processes? What kinds of mediated publics emerge on the platform as a result? The research questions illustrate the broader research approach and objectives of this thesis: to understand social formations on digital platforms, we must take into consideration how design logics and features play in tandem with users who are embedded in specific political and cultural contexts, and engaged in socially meaningful activities. Moreover, it explicitly engages with issues of emotion and affective design (3.2.1).

We define junk news as "publications that present themselves as news sites, but do not adhere to journalistic norms and ethics, and instead select, frame, and distort evidence to suit their political agenda" (Article I: 1). We had various reasons for using the term "junk news" to refer to the content. We found it useful in how it departed from the true-untrue binary of terms like "fake news." We found that disinformation mimicking a news format is not typically best described by its truth

value: the articles we analyzed did not necessarily contain factual errors and were never wholly made up. They were better understood with reference to their low journalistic quality and their aim of encouraging politically biased interpretations. With junk news, we also followed the conceptualization of the digital tool we used for harvesting the data: the Oxford Internet Institute's Junk News Aggregator (Liotsiou et al., 2019), which updated in real time links to articles and Facebook posts by US junk news outlets that had been identified by the research group behind the Oxford tool. Prior to starting data collection, we carefully acquainted ourselves with the aggregator's underlying methodology and rationale. We also had the pleasure of working with Liotsiou, who had been in charge of coding the aggregator.

Answering our research questions required a multi-level, mixed methods approach. We wanted to obtain a bird's-eye view of algorithmically mediated publics and to zoom in on the micro-level interactive and interpretive processes that took place around junk news. Combining multiple levels of analysis was a novel move in the context of research on political disinformation, as the literature had largely bypassed questions of interpretation and social negotiation, focusing mainly on the production side (see section 6.1 for further discussion). In practice, we topic modeled 40,500 junk news articles to explore the talking points and themes that cut across our data on a more abstract level. These articles were also posted to Facebook by their publishers. To find out how junk news on the identified topics became mediated by and visible on the platform, we explored how audiences had engaged with them through Facebook's affordances (such as sharing, commenting,

or indicating emotionality through the reaction button). Finally, we zoomed in on the comment boxes of the posts about the news articles, conducting a qualitative comment analysis by identifying common patterns of interaction and categories of expression.

The overall methodological approach resonates with contemporary, innovative work on digital social science methods. Mike Savage, for instance, argues that quantification does not need to aim at generalization or extrapolation; it can also be used to identify relevant outliers, to "render specificity and particularity," and to visualize and display in ways that "juxtapose and contrast" (2013: 16–17). Halford and Savage (2017) coined the term "symphonic social science" to discuss the potential of a kind of sociological big data analytics that borrows from data science the re-purposing of heterogeneous datasets and a focus on correlations and visualization while retaining a theoretical emphasis: "sociological concepts and theories" are used to "link together *recurring motifs* [within and across datasets] into a symphonic narrative" (2017: 1139). Another source of methodological inspiration was the theoretical and practical work on digital methodologies by Noortje Marres (2017; Marres and Gerlitz, 2016) and Richard Rogers (2013, 2019). Both researchers are critical of the political economy and power relations that shape digital media's data assemblages and attentive to the ways in which new mediums, data sources, and data-generating processes rub against customary social science methods and their underlying assumptions. Yet, as terms like "interface methods" (Marres and Gerlitz, 2016) or "postdemographics" (Rogers, 2013) suggest, they also see methodological opportunities in working with digital

affordances. For instance, social media's postdemographic traces of belonging – such as "tastes, interests, favorites, groups, accepted invitations, installed apps" (Rogers, 2013: 15) – can help one understand not only the social phenomena in question but also the digital services and how they participate in creating, maintaining, and reorganizing social relationships.

We explicitly took a similar approach; rather than seeking to work *against* the platform, its visibility affordances, and its dynamics, we worked *with* them, using computational methods to trace what the platform's metrics highlight as relevant and popular. In so doing, we obfuscated as much as we highlighted: What about the articles or comments that failed to gain recognition? What about the people who are not on Facebook or did not make themselves heard in the comment boxes? This omission was purposeful, as we wanted to target precisely the algorithmically visible and how it orients publics and their dramatic focus (see section 6.1. for further discussion).

5.3.2 Beyond the interface

Article II, "Filtering Feminisms: Emergent Feminist Visibilities on Instagram," is a collaboration with Professor Justus Uitermark (University of Amsterdam) and Assistant Professor John Boy (Leiden University). We wanted to reach *beyond* the surface of social media messages and visibilities and understand the subjective practices and processes behind them. More specifically, we studied how feminist Instagram users negotiated and reflected on their self-presentational practices on the platform. Instagram is a relevant platform for this purpose: in the current

cultural moment, it is arguably shaping sociality and aesthetics, along with novel forms of political communication. Theoretically, Instagram allows for non-normative and transgressive expressions of self, potentially widening the scope of representations. In practice, however, it seems to encourage complicity with (contextually varying) social norms and ideals and a standardization of visual repertoires. Part of the standardization may be attributable to algorithms: even though human gatekeepers may have been removed, algorithms have taken their place in allocating visibility according to certain logics of hierarchy and exchange (see section 3.1). Here, Sarah Banet-Weiser's (2018) work pointed us toward the potential tensions and ambivalences involved in feminist visual media practices. As she puts it, "for girls and women, adopting the logics and moralities of an economy of visibility means that … empowerment is often achieved through a focus on the visible body – precisely one of the aspects of patriarchy feminism has been fighting against for centuries" (Banet-Weiser, 2018: 25).

To access how feminist users reflected on their practices of Instagram self-presentation and negotiated their feminist identities on the platform, we interviewed 25 feminist Instagram users. We found 12 initial interviewees by querying data gathered through the erstwhile Instagram API on users who had geotagged posts to either Amsterdam or Copenhagen between December 1, 2015, and May 30, 2016 (Boy and Uitermark, 2016, 2017, 2020). We searched for users who had included "feminist" or "feminism" on their profile or the caption of a post. We then employed snowball sampling, asking our interviewees to suggest other feminist Instagram users to interview. In this way, we broadened the range of

interviewees beyond the initial population of northwest European urbanites and included more widely known users whose feminist affiliation is more broadly recognized. Our bottom-up approach to sampling interviewees allowed us to reach beyond our own social networks and understandings of feminism and to sketch out how feminism is imaged and imagined more broadly. The interviewees ranged in age between 18 and 37, represented about a dozen nationalities, and generally had high levels of education. Four interviewees identified as LGBTQ, with two identifying as non-binary; all others identified as female. While the interviewees were overwhelmingly European, five resided outside Europe at the time of their interviews, and eight had a minority ethnic background. Their follower counts ranged from 300 to over 70,000.

During the interviews, our respondents often scrolled through their profiles with us, discussing what specific posts had meant for them, or how their feeds and Instagram self-presentations had changed over time, with these changes often dovetailing with their growing feminist awareness. After acquiring repeated informed consent, we incorporated some of these posts as part of our analysis. Through this multimodal approach, we gained a deep understanding of how political sensibilities, sociological processes, and technological imaginations came together to shape feminist visibilities on Instagram. We target these processes with the concept of *filtering*, referring to the self-enhancing and self-protective practices of strategic exposure, concealment, and adjustment of self that characterized how our interviewees displayed and cultivated themselves and their feminist sensibilities on Instagram. While filtering practices shaped how users made

themselves visible to others, they could not be deduced from the surface of the posts themselves. Without talking with the person, one could not guess what was left out of the frame or know how what was included was transformed or stylized. Understanding why things look the way they look on social media requires going beyond the interface and unearthing and critically engaging with users' experiences and reflections.

5.3.3 Hidden governance

Article III, "The Shadow Banning Controversy: Perceived Governance and Algorithmic Folklore," extends attention from affordances and recommendation algorithms to content moderation. The article makes explicit the link between social media visibility and systems of governance (see section 3.2). Whether people aspire to grow their audience or simply want to communicate with their existing followers, they need to take the operation of algorithmic systems into consideration. The article traces people's beliefs about, experiences of, and struggles with recommendation and moderation algorithms. In so doing, the paper seeks to address the broader logics of and emerging concerns around algorithmic platform governance.

