Introduction

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The editing process of the present volume took place in the midst of the global COVID-19 pandemic. This historical moment has been accompanied by a marked shift in public perceptions of the role data plays in politics and everyday life. We have witnessed the emergence of highly visible data-intensive infrastructures and control mechanisms that have been developed to keep track of the spread of the pandemic, mitigating its effects locally and globally, and modulating established behavioral routines. Governments around the world turned to experimenting with a range of digital tracking tools and automated decision-making systems (Algorithm Watch 2020), giving rise to a new form of "sensory power" enacted through sensory assemblages targeting infectious "clusters as objects of government," including "hotspots, epicentres and bubbles" (Isin and Ruppert 2020, 8). Private sector parties were keen to offer their expertise and existing infrastructures and especially big tech platforms such as Apple and Google acted as "gatekeepers," for instance, governing and restricting app developers' access to Apple's App Store and Google's Playstore (Dieter et al. 2021). In doing so, the rise of COVID-19 pandemic response apps exacerbated public sector organizations' dependencies on private sector infrastructures. In short, the felt urgency to develop technological solutions brought on by the spread of a deadly virus has acted to catalyze and amplify ongoing developments of "datafication" (cf. Mayer-Schönberger and Cukier 2013; van Dijck 2014) that have been profoundly shaping society since at least the 1980s.

Mayer-Schönberger and Cukier first coined the term "datafication" to signal a general "transformation in how society processes information" (Mayer-Schönberger and Cukier 2013, 29), in which ever increasing areas of social, political, and economic life, including everyday administrative processes, healthcare, education, daily news coverage, cultural and industrial production were transformed by the increasingly automated generation and processing of data. In this urge to render all manner of activities into machine-readable formats – say, reading the news, listening to music, or hiring a bike – and producing continuous Big Data flows, activities are not simply granted a representational shadow or "data double" (Ruckenstein 2014) but are fundamentally re-constituted in this

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process. In becoming "datafied" versions of their former selves, these activities transform.

It would be short-sighted, however, to situate the pandemic intensification of practices of datafication exclusively on the side of (state) governance and "platformized" forms of control (cf. Poell et al. 2019), acting as top-down mechanisms to monitor, regulate and/or monetize the activities and behaviors of populations. On the contrary, the pandemic has equally foregrounded *everyday engagements with data* (cf. Pink et al. 2017 on "mundane data," Smith 2018 on "data doxa"), beyond state-led statistical interventions (Ruppert and Scheel 2021). The German Corona-Datenspende App, to focus on one striking example, encapsulates various aspects of society's shifting practices with data. Not only is it an example of a new kind of "data altruism" (cf. European Commission 2020) in which the app reifies personal data as an object to be given away for (speculative) public benefit. It also perpetuates longstanding promises of prediction that the combination of novel data sources such as wearable sensor-based, algorithmic technologies and devices enable.

Likewise, the pandemic has challenged our capabilities to make sense of data (Leonelli 2021). Corona dashboards combine various kinds of (possibly competing) knowledges as well as methods for data acquisition, analysis, and representation, frequently driving analysts and decision-makers down into "rabbit holes of investigating different metrics and standards" (Correll and Froehlich 2020, n.p.). Numbers, statistical values, and indicators proliferate together with multiple ways of counting, monitoring, and enacting the pandemic (cf. Day, Lury, and Wakeford 2014). The challenges and choices of enumerating the pandemic – also addressed and problematized as an "infodemic" (World Health Organization 2020), in which the authority of knowledge produced by public institutions is put into question – do not only affect lay people. Competing ways of counting and acting upon COVID-19 data have also foregrounded professional and expert disagreements and uncertainties (Ruppert, Isin, and Bigo 2019) as a critical challenge for the management of the pandemic.