I hit upon the idea for the article during the Amsterdam-based Digital Methods Initiative's 2021 winter school. The theme of the winter school was "Bias in Content Moderation and Recommendation." At that time, shadow banning was emerging as a highly popular term among users to refer to content moderation techniques by which posts are either excluded from recommendation or

suppressed by recommendation systems without notification. However, there was not much published academic work on the topic. Like the other four students on my team (Caitlin Harzem, Mea Lakso, Karlygash Nurdilda, and Clemence Degrandi), I wanted to learn more about shadow banning and its prevalence across social media platforms. However, and as suggested in section 5.1, platforms' algorithmic systems are often as opaque to researchers as they are to users. This gives rise to the challenge of how to map the contours of these systems, a challenge that researchers have addressed with various strategies, from computational analyses of metadata to user surveys (e.g., Nicholas, 2022; Gray and Suzor, 2020). However, these strategies (such as following content over time) may be inadequate in the case of shadow banning or, as Gillespie (2022) calls it, content reduction. It is difficult to determine whether the visibility of someone or something has been reduced because there is no clear baseline against which to compare a post's performance.

In light of these challenges, it appeared worthwhile to approach shadow banning through user discussions. While such a strategy would not produce knowledge about, for instance, the proportion of shadow banned posts and accounts over time, it would enable exploring why the practice occurs, which user groups are impacted, and how shadow banning affects their lives. The Amsterdam Digital Methods Initiative's 4Cat tool enables capturing and analyzing data from various online forums, including Reddit. During the winter school, our team retrieved Reddit discussions on shadow banning from subreddits[2] relating to three popular social media platforms: Instagram, TikTok, and YouTube. Focusing on more

[2] Forums dedicated to a specific topic or user group, such as Instagram creators or people who are passionate about baking.

than one platform allowed us to investigate whether (experiences of) shadow banning differed across services; that is, what was platform-specific and what was general about them. Our team went through the data as a group, thinking about ways to classify and structure the material. This exercise allowed us to familiarize myself with the data in depth. After the winter school, I redid the thematic analysis with my own categories and analytical foci; Article III is based on this analysis.

One methodological and conceptual hurdle I faced when analyzing the data related to the contested nature of shadow banning, an issue that is discussed further in section 6.3. For instance, ascribing to a "meritocratic" view of social media visibility (see section 3.1), some users thought that non-recommended posts were simply of poor quality and rightfully bypassed by more engaging, higher-quality content. At first, I found the discursive instability of shadow banning an existential problem for my research. I learned over time, however, that these kinds of moments – when customary ways of approaching data fall short – can create possibilities by prompting the researcher to take a new path. Instead of trying to uncover ground truths about moderation algorithms, I changed course. Given that uncertainty and instability were such prevalent themes in my data, I decided to use them as the starting point for my analysis. The guiding question in my thinking around the article became: What the precarious experiential and epistemic situation of users can reveal about systems, technologies, and relationships of contemporary platform governance more broadly?

5.3.4 Conceptual exploration

Article IV, "Dimensions of Autonomy in Human-Algorithm Relations," co-authored with Professor Minna Ruckenstein (University of Helsinki), is a conceptual paper. The value of conceptual research can be, for instance, in its originality (such as its ability to reveal novel aspects of a research topic) and/or its scientific or practical utility (Corley and Gioia, 2011). A conceptual paper does not rely on original data but produces novel insights by entering into a discussion with the existing literature. Instead of making and theorizing empirical findings, conceptual papers may aim to analyze and develop a concept, linking bodies of knowledge or extending a field's scope of thinking. However, these types of articles "share a common goal: to create new knowledge by building on carefully selected sources of information combined according to a set of norms" (Jaakkola, 2020: 19). As such, conceptual papers should also have a methodology or rationale, and decisions about key elements of the study should be made visible and justified.

The research project started in 2020, when we observed that the empirical research on the ways in which people live with, make sense of, and respond to algorithmic systems and automated decision making was burgeoning (see Chapter 1 and section 4.1). At first, our aim was to scope this emerging research focus by writing a literature review. We started off with texts that we considered foundational in initiating the scholarly conversation on everyday experiences with algorithmic systems, tracing articles that had cited them (e.g., Bucher, 2018; Seaver, 2017). In addition, we searched articles from multiple academic search engines with keywords such as "algorithm + everyday," "algorithm + agency," and "algorithm +

experience." Our sources ranged from digital media to digital health, allowing us to identify many similarities in how everyday agency in different contexts played out in relation to algorithms. Thus, the paper seeks to connect algorithmic engagements in the context of digital media with broader technological developments and their common logics and societal aspects.

Going through the gathered literature – our data, if you will – we noticed how the "living with" angle was often set up and its value justified by way of an opposition: while the critical literature on algorithmic systems depicts algorithms as if they are in control, the everyday perspective was viewed as a useful reminder that algorithmic power is far from total and that people can resist, adjust, and exploit algorithmic logics in myriad ways (see Chapters 1 and 4 and section 3.3). Rather than conducting a literature review of the everyday perspective, we felt that more work was needed to put these interesting findings into perspective and inquire about their deeper meaning in terms of not just living with but living *well* with algorithmic systems. To move forward with the debate, we decided to reorient our discussion of everyday engagements with algorithmic systems from the perspective of dimensions of autonomy (C MacKenzie, 2014). The topic of autonomy was suggested by our source articles, which circled around themes of human agency and self-governance (for instance, when discussing people's attempts at resisting algorithmic influences), but without always making them explicit. In bringing together the literatures on autonomy on the one hand and user engagements with algorithms on the other, the paper seeks to both broaden the understanding of agency in the field of algorithm studies and to provide conceptual

and analytical resources for assessing how human agencies may be enhanced or diminished when engaging with automated media.

5.4 Research ethics

Research ethics is an important and integral part of all scholarly endeavors. It has been my utmost priority to conduct research ethically and responsibly at all stages of my doctoral studies. Researchers bear a responsibility toward one another and the research community to act truthfully, respectfully, and fairly. Research ethics contributes not only to scientific integrity but also to public perceptions of science and the functioning and legitimacy of knowledge-based democratic societies. In particular, studies often involve research participants whose dignity and personal integrity should be respected and safety and wellbeing secured. As a general rule, research participants should be informed about and consent to participating in research. Another key facet of research ethics is protecting the privacy of research participants. Prior to conducting the research for Article II, we obtained written consent from each participant; we clearly stated how the data would be used and informed them of all their rights. The interview recordings were deleted after being transcribed, and the transcriptions were pseudonymous. The participants whose images are featured in the article provided *repeated* informed consent. We also sent a draft of the article to those interviewees and asked for their feedback. In so doing, we wanted to give them the opportunity to see their quotes and images in context, and we encouraged them to contest our interpretations. Meanwhile, the data for Articles I and III consisted of comments posted publicly to social media. No consent

was acquired – nor would it have been possible or realistic to do so, as the number of comments was high in both cases. This approach aligns with internet research ethics practice when it comes to analyzing data made accessible in the digital public sphere (cf. Townsend and Wallace, 2016). We took steps to protect the anonymity of the commenters by not collecting or displaying their profile names. No harm can be foreseen to be caused to the commenters as a result of being part of the research. Article IV was a conceptual paper and did not involve any participants or gathering original data on our part.

6 Findings

In this chapter, I discuss and summarize the findings of the original publications in light of the research aims and questions of the thesis (see section 5.2).

6.1 Article I: Algorithmically mediated publics

In Article I, we analyze how people engage with right-wing US junk news on Facebook, looking at how the platform's affective algorithmic architecture organizes and takes part in these connective, interactive processes. The study presents a case in point of platform affordances working in tandem with users to

generate a particularly problematic and highly spreadable form of political discourse.

At the core of the article is a threefold argument regarding platform architecture, digital emotion, and mediated publics. First, we use Wahl-Jorgensen's (2019) concept of emotional architecture to emphasize the centrality of emotive aspects in social media platforms' design. In the latter half of the 2010s, Facebook was searching for ways to counter decreasing levels of user engagement. The platform introduced "reactions" – an "extension of the Like Button" intended to be used "to express how you feel" (Facebook Brand Resources, 2020). In addition, its algorithmic system was updated to assign these emotional reactions more weight than mere generic likes. These and other tweaks in the algorithm were, according to the platform, supposed to promote "meaningful social interactions": posts that "spark conversations" and "bring people closer together." However, many observers critiqued the design approach for rewarding provocation, creating harmful incentive structures for content producers, and promoting unhealthy public debate, especially when it comes to polarizing political issues (Hagey and Horwitz, 2021; Matamoros-Fernández, 2018). Our study supports these claims by documenting how the changes toward more emotional and supposedly "pro-social" design unfolded in practice – in this case, by having been appropriated by junk news publishers and their audiences.

This brings us to the second tier of our argument. When we were writing the article, the scholarly engagement with the topic of disinformation was for the most part curiously devoid of people who consume and engage with problematic content

– who “Love” and “Share” it on Facebook, for instance. The question of reception and meaning-making was seemingly taken as a non-issue. Alice Marwick (2018) suggests that among social researchers, consumers of political disinformation have been predominantly imagined as “cultural dupes” whose behavior is determined by power structures and therefore largely unnecessary to analyze. Junk news as a particularly affective media form that is both native to and exploitative of social media’s emotionally driven dynamics of information circulation has arguably made this omission doubly easier – after all, assigning emotionality has a long track record of being used to dismiss the agency of out-groups and marginalized individuals. However, in light of today’s participatory and adaptable algorithmic media landscape, taking seriously people’s practices of sharing, reacting to, and commenting on junk news stories appears to be of paramount importance. This is because through the use of the connective, responsive affordances and semiotic resources provided by algorithmic platforms, these activities contribute significantly to both the spread and the framing of information.

We found that while junk news items themselves were typically about bounded events and were often written in a dry and even formal tone, audience responses gave them an emotional-evaluative valence and connected them to broader bipartisan narratives. Moreover, the focus on reception taught us an important lesson: in contrast to rationalistic notions according to which disinformation consumption results from poor media literacy, we found that for junk news audiences, whether or not a news story followed journalistic guidelines was not a priority. Disinformation could be used for building movements and

expressing solidarity, identity, and collective emotion even when users were made aware of its exaggerated and selective nature – perhaps even more effectively so. Moreover, while disinformation is typically associated with negative emotions like anger, hate, shame, or resentment, factoring in positively received content and "Love" reactions allowed us to understand more fully the emotional drives and social dynamics involved in the consumption of politically biased news.

As discussed in section 5.3.1, our methodological approach traced and trailed platformed dynamics of visibility rather than trying to reach beyond or work against them. This choice necessitated a critical reflection on what we were in fact studying when examining viral junk news and the user discussions that circulated along with them. This critical reflection brought forth the last constitutive argument of the paper. As pseudonymous and thoroughly transient, algorithmically mediated gatherings of public speech map awkwardly and with uncertainty onto persons or groups "on the ground." We found Zizi Papacharissi's (2015, 2016) work on *affective publics* highly instructive in dealing with this unreliability. Bound together by accumulating connective expressions, the existence of affective publics is inscriptive: they become what they are and a record or trace of what they are. This conceptualization allowed us to overcome the problems of origin, sample, and authenticity (here, for instance, of signaled emotion) that characterize unobtrusive social media data while emphasizing that although mediated publics might not have an existence independent of their "textual rendering" (Papacharissi, 2015, 2016) on social media, they may still have real-world effects. Building on Papacharissi's work, we argue that in the context of the study, affective virality surfaces audiences

qua publics, as bursts of mass engagement "bring otherwise disparate audience members together and direct their dramatic focus toward objects of collective concern, anger or joy" (Article I: 1). Digital political emotions are thus fundamentally inscriptive and performative.

In terms of the dissertation's research objectives, Article I highlights how seemingly simple changes in recommendation systems can have cascading real-world consequences as they interface with media ecologies, moral affects, and in- and out-group dynamics. In digitally mediated interactions, people negotiate truth, value, and meaning and create contexts for one another's feelings and expressions. However, in analyzing these interactions, the complementary role of algorithmic technologies in organizing pleasurable and enraging encounters with information and encouraging some kinds of expressions over others must be taken into consideration. A key issue here is how users are implicitly brought together and their symbolic products related to one another. In a post-phenomenological vein, algorithms appear as technologies of orientation, guiding interactions and attuning users socially, politically, and affectively. These processes are important to study because they have the potential to steer public debate and collective action toward certain political directions and sentiments rather than others.

6.2 Article II: Feedback-looped selves

Article II continues the focus on the interaction between social actors and design features to understand how public debate and subjectivities emerge at the interface between algorithmic platforms and their users. More concretely, we focus on

feminist Instagram users' practices of self-presentation. The study highlights Instagram as a place where selves are created, tested, and transformed – as are politics. Today, political expression and activism are increasingly rehearsed via social media profiles, where they are seen to borrow from and dovetail with scripts and practices associated with self-branding and, relatedly, social media "influencing" (cf. Thomas and Fowler, 2023). These practices are by definition directed at an audience and involve an orientation toward the technical and cultural factors that determine success on different social media platforms. Instagram has emerged as a central hub for communicating and enacting various feminist views. However, we argue that the social competition encoded in its algorithms, its popular association with self-promotion and status displays (Marwick, 2015), and its visual emphasis, combine to make it a challenging environment for (some forms of) feminist expression. After all, although contemporary feminism is best understood in the plural, feminism has an undeniable history as a collective movement with a critical and analytic stance toward visual culture and the place of women within it. Against this backdrop, my co-authors and I became interested in how feminist Instagram users experienced the platform and how the platform steered and restricted their construction and communication of a feminist self.

The questions we pose presuppose a socio-technical environment that encourages and inhibits expression in ways that involve yet go beyond mere technical features. As to the research objectives of the dissertation, a key contribution of the paper is the way it takes up and develops Goffman's concept of the *interaction order* to illustrate the (inter)active role of users and technologies in

co-shaping social orders on digital platforms. The concept refers to the unspoken, ceremonial ground rules of interaction "upon which the maintenance of self depends" (Rawls, 1987: 140). We argue that the distinct interaction orders observable on different platforms emerge in a dynamic and contingent interplay between user activity and technology, of which algorithms are only one – albeit an important – element. People explore the possibilities and affordances that platforms offer visually, aesthetically, professionally, and so on. As they observe each other adopting novel styles, skills, and technologies of self-expression, new expectations, standards, and ideals develop. For instance, many of our interviewees reflected humorously on the "naïve" and artless character of Instagram posting during the platform's early days, which has now been replaced by more polished, curated, and strategic self-presentation. We stress that social media's interaction orders are not fixed or total but flexible and context-dependent: on Instagram, there undoubtedly exist niche communities with specific interactional rules and self-presentation practices. Yet, it is noteworthy how consistently – at least among our Western respondents – Instagram was imagined as an aspirational, visual, and person-centered technology. Our interviewees agreed that the platform allows for, encourages, and rewards more aestheticized, entrepreneurial, and individualistic displays of self than other social contexts.

We found that Instagram posits highly compelling rewards for users, such as social status, positive affirmation, and professional advancement. Many of our interviewees felt energized to build an audience or pursue "influence," by, for instance, dreaming of one day receiving art commissions through the platform or a

free holiday "gifted" by a travel agency. At the same time, the platform's aspirational interaction order – promoted by an algorithmically forged competition for visibility – created a structural push toward presenting oneself in ways that clashed with collectively oriented feminist politics. Many of our interviewees struggled with how to negotiate their feminist ideology with the competitive and individualistic displays of self that they perceived to be the norm on Instagram. They often became more passive on the platform as a result. We call such practices, where users conceal otherwise central aspects of themselves and their identities, *subtractive* filtering (see also section 5.3.2.).

At the same time, for some interviewees, "getting into feminism" had in fact reduced inhibitions to put themselves more boldly on display. These respondents often wanted to challenge norms around female modesty by showcasing their bodies or successes as young women. They found sexy selfies and posts about professional or social achievements to work especially well on the platform and harnessed feedback to gain algorithmic visibility. In the process, their self-presentations developed, often in a more provocative direction. Feminism was negotiated to fit the precepts of reach and exposure: for instance, one informant whose Instagram profile was focused on feminist twerk dancing told us that if a post created controversy, that meant that she was pushing boundaries and breaking social norms – which she should as an activist. We refer to these practices as filtering as *enhancement*: they illustrate that for people whose feminist ideology is not in conflict with Instagram's affordances and user culture but rather aligns with (at least some aspects of) it, the platform can act as a booster. As we put it, "the

ethos of social media self-production turns out to be highly compatible with a branded, hyper-confident, and corporeal mode of activism" (Article II: 567). Filtering as enhancement attests to how digital mediation of feminisms not only leave elements out but refashions them altogether.