Incidence rates in particular, often expressed as the number of cases per 100,000 over a seven-day period, have come to be seen as a key metric for worldwide monitoring and comparison, for instance, in European politics and media coverage (e.g., in The Economist's [2021] section "Tracking the coronavirus across Europe"). The result, or at least an *intended promise*, of such a metric has been to offer a standardized mechanism through which people are able to respond accordingly: adapting their behavior in light of the numbers. A popular slogan also emerged in the early stages of the pandemic: *Flatten the Curve!* instructing people

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to act responsibly to help reduce incidence rates.[1] Imposing a normative shortcut between data representations and everyday practices, citizens were expected to consider appropriate levels of personal hygiene. Moreover, social events were conducted on the basis of the incidence curve. Yet, the attendant promise – of citizens responding effectively and diligently to rising incidence rates by modifying their behavior, decisions, and movements – has not necessarily been matched by reality. Indeed, as the pandemic continued to rage, people's capacity – and often, willingness – to flatten the curve waned, dependent not only on changing circumstances (e.g., the closing of kindergartens or the re-opening of workplaces) but also on the fluctuating relevance of specific metrics from incidence rates to *r* values to hospital bed capacities.[2] What we have seen emerge, then, is a far messier array of *data practices* linked to these metrics; entangled in the pandemic-specific social lives of citizens.

The condensation of the pandemic moment has afforded ample opportunity to re-examine and interrogate how processes of datafication operate. Accordingly, the goal of the present volume is twofold: 1) to understand processes of datafication as grounded in and composed of heterogeneous practices of data creation, collection, cleaning, processing, analysis, archiving, transfer and re-use, among others, and 2) to scrutinize how processes of datafication increasingly target fluid, mobile and ephemeral phenomena, e.g., in the capturing of local and real-time transactional data generated through everyday practices (cf. Agre 1994). By stressing the role of situated practices within and throughout macro processes of datafication, we follow the premise that the social is always enacted in "practical accomplishments" (Garfinkel 1967, 9) and ongoing acts of mutual sense-making. To put it succinctly, datafication does not just happen on its own, but is manifested through everyday interactions between people, infrastructures, and established conventions.

The present volume argues that in order to understand how datafication continues to redefine societies epistemologically, economically, and socially, we need to turn our scholarly attention towards *practices*. As a macro-phenomenon datafication has the potential to appear abstract, despite its obvious entanglement with local contexts of use and specific *communities of practice* (Lave and Wenger 1991). In this, practices of producing, collecting, aggregating, disseminating, processing,

1 See, for instance, this news coverage in *The New Yorker* from 27 March 2020, the early stages of the COVID-19 pandemic: https://www.nytimes.com/article/flatten-curve-coronavirus.html.

2 This is, for example, indicated by mobility measures such as monitored by the COVID-19 Mobility Project based on anonymized mobile phone data: https://www.covid-19-mobility.org/mobility-monitor/. For an impression of shifting attitudes and behavior toward official COVID-19 measures see, for instance, the German COVID-19 Snapshot Monitoring (COSMO): https://projekte.uni-erfurt.de/cosmo2020/web/.

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representing and displaying, analyzing and re-using data become vital in exploring and accounting for how datafication operates. We are thus interested in the *practical accomplishment of datafication*, including hard-to-observe data work taking place behind digital media. As Clare Southerton (2020, 3) writes, "[w]ith the mass infiltration of smart technologies into everyday life and as more social interaction is filtered through social media platforms and other online services, data is now generated and collected from a diverse array of practices." Thus, as the volume explores, datafication is a pervasive phenomenon, occurring far beyond social media platforms within the extended "digital enclosures" (Andrejevic 2007, 297) of smart cities and homes, and always-on mobile devices. In today's digital media environments, it is hard to find a practice that is not datafied to some extent. But while data are increasingly produced in all areas of social life, datafication is by no means just an automatic process. On the contrary, it has to be considered as the result of practical work.

In the following, we will briefly summarize the current state of research around issues of datafication in the humanities and social sciences. In particular, we highlight various contributions in the fields of (critical) data studies and offer historical perspectives on (digital) data to develop a more nuanced understanding of datafication, focusing on the situated character of *all* data. That is, data is produced under specific local conditions, processed and (re)appropriated in heterogeneous situations of use. Building on this existing work, we develop our own proposal for a praxeology of data in the next part of the introduction by drawing on the rich tradition of research inspired by ethnomethodology and emerging ethnographic accounts of data practices. The introduction concludes with an outline of the structure of the volume itself.