For the majority of our interviewees, though, feminist expressions took the form of *minute deviations*. For instance, they wanted to challenge aesthetic norms and ideals of beauty but at the same time maintain the aspirational self they had carefully crafted on the platform. Thus, they could deviate from the perceived standard only slightly, such as showing cellulite on an otherwise beautified picture. Based on our analysis, we suggest that filtering does not just describe feminist users' personal experiences with using the platform. Rather, we argue that their "socio-technically conditioned judgments regarding what to display, augment, and conceal – together with algorithms that likewise value and rank content – produce a certain kind of a feminist imagery and imaginary" (Article II: 575), in particular amplifying a feminist politics that affirms the pleasures of visibility and desire.

6.3 Article III: Runaway rules

Article III shifts the focus from algorithmic visibility to invisibility and from algorithmically mediated public debate on social media to public debate about algorithmic mediation itself. It does so by exploring social media users' beliefs and experiences of shadow banning (see section 5.3.3). A key feature of the paper is employing user experiences to surface and map logics and dynamics of algorithmic

architectures. This does not mean taking lay beliefs about algorithmic systems at face value; after all, they are subjective and reflect their speakers' interests and biases. However, everyday experiences and emotions arise in relation to socio-technical structures and thus can in this case reveal some aspects of the logics and dynamics of platform governance.

Users accuse platforms of secretly thwarting their visibility: according to a recent survey, as many as one third of US social media users believe that they have been shadow banned (Nicholas, 2022). Meanwhile, platforms firmly deny engaging in the practice. They point, for instance, to standard fluctuations in visibility due to changing volumes of incoming posts or the complexity of the signals that recommendation algorithms consider (Mosseri, 2021). At the same time, it is known that platforms have emerging "borderline" content policies and practices for preemptively suppressing the exposure of potentially problematic content, which is assessed through various signals and proxies with the help of machine learning methods (Gillespie, 2022). Even on a discursive level, suppression appears to be a vague technique: what counts as borderline content or behavior is never clearly or concretely explained in the platforms' terms of service. This "freedom of speech, not of reach" ideology may seem reasonable. Yet, because consumers rely on recommendation systems to provide them with information, suppression can easily turn into a particularly deceptive tool of moderation and even censorship (cf. Are, 2022). As noted above, suppression differs from more "traditional" forms of content moderation (such as post removals or account suspensions) in the important sense

that it is difficult if not impossible to ascertain, because neither users nor researchers have a clear baseline against which to compare a post's performance.

The back-and-forth between some actors challenging the legitimacy of algorithmic recommendation systems and others presenting them as neutral mediators of audience interest or working as intended aroused my curiosity. But how to render something whose existence cannot be pinned down, whether globally (Does shadow banning exist on this platform?) or locally (Is shadow banning the cause of decreased visibility in this case?), into an object of social research? In light of my data, I approach shadow banning as algorithmic folklore, understood as experiences, beliefs, and stories about social media algorithms that are "passed on informally and can exist in tension with official accounts" (Article III: 1092). I find algorithmic folklore to be a symptom of contemporary data relations, reflecting the invisibility of datafication and algorithmic processes on the one hand and their simultaneous intrusiveness and power on the other. I argue that shadow banning as algorithmic folklore can act as a methodological entry point to studying the shifting grounds and emerging logics of algorithmic governance on social media – not necessarily in terms of the actual practices themselves, but in terms of the experiential dimension that, in turn, indicates broader modalities of control.

Shadow banning was also an extremely unstable term among users themselves, who disagreed about its definition, prevalence, rightfulness, and even its existence. Thus, instead of referring to something fixed and definite, I found that shadow banning acted as a discursive gathering point for discussing various experiences of algorithmic power, united by feelings of precarity, uncertainty, and

not knowing. This suggests that what makes the term, whose origins date back over 20 years in internet history, resonate today is primarily that it addresses governance that is hidden from the governed. Moreover, the conversations provided an interesting counterpoint to mainstream discussions of algorithmic governance as consistent and rational. While machines have traditionally been seen to correct human fallibility (cf. Crawford, 2021), users experienced algorithmic systems on social media as capricious and prone to error, discussing rules encoded in algorithms as opaque, ever-changing, and inconsistently enforced. Interestingly, the precarity experienced by users relates in part to the role they themselves play in the system's operation: algorithms are not only tweaked as a response to changing user practices (see section 3.3) but also reflect user behaviors and predicted trends in the ever-changing supply and demand for content.

The finding that users tried their best but were unable to follow the rules that algorithms encode merits a pause. Traditionally, rules have functioned as resources of power by being communicated to the subjects of that power. Moreover, clarity and publicness of norms count among the governance values that legitimate the use of power. Without awareness of rules, subjects have neither the ability to follow them nor the agency to criticize them (Schwarz, 2021). By contrast, because they are sunken into material infrastructure, algorithms exert influence first and foremost as material things, giving rise to a modality of power that Lash (2007) describes as "post-hegemonic." Although based on and enforcing rules, algorithmic decision making thus implies "forms of semiosis that take effect not like signs … but also like walls, encroaching on conduct through modifications of the visible and

navigable environment" and "adjusting the probabilities of possible outcomes" (Rieder, 2020: 256). This is well reflected by the move from content moderation to "visibility moderation" (Zeng and Kaye, 2022), of which non-recommendation is a prime example. Here, the aim is not primarily to enforce behavioral norms – indeed, neither the rule-breaking nor the ensuing "punishment" are necessarily communicated to the user – but rather to anticipate, control, and optimize the environment based on data. In relation to this modality of algorithmic power, user agency takes the form of constantly seeking to uncover hidden algorithmic rules and states of affairs.

Based on my analysis, shadow banning folklore surfaces perhaps irresolvable paradoxes in algorithmic platform governance. From the platform's point of view, disclosing the rules that algorithms encode might be counterproductive, as it would likely result in some users trying to exploit them. It should be noted that this could also have negative and largely unpredictable effects for the digital public sphere. At the same time, the mere existence of hidden forms and rules of governance hampers people's trust in a platform, because it puts pressure on autonomy and creates significant levels of uncertainty and speculation among agents. These tensions around the clarity and stability of platform rules are only going to become more pronounced as platforms develop their governance systems into an increasingly automated and algorithmic direction (cf. Katzenbach, 2020). This is because while the target goals of algorithms are set by humans (for instance, maximizing time spent on the platform or removing material that infringes on "community guidelines"), algorithms learn actual decision-making principles

through evolving data. As algorithms essentially self-generate rules, they are involved not only in enforcing human-made policy regarding acceptable and desirable behavior but also, to a certain extent, in setting it – and doing so in ways that may even escape the human rulers and designers behind these systems.

6.4 Article IV: Doing autonomy against and with algorithms

Article IV examines in greater detail the various kinds of human-technology relations promoted by algorithmic systems in daily life and how they reconfigure social practices in ways that may run counter to public values. The study focuses on one value in particular: autonomy, which refers to the state or quality of self-determination. It is entwined with other ethical principles like human dignity and privacy and is an experience according to which people evaluate their quality of life. At the core of autonomous agency is the ability to make decisions and act on the basis of motives, values, or reasons that correspond with one's reflectively constituted self (C Mackenzie, 2014). Autonomy, then, requires not just non-interference but also a degree of control over one's drives and impulses, critical reflection on one's choices and actions, and self-evaluative attitudes as competent and accountable. Importantly, the full realization of autonomy is a socially embedded process. For instance, the development of the capacity for and the exercise of autonomy call for recognition and support from others over time and an environment where certain cultural and informational prerequisites are met, such as a sufficient variety of cultural options and an adequate degree of privacy.

Various empirical and theoretical observations, some of them already touched on in this dissertation (e.g., section 5.3.4), guided my co-author Minna Ruckenstein and me to reflect on what happens to personal autonomy and its sense in relation to algorithmic decision making. Algorithmic systems are characterized by information asymmetries between their owners and users, making it difficult to object to or endorse them in an informed, rational manner. Furthermore, they influence our decisions or make them for us based on "reasons" that we may not understand (see sections 2.2 and 6.3), giving rise to the question of (the possibility of) authenticity in algorithmically conditioned choice. Moreover, in doing so, their predictions are wholly based on past data and thus seemingly work against our potential to become otherwise; for example, to change our habits, attitudes, or devotions, seen as formative of autonomous personhood (Helm, 1996).

In light of these insights, we approach autonomy as a multidimensional value that is actively worked on in practical engagements with technology, and that (like all values) becomes particularly visible when under threat (Tanninen et al., 2022). While autonomy is negotiated in many kinds of relations (e.g., in personal relationships and in relation to social structures or oppressive socialization), due to the aforementioned ways in which algorithmic logics appear to endanger human autonomy, it is relevant to ask how this happens in encounters with algorithmic systems. With this conceptualization, we recognize that algorithms challenge and support human autonomy in qualitatively varied ways and that despite threats to human autonomy by algorithmic systems like opacity, manipulation, or misrecognition, agents are able to reflect on, counteract, tweak, and even opt out of

algorithmic operations. Such an empirically oriented perspective is especially relevant given that the ethical, affective, and social relations into which algorithms enter cannot be theoretically deduced or read from code alone and may be unintended or unforeseen (see Chapters 2 and 4). Thus, it is important both to pay attention to the procedural aspects of values and to theorize their relationship to emerging technologies while also recognizing the ethically important dilemmas and moments that arise in day-to-day life, as they can guide us toward novel tensions and developments.

While acknowledging the messiness of both ethics and technologies in practice, we sought by writing the article to contribute conceptual resources for understanding and assessing autonomy and its experience in the algorithmic everyday. We do so by arguing that in relation to algorithms, autonomy is navigated as an *instrumental* and *intimate* type of relation to technology. With the former, we call attention to how algorithmic systems are used to bring human behavior under computational rule and optimization (see section 3.2). In the user experience, algorithms often appear as background decision makers and enforcers of rules whose instrumental logic can be learned and reflected on and in relation to which once can act rationally. In this context, user autonomy hinges on a) understanding the role of algorithms in conditioning one's choices and chances and b) being able to counteract the technology where necessary in order to avoid interference. However, we emphasize the precarious, individualistic, and situational nature of such engagements, arguing that impactful resistance for a more empowering digital sphere would require collective organization.

Paradoxically, though, the same computational processes that allow control at a distance also promote technological relations that are experienced qualitatively very differently: as close and even *intimate*. We share confidential information, personal space, and affective practices with algorithmic systems, using them as aids in the construction and cultivation of our selves. They are embedded in gadgets we carry with us at all times, becoming our bodily extensions. At the same time, they evaluate and act on us in ways that feel highly personal and invasive, transforming our behavioral data into intimate inferences and outputs. Among other things, qualities such as sexuality and gender, tastes and desires, and trustworthiness and attractiveness all become objectified and predicted.

This new transparency in algorithmic systems is relevant from the point of view of autonomy. We especially draw attention to how behavioral approaches in algorithm design are felt to violate the personal space needed to foster goals, reasons, and self-definitions that we can truly claim as our own, giving rise to self-protective behaviors. Here, algorithmic systems run up against the relational and affective dimensions of autonomy that relate to social recognition and self-evaluation. For instance, when algorithmic systems override our personal goals and self-definitions based on group-level data and interested predictions, they appear to misrecognize our autonomous personhood. Here, it should be noted that generalization is not necessarily at odds with human autonomy. Rather, the question is how to balance the efficacy of treating people based on statistical inferences while also leaving room for individual variation and agency. The theory of relational autonomy, especially in its affective and self-evaluative dimensions,

raises the concern that if digital infrastructures continue to be built on opaque and behaviorist principles, our sense of autonomy and capabilities for exercising it may begin to deteriorate; for instance, we may start to feel increasingly comfortable in leaving significant choices regarding value or meaning to machines.

7 Discussion

In this dissertation, I have explored the socially patterned ways in which the world appears to us and how we appear to others on social media platforms. The locus of my analysis has consistently been on the platform-user interface. I have sought to understand how platform features and users play in tandem to create expressive and affective patterns (Article II) and emphasized the active role of users in co-shaping even problematic forms of algorithmic phenomena, such as viral disinformation (Article I). Moreover, I have found it paramount to seek to understand and conceptualize the role of algorithms in regulating what is made visible and to whom, and how users can make sense of these largely hidden governance processes (Article III). In doing this work, I became interested in exploring user agency in relation to algorithmic decision making in greater depth and on a more conceptual level (Article IV).

Taken together, the four sub-studies offer valuable fresh perspectives to research on algorithmic social media. While they have different theoretical and empirical foci, they all approach technology use with an open and curious attitude while remaining committed to a critical stance toward the power imbalances it

involves. In this integrative document, I have woven the different articles together by combining them with insights from platform studies and social studies of algorithms on the one hand and STS and post-phenomenological approaches to technology use on the other. Enriched and enhanced by these theoretical resources, the findings of the sub-studies highlight the intimate and dynamic nature of human-algorithm relationships: social and algorithmic agents become implicated in one another so that their unfolding trajectories cannot be understood without reference to each other. However, this mutual shaping takes place in an uneven landscape: if users are involved in molding algorithmic phenomena, they are involved selectively, because they have little control over how their behavior becomes datafied and the purposes for which the algorithmic system optimizes for.

Next, I build on the results of the sub-studies and the perspectives introduced in the literature review, illustrating their contributions to the current discussions in algorithm and platform studies and to a lesser degree to STS and media scholarship focusing on the role of users in shaping technology (see section 3.1). Ultimately, I argue that while we need to take use seriously as a location where algorithmic phenomena and futures are co-shaped, we should be careful not to overemphasize the empowering qualities of such interfacings.

7.1 Technology in context

Inspired by cultural approaches in media studies, the thesis understands society and culture not as passive or vacant landing sites for powerful technologies but as already teeming with practices, meanings, values, and differences. What matters is

how technologies come to reconfigure or enforce these social patterns. For instance, Article I illustrates the entwinement of the political, emotional, and the algorithmic by exploring how viral US junk news brought like-minded users together, enabling them to share and demonstrate collective concerns and feelings. I found interactions with US junk news on Facebook to be closely linked with a bipartisan culture, enforced by the long-standing political polarization of the US media ecosystem, especially on the (far) right. Article II, meanwhile, analyzes the intricate patterns of meaning-making that underlie feminist users' self-presentation practices on Instagram. I was intrigued by the complexity and richness of reflections to which discussing a seemingly habitual practice – that of posting images of oneself and one's life to social media – could give rise. The findings made visible how the visual platform encouraged specific ways of relating (to) oneself (and) to others and amplified forms of aestheticized, branded, person-centered, and audience-oriented activism. Understanding feminism's ambivalent relationship with individualism, marketization, and self-objectification and self-subjectification (cf. Gill, 2003) helped me make sense of the differences in my interviewees' reflections on self-presenting on the platform.

Social media algorithms are able to bring users together in particular ways through data-based assessments: for instance, as correlative, affective audiences (Article I) or as individualized content producers who are incentivized to compete for engagement (Article II). Yet, the described social media visibilities could not be reduced to the algorithmic logics themselves. As detailed above, the expressions, behaviors, and experiences analyzed in Articles I and II would not have been

understandable without reference to the contexts within which my research subjects were immersed. In both cases, the identity of the technology – and the related precepts and conventions of use – were not dictated by design, but co-shaped by users, their frames of reference, and their practical goals. Thus, it makes sense to think about the algorithm as providing an organizing principle that comes to matter or becomes operative as it interacts with other elements that make up the system, from other platform features to content producers and audiences' identities and feelings. For instance, the forms of virality discussed in Article I were closely related to how simple yet powerful changes in interface design (most notably, Facebook's Reactions button, which was introduced to spur engagement with content) were linked with optimization based on machine learning (see section 2.1). These changes encouraged opportunistic practices among content producers ready to exploit the affordances of affective computing, whatever the downstream effects.