Datafication: Operations, Logics, and Critiques

Rephrasing Mayer-Schönberger and Cukier's definition of datafication, José van Dijck notes that datafication is the "transformation of social action into online quantified data" predicated on "real-time tracking and predictive analysis" (van Dijck 2014, 198). In this, datafication is cast as a "legitimate means to *access*, *understand*, and *monitor* people's behaviour" (2014, 198, author's emphasis) online. Van Dijck, writing in 2014, discusses datafication in the context of social media, focusing on a roster of platforms, now commonplace, from Facebook to YouTube. Real-time tracking of user activity on these "data-intensive" platforms (Gerlitz and Helmond 2013, 1349), ensures all manner of comments, likes, tags, uploads, edits, and other similar interactions are recorded. Following the logic of the "Like economy" (2013, 1349), datafication provides an opportunity to capture, and increasingly extract, *forms of value* from users.

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In the context of social media and communication platforms, datafication is presumed to be a silent, discrete, unobtrusive process in which users of such services are largely unaware of how their interactions are being datafied. We argue, however, that datafication implies two relations between data and practices: both accomplished *through* practices while also *capturing* specific practices. In the context of social media, Ganaele Langlois et al. (2009) have argued that social media usage such as posting or liking content involves both social as well as data practices. At the very least, platforms may facilitate user (inter)actions, with users free to use these services (e.g., reading and commenting on (blog) posts, sending messages, listening to and recommending music etc.) unaware of background, or "back-end" (Gerlitz 2016, 28) datafication processes. Yet, as we hope to show throughout this collection, this is far from the case in the contemporary digital media landscape and the platformized technological infrastructures it thrives on, in which datafication processes are the basis for interactions and engagements of diverse user groups with recreational or professional interests. Included in the latter group are third party "complementors" who offer their services making use of, and are therefore dependent on, platform data infrastructures and modes of governance (Poell et al. 2019, 6–9). Such datafied modes of platform governance may involve continuous data capture in the background or passively through the integration of automated sensing processes (cf. Thielmann 2019). Rather often, though, platform governance includes mechanisms and modalities of surfacing data from and for diverse users in the form of "participative metrics" (Gerlitz and Lury 2014, 174) such as scores, rankings, and ratings, which in turn both exploit and shape the practices of these users (Fourcade and Healy 2017).

In organizational and technical terms, then, datafication is associated with "platformization," which has been "defined as the penetration of infrastructures, economic processes and governmental frameworks of digital platforms in different economic sectors and spheres of life" (Poell et al. 2019, 1). Drawing from software studies, business studies, critical political economy, and cultural studies, Poell et al. (2019, 3) "define platforms as (re-)programmable digital infrastructures that facilitate and shape personalised interactions among end-users and complementors, organised through the systematic collection, algorithmic processing, monetisation, and circulation of data." The influence of the "big five" platforms – Google, Apple, Facebook, Amazon, and Microsoft – have marked today's "platform society" (van Dijck, Poell, and de Waal 2018) in which a few platform businesses offer all kinds of services from online teaching to housing. As a result, Poell et al. (2019, 5, our emphasis) "stress the importance of considering *platform-based user practices*" striving to "trace how institutional changes and *shifting cultural practices* mutually articulate each other." In this, data generated through platform-based user practices simply serves to further embed platforms in everyday life.

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Van Dijck's (2014) early critique of datafication can be seen as a kind of pre-empirical intervention, laying out the foundational principles of its operation (i.e. accessing, understanding, and monitoring user actions and behavior) as it was then found across social media platforms. In the years since, however, datafication has arguably become more *forceful*, being imposed in and on other realms previously untouched by it, and offering a means to *intervene*. In an economic environment revolving around the monetization of data, processes of datafication have become increasingly *unavoidable* not only for certain kinds of online users, but a whole host of people from school children (e.g., Kerssens and van Dijck 2021; Williamson 2016) to delivery bike couriers and drivers (e.g., Shapiro 2020; Pentenrieder, this volume) and pedestrians (e.g., Mattern 2014, O'Grady, this volume). Naturally, there are also geographical, political, and legal differences in the *spread* and *depth* of datafication globally, see for instance the effect of the EU's GDPR (General Data Protection Regulation) on data protection and privacy. Whilst the premises of datafication may indeed be shared – even between the USA, Europe, and China – on the ground realities differ markedly and are deserving of systematic analyses.