Consequently, when analyzing algorithmic visibilities, we need to be not only technology- and platform-specific, but also culturally and contextually specific. As argued, the literature on users' agentic engagements with social media algorithms tend to analyze encounters with algorithmic systems in ways that are circumscribed to their self-aware, tactical dimensions. This gives much of the discourse on such engagements a technical tone. It is true that algorithmic decision making situationally pushes users to relate to their own activities in highly strategic ways (Article IV). However, the sub-studies draw attention to how, in general, humans engage with (social media) technologies as embodied, socially immersed,

and culturally wired beings with a past and a future – and whose main focus is often not the algorithm itself but the social activity it enables. This argument is not intended as a romantic reminder about the irreducibility of the human in the face of machine logic. Rather, as I have tried to argue, a qualitative researcher's sensibility is urgently required to make sense of the behavior of user-algorithmic interfacings in the wild. When we use social media, our social and affective dispositions work through us and become reflected in our data traces in different ways of which we are aware and unaware (Airoldi, 2021). This dissertation, then, calls for context-sensitive explorations on how algorithmic systems become embedded in the practices of differently positioned users and interfaced with users' emotions and agency. Below, I contribute to our understanding of social-algorithmic interfacings by drawing together some of the most important conclusions of my studies under the notions of algorithmic intimacy, generative use, and reactive governance.

7.2 Algorithmic intimacy

Research suggests that algorithms are increasingly used to help entice individuals by identifying and producing affective reactions and behaviors and that through personalized, interactive technologies, platforms seek increasingly emotion-based connections with users (see section 3.1). These are observations that my research supports. However, because it is concerned about algorithmic developments and their impacts on public debate, much existing research on emotions and algorithms

treats emotion as a somehow threatening and regressive force. The latter is particularly visible in research on digital disinformation. In many cases, little space is devoted to defining the concept and its contours, and emotion is often painted in a negative light by assigning various social ills to the (stimulated) "emotionality" of digital media users, from their assumed preference for information that affirms their attitudes and beliefs to the decline of democratic culture (Bakir and McStay, 2018; Gustafsson and Weinryb, 2019). This is problematic, because assigning emotionality is often a tool of delegitimizing actors, their claims, and their agency. Moreover, the vilifying accounts of emotion found in work on algorithms seem to unintentionally bolster platforms' power by affirming the potency of their tools in manipulating individuals and dictating their affective landscapes (e.g., Bakir and McStay, 2018).

Meanwhile, in light of the sociological literature, emotions are complex, often layered and contradictory, and entwined with language and cultural practice (Wetherell, 2012). We should not get rid of emotion, and nor could we. At the very core of meaningful participation in public life (exactly what many academics hoped social media could promote) is an affective experience of collectivity (Kelty, 2020). Emotions are evaluative: they inform us about the world and our place in it – suggesting that emotions and reasons are not separate but co-constitutive. Thus, emotional experiences – even staged ones – are never the same for two people, because they derive from the interaction between the event and the individual with their unique history and patterns of meaning-making (cf. Pine and Gilmore, 1998). Feeling is thought to be involved in, and indeed to support, thinking. Emotions

enable and enhance decision making, functioning as a preconscious judgment and filtering of experience. And without affect and emotion, information does not interest or engage us. It is no wonder that young people are increasingly turning to social media's affective, co-presencing infrastructures to find information and learn about new topics. Thus, while the story I have told with my research is often recounted with and through emotions and experience, I have sought to bring nuance to the discussion, highlighting the aforementioned complexity and layeredness of algorithmically mediated emotions. Attending more precisely to how emotions are enrolled in algorithmic world-making and the kinds of feelings to which algorithms give rise (Bucher, 2018; Ruckenstein, 2023; Article III; Article IV) can help us think more productively about the relationships between algorithmic power, emotion, and agency.

The four sub-studies point to different ways in which platforms mobilize and activate feelings among users, enrolling affective processes into algorithmic world-making. *Semiotically*, platforms encourage emotional interactions with information and other people through embedding "pro-social" communicative affordances like hearts or emojis (Article I). As a result, more and more of our technologically mediated communication happens multimodally. The use of emotive features can be used as input data for algorithms that boost emotionally engaging content. Article I traces how relatively simple changes toward more "emotional" interface design can spur the social process of affective polarization, as they interface with media ecologies, political emotions, and in- and out-group dynamics. The article suggests that while affect and emotion are inherent to all

public debate and participation (as stressed above), perhaps the mediating role of digital platforms could be viewed as recalibrating and intensifying their role in democratic culture in ways that make productive deliberation more difficult.

Relationally, platforms seek to make themselves key mediators of social relationships and emotional lives. Digital services support cherished and intimate connections (Paasonen 2021: 17). They harness social information and feedback (in the form of, for example, social comparison, notifications, likes, and comments), organize relationships (by, for instance, suggesting friends or promoting content from users ranked as close to oneself), and encourage people to document important life events on their services. As a result and as illustrated by Article II, many of our relational projects – from self-construction to the enhancement of social status and reputation – now take place on and through digital platforms. Platforms have a stake in fostering emotional connections and attachments: in so doing, they effectively bind users to their services. Article III makes visible the power that platforms have as mediators of social relationships: users who had lost algorithmic visibility often felt like they had lost their ability to communicate and were stripped of their social capital (Schwarz, 2019).

Behaviorally, social media's interfaces and algorithms seek to involve pre-conscious responses and exploit users' psychological "vulnerabilities" and predictable irrationality in order to more effectively shape their behavior in line with corporate aims (Seaver, 2019; Stark, 2018; Yeung, 2017). For instance, algorithmic platforms are knowingly designed to harness perceptual stimuli and brain reward systems. Vibrations, sounds, and colors command attention, while

design choices such as the infinite scroll entice through a "constant, repetitive switching between certainty and uncertainty" (Heaven, 2014; Schüll, 2012). Atomized users are immersed in an experience of flow at the center of which are not the rewards themselves but the affective state generated in human-machine interaction (Schüll, 2012). In Article IV, we approach these developments from the point of view of autonomy, arguing that contemporary digital infrastructures are very purposefully seeking to intervene in our courses of action, steering them in line with interests that might differ from our own. Here, we assume that technological constraint and influence are not problematic in themselves, but that technology becomes autonomy-threatening when it is difficult to develop a working relationship to it – for instance, because it is opaque or determines activity and its overarching goals to a great extent (Verbeek, 2011: 111).

Resonating with existing research on corporate strategies of commodifying emotion, the semiotic, relational, and behavioral point to different ways in which emotion – both as somatic responses and discursive practices (Wetherell, 2012) – is increasingly harnessed by and incorporated into the regulatory and value-producing infrastructures of social media platforms. Meanwhile, less understood are the technological relations that newly emotional algorithmic technologies promote in the everyday. In light of the more nuanced views on emotion, approaching human-algorithm relationships calls for expanding focus from the critical analysis of corporate aims toward looking at the various ways in which people actually live with invasive technologies – for better and for worse

(Ruckenstein, 2023). In Article IV, we seek to conceptualize the patterns of these experiences with the concept of intimacy.

The intimate refers to what is closely held, private, and selectively shared with trusted others (Yousef, 2013). The concept of intimacy seeks to capture technology experiences and attachments as personal practices that are increasingly transparent to and co-shaped by algorithmic operations. The interactivity of algorithmic systems and their ability to learn and remember user preferences invite users to build relationships with them: use thus involves a movement toward increasing closeness with the machine. In user experiences, algorithms routinely appear as familiar and trusted companions, providing pleasurable, personalized experiences. For instance, Şot (2022) argues that users' choice of one platform over another relates in important respects to the ability of their algorithmic systems to foster a sense of intimacy by connecting users with like-minded others and creating "safe spaces" of intimate interaction and familiarity. Meanwhile, Karakayli et al. discuss recommender systems as "intimate experts, accompanying users in their self-care practices" (2018: 3). Despite academic and public concerns about pervasive surveillance, when a user feels that an algorithmic system can assist her, she may indeed seek to provide it with ever more accurate and exhaustive data about her preferences (cf. Ruckenstein, 2023; Siles et al., 2020).