To reiterate, it is becoming clear that datafication is a plural phenomenon, dependent on *who* is doing the datafication. Besides specific platforms, the big five are variously involved in gleaning understanding of and regulating user behavior, using different strategies and techniques to do so. Away from big tech, many other corporate parties are striving for datafication, such as those in the healthcare sector (e.g., 23andMe), the agriculture sector (Bayer Crop Science), or the automotive industry (e.g., Hind, this volume). In these application contexts, datafication is bound to look differently, adapting to particular industry demands and expectations, as well as navigating different legal restrictions and cultural discourses. The question, then, is the extent to which these *datafications* do indeed share common aspects and logics. Yet, as van Dijck has already underscored, "all three apparatuses – corporate, academic, and state – are highly staked in getting unrestrained access to metadata as well as in the public's acceptance of datafication as a leading paradigm" (van Dijck 2014, 203). In this, datafication is not simply a technical procedure (of collecting and processing data), a social phenomenon (attempting to capture and shaping behavior), or an economic process (generating profit) but a *political project* motivating the whole gamut of social actors from global corporations to nation-states.

Also returning to Mayer-Schönberger and Cukier, Ulises A. Mejias and Nick Couldry contend that datafication is not merely digitization because, through the former "large domains of human life bec[ome] susceptible to being processed via forms of analysis that [can] be automated on a large-scale" (Mejias and Couldry 2019, 2). In this, they offer a similar definition of datafication to van Dijck: "the transformation of human life into data through quantification" (2019, 3), emphasizing not how datafication becomes a means through which to merely access or

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understand people's behavior, but how it becomes a means to actively *shape* and *manage* social activities. In this, Meijas and Couldry suggest that datafication is enabled through particular *infrastructures* such that "life actions previously performed elsewhere (such as communicating with friends, sharing cultural products, hailing a taxi etc.)…" (2019, 3) become *re-routed* and *re-organized*.

Nonetheless, writing with a far greater sense of urgency, Couldry also suggests that there is a need to "grasp a world where a general project of social reconstruction…is under way" (Couldry 2020, 1140). Whilst Mejias and Couldry write that datafication involves the transformation of human life, they also add that it entails "the generation of different kinds of value from data" (Meijas and Couldry 2020, 3). Yet, between the lines, it is evident that datafication is not necessarily generating different kinds of value at all, but quite a narrow, quantifiable kind of value derived from captured data, and captured data only. As they later posit: "[e]ven more importantly" than the large-scale re-organization of social actions and activities, "the process of quantification involves *abstraction* via the process of turning the flow of social life and social meaning into streams of numbers that can be counted" (2020, 3, author's emphasis). That which cannot be counted, following the logic of datafication, does not count. Put otherwise, the question is "[w]hat counts and who counts" (Gerlitz 2016, 33). Aspects of social life that cannot, or *will not*, be transformed may escape datafication, but in a world being rapidly datafied the risk of *not* being transformed may perhaps be greater; dismissed as ill-fitting, unruly, or irrelevant.

With this realization, Couldry wonders whether some philosophical traditions are well-equipped enough to make sense of the "new and radical forms of reduction" (Couldry 2020, 1140–1141) offered by datafication. In particular, he asks whether the "descriptivism" (2020, 1140) of certain approaches such as actor-network theory (ANT), "lose[s] sight of the critical question" (2020, 1140) of what happens when social life either becomes datafied, or dismissed. In a similar fashion, Mirko Tobias Schäfer and Karin van Es (2017) ask whether studying culture through data is possible and desirable, and what kinds of epistemological reflection and methodological criticism such approaches offer. The following paragraphs offer different strategies to keep the critical question in sight situating data in society, including from historical perspectives.

Situating Data in Society

Critical Data Studies (CDS) emerged as a reaction to the propagation of processes of datafication and their product Big Data, both as sociotechnical phenomena and epistemological promises (e.g., boyd and Crawford 2012; Kitchin 2014a; 2014b; Iliadis and Russo 2016). danah boyd and Kate Crawford's (2012) article can be seen

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as seminal, posing "critical questions for Big Data," taken up in subsequent publications (cf. Dalton, Taylor, and Thatcher 2016; Iliadis and Russo 2016; Kitchin and Lauriault 2018). In it, boyd and Crawford (2012) discuss the required (preliminary) knowledge and expertise for understanding Big Data, the (in)accessibility – and (in)assessability – of data, including involved methodological assumptions, technical infrastructures, and tools. Their aim was to evaluate and reflect on actual possibilities in comparison to the "mythology" (2012, 662) of Big Data, or the positivist empiricism propagated by those who celebrated the "accuracy" and "objectivity" of large-scale, automated data collection.

In an influential dialog, Craig Dalton, Linnet Taylor and Jim Thatcher suggested how scholars could develop and express "critical agendas and responses" to "data and algorithmic analytics" (2016, 1). In this, the emergent interdisciplinary field of CDS could serve to draw together "diverse sets of work around data's recursive relationship to society" (2016, 1), driven by a collective interest in the broader social embeddedness of digital data, and the techniques involved in their production and distribution. In short, that data has significant cultural, historical, economic, and political qualities worthy of specific focus. Yet, Dalton, Taylor, and Thatcher also addressed the challenge of CDS to connect those who "use critical theory [to] those who engage in rigorous empirical research" (2016, 1), advocating the need to establish a dialog between conceptual and applied work. Craig Dalton and Jim Thatcher's original call for CDS also understood data as inherently spatial, requiring understanding the "contextual value" of place (2014, n.p.): that data need to be considered *in situ*, connecting to the intrinsically socio-technical settings and situations of their making.

In recent years, CDS work has received more criticism, especially on the notion of critique itself. In particular, scholars have criticized the distant, macro-sociological focus of early CDS work mainly tackling the technological infrastructures involved in datafication processes, and less concerned with actual practices of people confronted by and interacting with, data and algorithmic systems (Christin 2017; Dencik 2019; Leonelli 2021). More recent "data studies" approaches have foregrounded empirical and interventionist work. These range from calls to radicalize the scholarly community to become more active and socially engaged, to work that has explicitly investigated the (often silent) voices of practitioners, non-experts, and lay people. For example, Neff et al. (2017) have invited scholars across the data science-CDS divide to work collectively to "help push for more ethical, and better, ways" (2017, 85) to know the "datafied society." Likewise, Kennedy (2018, 18) has explored the "everyday experiences" of data, and Kennedy et al. (2020, 3) have studied the "public understanding and perceptions" of digital, and personal, data.

These practical critiques of and updates to CDS have explicitly offered activist, feminist, inventive and affective approaches, especially around datafication "from the margins" (Milan, Treré, and Masiero 2021) such as in the Global South (e.g.,

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Crooks and Currie 2021; D'Ignazio and Klein 2020; Marres 2012; Milan and Treré 2019). Recent (critical) data work has also offered novel methodological strategies. For instance, Jo Bates, Yu-Wei Lin, and Paula Goodale (2016) introduced "data journeys" as a methodological device to follow "the life of data" across settings and situations, whilst Nate Tkacz et al. (2021) developed "data diaries" as a similar such device to chart and account for how data "co-constitute a given spatial situation" (2021, 2). Similar such methodological approaches are in evidence in this volume, whether concerning the flow (or not) of data in the context of asylum applications (Al Jaramani, Ponzanesi, and van Schie) or the construction of "data stories" in an academic context (Mosconi et al.).

Historical Perspectives on Data

In a related vein to the contributions in CDS, historians of science and media historians have responded with reservations to accounts that depict datafication as a radical transformation of how data is being processed in societies. Rather than focusing on the alleged "newness" of Big Data, Elena Aronova, Christine von Oertzen, and David Sepkoski (2017) urge data scholars to also consider technological, structural, epistemological, and praxeological continuities that are present in current expressions of datafication. In this respect, they refute claims that present Big Data as a consequence of the digital age by arguing that the "forward-looking rhetoric" of the present discourse tends to conceal that "these technologies have histories, and that those histories stretch back well before the advent of electronic computing" (2017, 2). Against the presentism of common Big Data narratives, they argue for a *longue durée* perspective on datafication since "the project of translating the world into data … has been under way for centuries" (2017, 8). This is evidenced, for instance, in historical practices of data aggregation and database practices, which span back to pre-digital times and material cultures. Although Aronova, von Oertzen, and Sepkoski contend that it is impossible to ignore the impact of electronic computing within the history of data, they strongly warn against "making the introduction of computers a decisive Rubicon in a broader history of data—to avoid, in other words, thinking of data histories as being 'B.C.' (before computers) or 'A.C.'" (2017, 15). In order to stress this understanding this volume also features historical case studies.