However, based on our research in Article IV, we argue that algorithmic intimacies are also inherently volatile because algorithmic systems can never know users in their individuality, quite apart from whatever algorithmic "knowing" might mean. The sense of closeness and familiarity relies on intense datafication and

predictive analytics, of which algorithms routinely "give accounts" (Amoore, 2020), such as when their recommendations come off as stereotypical, or when they steer users too aggressively or noticeably toward particular behaviors. In these instances, intimacy breaks down. Users are made to question the risks of data capture and profiling and reminded of their vulnerability to techno-economic forces. In Article IV, we argue that what is at stake at such moments is autonomy: our desire to define ourselves and decide for ourselves what we find worthwhile – and the demand that others respect these definitions and decisions.

In much of public and academic discourse, technology still tends to appear as a somewhat utilitarian thing, used to carry out a non-technological end in an effective, rational, or objective manner. As a result, the public debate appears to lack a more nuanced vocabulary for critically reflecting on the potentials and perils of newly intimate technologies. In this landscape, emotions contain elements of social critique. They are key to people's everyday efforts at living well with algorithmic systems: they signal what must be avoided (e.g., profiling based on stereotypes) and what is worth striving for in algorithmic media (e.g., more control over how one becomes influenced). Perhaps the diagnosed "emotionality" problem of algorithmic platforms (Bakir and McStay, 2018) is, then, not a problem of emotionality per se (Nikunen, 2019) but rather relates to the selective ways in which affects and emotions are enrolled as part of algorithmic world-making. All in all, understanding the complex ways in which private and public practices are mediated by social media requires departing from straightforward understandings of social media as a new form of rational public sphere or algorithms as cold,

logical, and bureaucratic and foregrounding their intimate and persuasive aspects instead. We should start from acknowledging that – for better and for worse – the aim of contemporary technology engagements is increasingly in the subjective, affective, and immersive experiences facilitated by technology.

7.3 Generative use

The active nature of use is a theme that runs through the sub-studies. While much influential work on algorithmic systems depicts them primarily as manifestations of the will of corporations or designers, there is in fact a long stream of research in STS and media studies that challenges the viability of such understandings by illustrating the myriad and productive ways in which users take part in shaping technology (section 4.1). My research underlines the continued relevance of this work in the face of algorithmic developments. For instance, in line with recent empirical findings (Lomborg and Kapsch, 2020), I have illustrated how the meanings people give to social media platforms and how these meanings dovetail with their identities and political sensibilities guide how they engage with algorithms (Article I). However, given the self-learning nature of algorithmic systems, we also need to think about the participation of users in novel ways. Most notably, learning systems evolve as their outputs are fed back to them as inputs. Each time users engage with algorithmic technologies, they are already changing them materially. Users' incremental contributions make up for system-level change and learning, influencing the particular techno-cultural formations that become visible. In other words, users not only post, comment, and self-express but also

shape algorithmic decisions about which expressions are worth promoting and for whom.

In the everyday-oriented STS and media studies literature, the productive nature of use relates to the increasing stability and meaningfulness of a technology. On the one hand, it is understood that users play a critical role in technological "stabilization" – that is, the social process of negotiation and contestation whereby a technological artifact gains a more or less fixed function and status (section 4.1). On the other, STS and cultural approaches in media studies (cf. Oudshoorn and Pinch, 2003) emphasize the processes by which technologies become "domesticated" through user practices that involve making meaning of and embedding technology in mundane practices. However, due to the direct and continuous feedback between input and output data, with algorithmic systems use is not merely productive but should rather be viewed, I suggest, as *generative*. Instead of simply "stabilizing" or "(re)interpreting" technology, users' data and practices contribute to the system's continuous change and transformation. What is at stake is this: how one uses a technology like a bicycle is unlikely to affect other cyclists. Meanwhile, generative use reconfigures the relationship between local and global, establishing a direct, immediate, and continuous interchange between the two. How one user interacts with the algorithmic system immediately shapes how other people will be known, targeted, and treated by it in the future. The outcomes of generative use thus result from complex human-machine interactions carried out at scale.

Here we come back to the puzzle introduced at the very beginning of this thesis: do algorithms reflect the will of the platform or those of its users? Generative use results in a paradoxical situation where, on the one hand, the agency of media consumers is amplified and they in some sense have more power: algorithmic systems seem to materialize, particularly intensively, a decentered notion of power as being exercised "through the effect [our] actions have on others' actions" (Cooper, 1994: 437). On the other hand, their autonomous agency is challenged because they have little control over how they are datafied and the kinds of goals and values their intimate data are made to serve (Article IV). As illustrated by Article III, the ability of algorithmic systems to automatically optimize behavior based on diffuse and high-dimensional information creates notable uncertainty among users regarding how the systems work and how they should be successfully or appropriately used. Experientially, productive use *reduces* uncertainty around a technological artifact. Meanwhile, generative use can be viewed as *increasing* this uncertainty.

The notion of generative use contributes to the scholarly debate on algorithmic power and user agency by underlining that although use shapes technology, it is not necessarily empowering. While use has system-level outcomes, they arise from the complex interdependencies between the actions of individuals, algorithms, and platform companies. Everything from data about a user's historical behavior, combined with those of other users to changes in the volume of and demand for content influence algorithmic decisions. Thus, users are performatively involved in shaping what is made visible and to whom, but not in ways that would

be fully or meaningfully in their control. Moreover, much of the media studies literature on agentic engagements with algorithmic systems centers on how individual users act on algorithmic logics for their personal advantage, emphasizing users' competence and creativity (section 3.3). This research focus is not surprising, given that digital platforms address content creators as entrepreneurial individuals. Yet, the notion of generative use suggests that it is worth asking what such individual tactics amount to, and what kinds of social worlds are generated as a result. For instance, many of the interviewees in Article II avoided Instagram on days when they were not feeling confident: the flood of curated feeds and beautified images by other women was simply too much. At the same time, they were creating similar imagery themselves, having noticed that it "worked" on the platform, passed algorithmic gatekeeping, and earned them praise and rank. Here, the notion of generative use calls attention to the emergent, cumulative, and collective repercussions of each individual advancing her own interest in an algorithmically enforced competition for visibility and status. Overall, the term not only complicates simple stories about user agency and its ethical dimension but also raises questions regarding how to think about designing algorithmic platforms that would, for instance, be more controllable or less unequal in terms of how attention and visibility become distributed.

7.4 Reactive governance

Platform governance is an important topic both practically and academically, with scholars considering how platform owners' rule should be regulated and steered to

facilitate a more democratic digital society (Lehdonvirta, 2022; Suzor, 2018). Thus, the last key contribution of the dissertation – and the perspective it develops in approaching use as generative but not necessarily empowering – relates to governance by platforms. These insights stem mainly from reflecting on and contextualizing the user experiences analyzed in Article III.

Discussions on algorithmic governance often tell a story about power and governance *empowered* by real-time information about social behavior and armies of tireless, computerized rule-enforcers (cf. Couldry and Mejias, 2019a; Schwarz, 2021; Sinnreich, 2018; Zuboff, 2019). Datafication and algorithmic intervention are viewed as making the everyday radically more legible and accountable. However, as should be clear by now, while platform companies have the upper hand in tweaking algorithmic systems and designing their logics of order, sequence, and hierarchy, it would be incorrect to say that they have full control over them (see sections 3.3 and 4.1). The digital medium poses problems and challenges of control (Lehdonvirta, 2022), with platform governance developing in incremental and unsystematic steps as these problems arise and are addressed. The effectiveness of shared, informal social norms in ordering behavior weakens as people can communicate anonymously in large-scale networks. Moreover, governing online content is hard, not only because it can be copied, spread, and re-uploaded in different forms again and again (Suzor, 2019: 67) but also because algorithms themselves can be unreliable as guardians and enforcers of rules (Article III). If algorithms are opaque to users, so are users to algorithms and their designers, at least to a fair extent. In an endless game of cat-and-mouse, engineers seek to identify the ways in which their systems

are being appropriated and exploited, secretly modifying the regulatory apparatus as a response.

On digital platforms, users are drawn into an experimental culture where smaller and larger interventions are endlessly applied without notice. Following how algorithmic systems unfold in practice has revealed that incorporating technology into social contexts entails lengthy and uncertain actualities and is often achieved through hidden labor and unevenly distributed costs of experimentation (Mateescu et al. 2019; Schwennesen, 2019). However, it could be argued that we are permanently stuck in such a transitory stage, given that digital infrastructures are built on the premise of constant testing and updating through the cloud (Thrift, 2011).