Aronova, von Oertzen, and Sepkoski further emphasize that the notion of Big Data is reminiscent of the term Big Science, another capital-letter term that became prominent after World War II to denote the enormous financial, technological and institutional efforts in connection with Cold War science funding: "There are parallels—and indeed direct overlaps—between Big Science and Big Data. Many projects that involve Big Data—the Human Genome Project, CERN, the Very Large

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Telescope array—unquestionably fit the definition of Big Science." (Aronova, von Oertzen, and Sepkoski 2017, 3) In both cases, the adjective "big" does not merely refer to the vastness of the data that are being collected and processed but indicates the magnitude of investments being made in both economical and institutional terms.

Against this backdrop, Aronova, von Oertzen, and Sepkoski regard the contemporary phenomenon of Big Data "as a chapter in a longer history (or, rather, histories) of observation, quantification, statistical methods, models, and computing technologies" (2017, 6). At the same time, they stress important differences between past and present forms of datafication as well. While, for instance, the scientific endeavors of data capturing in the pre-electronic era were somewhat "bound in space and time to physical archives and analog infrastructures," the contemporary project of Big Data "radically transcends the circumstances and locality of its production" (Aronova, von Oertzen, and Sepkoski 2017, 16), allowing data sets to move in digital form and to thereby traverse the contexts of their creation at will. The growing mobility and portability of data, in turn, equally raises questions regarding the ownership and provenance of data, and particularly personal data obtained from marginalized populations. More often than not, these questions lead the way once again into forgotten pasts, such as to the common but no less dubious practices of colonial and colonialist data collection (see also de Chadarevian and Porter 2018, 551) and exploitation. For instance, Joanna Radin (2017) tells the story of how a comprehensive long-term dataset on rates of diabetes and obesity in the Native American Akimel O'odham (known in science as Pima) became widely used training data for machine learning applications by means of decontextualization.

Soraya de Chadarevian and Theodore M. Porter (2018, 550) similarly seek to put "into sharper relief the relation of current data practices to earlier ones." Contrary to Aronova, von Oertzen, and Sepkoski, their focus rests less on individuals but foregrounds more "the roles of diverse institutions as sites of data production, including medicine, militaries, industry, commerce, finance, insurance, pensions, libraries, censuses, and bureaus of standards" (2018, 550). Moreover, they consider the central role of technology beyond simply computers, to include "a variety of tools for recording, storing, communicating, and processing information" (2018, 550) and foreground the field of statistics with its double status as both a mathematical and a social field, which "brings out the fundamental and longstanding role of social know-how and state administration in the history of data" (2018, 551).

Nevertheless, de Chadarevian and Porter too acknowledge fundamental differences between scientific data and what they call "social media" data – hereby referring to the digital data "managed by an oligopoly of internet marketing firms that specialize in linking potential customers to taxi rides, hotel stays, and things for sale" (2018, 550). As one of the main differences, they highlight the fact that data in the social web are generally not generated as samples that may serve as a

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basis for assessing "scientific models or hypotheses" but as personalized indexes used for algorithmic predictions of future behavior: "Such data, in their teeming abundance, have not been content to remain mere samples, but have become universes unto themselves [, supporting] the making of algorithms to anticipate and to nudge future behaviors on the basis of all the numbers generated by previous actions and choices" (2018, 550).

This distinction between the use of data for testing scientific hypotheses and as a means to predict future behaviors of users and customers, however, might also indicate certain limitations of data histories from the history of science. While the existing historiographic scholarship provides productive insights regarding the epistemic dimensions of data practices – including the often problematic relation between quantitative data, the construction of scientific "evidence," and the truth claims that are based on them (de Chadarevian and Porter 2018, 552; see also Leonelli et al. 2017) – the case studies in their totality tend to keep a rather narrow focus on the realm of the sciences and scientific practice. Although many data practices and tools indeed originated in scientific uses, it seems equally important to explore data histories outside the sciences. Karin van Es and Eef Masson (2018), for instance, have approached the history of datafication from the perspective of media studies and media history, with a particular focus on media industries. In a similar vein, this volume features historiographic case studies from the history of cinema and early computing that seek to delineate both the continuities and ruptures of past and contemporary data practices. Taking recent work in data studies as an inspiration, future historiographic research may also study datafication as socio-technical phenomena beyond the domains of both the sciences and the media.

This volume nevertheless follows the path laid out by the more recent science studies with regards to a strong focus on practices. Aronova, von Oertzen, and Sepkoski remind us that data and data practices have often been at the root of controversies over positivist visions of science and scientific progress, as crystallized, most prominently, in Thomas Kuhn's *The Structure of Scientific Revolutions* (1962). In the aftermath of Kuhn's groundbreaking book, science studies "reinvented the history of science as the history of scientific practices rather than scientific ideas" (Aronova, von Oertzen, and Sepkoski 2017, 4). To put it differently: rather than seeing the diverse practices, routines, and tasks that make up laboratory research as negligible procedures that are simply applied to support or falsify theoretical models, post-Kuhnian historians of science and scholars from the emerging fields of science and technology studies (STS) and historical epistemology came to understand them as the very basis of scientific knowledge making and the truth claims often associated with them. These particularly include practices that enable the production and manipulation of data, e.g., through observation and the creation of material traces (see, for instance, Latour 1987). Moreover, practices of data dis-

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play are vital for rendering data into meaningful forms, such as graphs, diagrams or other forms of visualization (e.g., Rheinberger 2011).

Towards a Praxeology of Data

This volume builds on the socially and historically situated understandings of data outlined above. Yet, as the following sections will show, it takes a distinctive path, offering an account of data *practices*. In this, we take up Lina Dencik's (2019) call to advance a "practice approach to datafication" in order to "consider the *uses* to which data systems are put in social life" (245, author's emphasis). Whilst Dencik herself builds on a Bourdieuian *a priori* notion of practice as "habitus," however, this volume offers a more ethnomethodological (Garfinkel 1967) or "praxeological" (Schüttpelz and Meyer 2017; Gießmann 2018) approach in which data practices are conceived as cooperatively achieved accomplishments.

Noortje Marres (2017), for instance, differentiates three main approaches to studying the social aspects of digital culture: a technology- or platform-centric, a data-centric, and a practice-centric approach. To exemplify, this "social" dimension might respectively be traced back to specific technologies like social media and Web 2.0 (technology/platform), to the capture and processing of data about society (data), or to contexts of action and use (practice). The practice-centered study of digital sociality considers how the use of technology is always *contingent* as people engage with it in myriad situations and settings, from negotiating the Dutch immigration system, to self-monitoring blood pressure. This view also helps to destabilize the ontological security of technologies as singular, fixed entities with specific properties. It draws our attention to how engagements with datafication are not only *practical* accomplishments, but also *distributed* accomplishments (Marres 2012), often involving many connected technologies, and increasingly resulting in "synthetic situations" (Knorr-Cetina 2009).

Our aim is thus to approach data practices as cooperatively performed, articulated and understood through specific and shifting sociomaterial arrangements. The book follows in this spirit of Ruppert and Scheel (2021) who explore the data practices of (international) statisticians, Hobbis (2017) on the data practices of temporary laborers in the South Pacific, and Lämmerhirt (2021) on citizen COVID-19 data donations. To clarify, the contributions to the present volume explore the data practices not just of professional practitioners, but also by and in relation to citizens in everyday situations. They also strive to combine situated understandings of data, as proposed by (critical) data studies scholars (e.g., Dencik 2019; Kennedy 2018), with a *greater* praxeological sensitivity previously identified by Marres. This brings with it several theoretical and methodological questions regarding our understanding of *situations* and *practices* that we will address in the following.

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The praxeological approach to data suggested in this volume provides critical resources against the abstracting tendencies of datafication discussed above. Praxeological work may serve to empirically highlight and deconstruct how data are manufactured in practice, as well as inquire into the imaginaries around those same data practices (see Bucher 2017). As such, a praxeology of data is well-suited to study processes of datafication not from the God's eye perspective of a distanced and neutral theoretical observer (Haraway 1988, see the discussion in Rettberg 2020), but by following the trail of situated practices involved in processes of datafication.

Labeling the approach of the present volume as *praxeological* carries with it a number of premises and assumptions that are worth detailing. One such premise is the focus on studying the *ethnomethods* of specific communities of practice. This builds on the insight by Harold Garfinkel "that the activities whereby members produce and manage settings of organized everyday affairs are identical with members' procedures for making those settings 'account-able'" (Garfinkel 1967, 1). Social order, understood from an ethnomethodological perspective, is "assumed to display a mundane intelligibility of its own, prior to and independently of its scholarly treatment" (Sormani 2019, 3).