This reactive, provisional, and exploratory nature of platform governance makes sense against the backdrop of software engineering, where the move away from shrink-wrap software to agile software development has made "continuous deployment" a gold standard (Gürses and van Hoboken, 2017). And of course, we want to mitigate uses of platforms that could cause harm, which might well require constantly monitoring the situation and having an ability to respond promptly. However, platform self-governance has often led to the wide application of arguably odd and ethically questionable practices and rules: for instance, how did TikTok come to restrict the algorithmic visibility of disabled, plus-sized, or LGBTQ+ users in an alleged effort to decrease online bullying (Hern, 2019)? Why has the platform seemingly automatically applied "beauty filters" on creators' videos without notifying them (Ohlheiser, 2021)? These examples illustrate the tensions and harms

that can arise when design logics originally developed to streamline relatively straightforward, technical processes are used to administer technological fixes to problems that relate to values and politics – such as the question of what kind of speech and by whom should be prohibited or promoted – without any public deliberation or oversight.

How to create better visibility algorithms and forms of platform governance? Based on my research, especially Article IV, I offer a few points to consider. First, greater transparency is often lauded as an area of improvement for platform governance. However, platforms' transparency reports and outputs have often merely worked to contradict and delegitimize user experiences (Cotter, 2021). While we do need more transparency in platform governance, that transparency must be on public rather than private terms. Of key importance here are not the "goods" that platforms purport to promote but rather their actual procedures and the impacts of their decisions. How and by whom are decisions made? Whose interests do they reflect? Who loses, and who benefits? The average citizen does not need to know every rule that exists in our legal and bureaucratic systems to trust them and perceive them as legitimate, as she believes them to protect hers and others' rights and to have a firm grounding in democratic values and procedures. Platforms, with their reactive, experimental, and even "scandalous" (Bossetta, 2020) governance systems have no such grounding and thus generate uncertainty, speculation, and distrust among users (Article III).

Building organizations and institutions that would enable the public to oversee and participate in shaping design values and decisions could provide a way

out of the current deadlock; an impasse where one side of the debate calls for more transparency, while the other counter-argues that it would merely empower media manipulators and other malicious actors. Not all details about a platform's algorithmic system can be made transparent, for a variety of reasons (Burrell, 2016). However, trusted officials and organizations could effectively supervise algorithms and their effects in the service of public interest and act as representatives of differently positioned user groups, thus ensuring that platform companies are "response-able" (Schwennesen, 2019) to emerging concerns. This would be a notable improvement as many of the current progressive changes in platform governance have resulted from persistent, time-consuming, and often thankless work by individual activists and groups (cf. Gillespie, 2018). Users have found their complaints about algorithmic discrimination dismissed by platform companies – a practice some researchers have termed "black box gaslighting" (Cotter, 2021) – only to be revealed years later that they had been right all along, as the current discussion around shadow banning on Instagram illustrates (Gerken, 2022).

Second, visibility governance is typically framed and documented as operations performed on data. As a result, discussions around content moderation can feel strangely disembodied and technical. Yet, the algorithmic enforcement of rules – the banning, blocking, or suppressing of content –not only modifies data but has real consequences for the individuals behind social media profiles, as I also document in Article IV. For instance, people and organizations who depend on social media platforms for their livelihoods are economically impacted by account suspensions, content removals, and suppression. Meanwhile, content moderation

may take an emotional toll on marginalized individuals, as it sends the message that simply by trying to exist digitally, one is breaking rules of acceptability. These ways in which social media technologies entwine with people's social, emotional, and economic lives is not necessarily visible to designers or engineers. Such impacts cannot be "read" from code, because they relate to the kinds of relationships and interdependencies that technologies weave in practice. Research and activism are needed to make these entanglements visible in order to factor them in when assessing the effectiveness or desirability of algorithmic techniques.

Third, our assumptions also need to shift. Users relate to platforms as customers, expecting an optimal user experience, without much thought given to the understandable difficulty of managing global-scale information networks. Meanwhile, researchers (myself included) have called for greater accountability of platform governance without always carefully considering whether accountability or other good governance values can be realized in the ways we are used to in other contexts. After all, even legal scholars who are experts on regulation have emphasized that algorithmic systems and automated decision making might require rethinking core governance concepts (e.g., Hirvonen, 2022). In the face of automated, self-learning systems regulating global flows of real-time information, it is becoming increasingly unfeasible to hold on to notions such as personal responsibility, completely public rules, or full accountability for individual decisions – nor do they always produce the best collective outcome. For instance, there are platform governance tasks like removing violent content or hate speech whose necessity is almost unanimously supported. However, carrying out these

tasks at scale is absolutely traumatizing for humans, and while machine learning systems have promise in executing them, their predictions are complex and come with degrees of certainty, meaning that decisions may escape full human understanding and that there will always be false positives.

While it is wise to be critical of automated decision-making technologies in the collective quest to build better platforms, we must be careful not to throw the baby out with the bathwater. These considerations suggest that we might need to fundamentally rethink what could be a legitimate use of power and how to generate trust in the context of algorithmic platform governance. In so doing, we might find that achieving these goals does not have to rely on more or less unattainable technical standards, such as totally transparent or unbiased algorithms; see Amoore and Woznicki (2018), Airoldi (2021), and Burrell (2016) for a critique of these concepts, but on something else: for instance, participatory design principles, openness to admitting mistakes, and a commitment to fostering a healthy, inclusive, and diverse digital public sphere. Thus, our focus should not be only on the technical outcome: the perfect or working-as-intended algorithm. Instead of and in addition to trying to fix the technology, perhaps what needs care and fixing are the institutions, procedures, and norms that surround it.

8 Conclusion: A complex interfacing

Louise Amoore (2020) reflects on the 2020 student protests against Ofqual's (the UK government department regulating qualifications, examinations, and assessments) algorithmic model, which downgraded students' exam results based on factors that had nothing to do with their individual performance. She contrasts them with previous uprisings against algorithmic operations, which highlighted issues of data protection and privacy by saying that the students "weren't focused on how their data might be used in the future, but how data had been actively used to *change* their futures" (2020). Although this dissertation is focused on a different socio-technical context, that of algorithmic social media, Amoore articulates something very important. Her words suggest that what is at stake with the algorithmization of society and culture is the capacity that algorithms have to steer futures and materialize certain kinds of worlds instead of others. In today's media landscapes, algorithms are directly feedback-looped with the processes they measure, taking part in how these measured processes unfold both directly and through reactive strategies deployed by human agents. Algorithms, then, are intimate with us not only because they process confidential data but also because we co-evolve with them: we shape algorithms and they in turn shape us and our practices.

As I have argued, these dynamics of mutual shaping are often hidden, fuzzy, and subtle, leaving room for individual and contextual variation. They are qualitative, relating less to the objective harms of algorithms and more to how the interplay between algorithmic systems and their users shapes subjectivities, social practices, and regimes of valuation in ways whose desirability and disadvantages

can be contested. For instance, what is seen as addictive and exploitative by some can be experienced as enhancing wellbeing, sociality, and learning by others. Indeed, part of the challenge of studying technologies from a social scientific perspective is precisely the fact that they are open to multiple experiences, uses, and interpretations. Following Swierstra, when we are dealing with them, we are rarely dealing with straightforward or technical yes/no answers but rather, "evolving relations that require permanent negotiating, updating, articulating and investigating what is important in life [and] in society" (2015: 18). Importantly, such a reflective, deliberative, and open-ended attitude clashes against the sense of inevitability that typically characterizes attitudes toward techno-economic developments (Markham, 2021) and the idea that overcoming technology's ethical challenges would merely require more technical solutions. To this end, the research questions I have posed and the theoretical notions that I have proposed to think with illustrate the value of qualitative and interpretive approaches in critically engaging with controversial technological developments. These particular questions or literatures were not my starting point, however. Rather, I found my way to them during the research journey I have taken over the last four years, and my inquiries have all but exhausted them. A lot remains to be done in terms of studying how algorithmic decision making revives questions about public values, such as autonomy, what the increasingly emotive and agentic nature of communication infrastructures means for public culture, and how algorithmic systems shape our relationships to ourselves, to others, and to society at large. Fortunately, I am far from alone in my interest. Through a collective effort, stitch by

stitch, we can hopefully weave algorithmic systems to the fabric of everyday life in more desirable and democratically legitimate ways.

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