The effect of this focus on the accountability of social practices is twofold. Firstly, it pays attention to the inherent reflexivity of everyday practices, thus rejecting sociological understandings of practice that consider it unconscious, quasi-automatic, or unintelligible on behalf of the practitioner. Then secondly, such a focus places an emphasis on the specific methods of documentation (textual, audiovisual etc.) employed by members of a social group, such that they make their own activities "visibly-rational-and-reportable-for-all-practical-purposes" (Garfinkel 1967, vii). This in-built sensitivity to processes of mediation within ethnomethodology – made explicit in media formats like files, records, graphs, or audiovisual recordings – is further emphasized in a praxeological approach to data, as novel techniques, such as formatting practices (see Jancovic, Volmar, and Schneider 2020), are developed to enable the datafication of social practices.

Thus, a praxeological approach to data aims to avoid any preconceived notion of what a practice is, could, or should be, in relevant settings. Whilst proponents of ANT insist that one must "follow the actors themselves" (Latour 2005, 12), a praxeological approach, arguably, insists that one must "follow the action" instead (Boersma 2020, 665). In this formulation, the overriding interest is in articulating how rote actions – say, of registering people claiming asylum – become iterative practices. Or how new data practices are generated by technological developments in data collection, storage, and aggregation. Whilst social actors are, of course, critical to understanding how data practices are performed, it is the data *practices* as things-in-themselves, rather than the data *practitioners* that are the principal focus.

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A praxeological account, therefore, has to begin its inquiry into data practices from traces of *observable* phenomena, not from general theoretical accounts or abstractions such as the notions of "data," "platform," or "society." Here, observable phenomena might well be indeterminate, ambiguous, or open-ended. Indeed, such phenomena might have multiple, attachable meanings and interpretations with its relevance only temporarily defined and negotiated. An example of such situational meaning-making is provided by Garfinkel in the distinction between actuarial and contractual uses of patient folders in a hospital setting (Garfinkel 1967, 197–207; Paβmann and Gerlitz 2014). In this, data are themselves situational, with meaning derived from the very practices into which they are enrolled.

With an interest in observability, praxeological approaches offer opportunities for various kinds of *ethnographic inquiry*. Whilst there are identifiable differences between historical/biographical forms of ethnography (in which observability of phenomena is somewhat difficult), traditional forms of embedded ethnography, and "shallower" forms of ethnography, there is nonetheless a shared interest in the study of communities of practice. Moreover, digital forms of ethnographic inquiry (like Kozinets' [2019] netnography or Pink et al.'s [2015] digital ethnography) recalibrate this shared interest as such communities of practice are distributed, yet infrastructurally stabilized through digital media and technologies. Likewise, digital methods approaches (Rogers 2013) consider the role that the medium itself has on how these communities are composed, rather than merely seeing them as incidental. Here, the project of a *data* ethnography – discussed in a moderated discussion in this volume – remains in its infancy, but necessarily draws on these traditions. In foregrounding the role of data in the ethnographic work undertaken, one is attentive to how it allows people to account for their activities, which, as this volume shows, can range from working in a hospital to driving a car. Rather than constituting an actor in its own right, however, data can be used to trace connections between and across sites in the fashion of a "multi-sited ethnography," that is "designed around chains, paths, threads, conjunctions, or juxtapositions of locations in which the ethnographer establishes some form of literal, physical presence, with an explicit, posited logic of association or connection among sites that in fact defines the argument of the ethnography" (Marcus 1995, 105). Following the data, thus, turns into a mode of field site construction, and necessarily complements the praxeological focus on observable actions and behavior.

Ethnographers of all persuasions do not only produce accounts of *other people's* data practices, but generate *their own data* while doing so. Data ethnographers thus take data practices to be their *object* of inquiry when investigating phenomena of datafication, whilst also employing data practices as a *method* through which to make sense of the scrutinized phenomena. Such data may, of course, be produced in concert with practitioners in the field, from hospital administrators to software engineers. Not limited to hand-written field notes or audio(visual) recordings, data

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may also take the form of relational database entries, data visualizations, outputs of automated tracking tools, or even experimental algorithms uploaded to software repositories. The result is a common overlap of research object and method of study that makes it necessary to explicate and reflect on the data practices employed on both sides. In any case, employing ethnographic methods to account for data practices brings with it a set of *new challenges* that warrant attention.

The first challenge concerns what a practice *actually is*. While a praxeology of data can build upon the intuitions of ANT and actor-media theory (Thielmann, Schüttpelz, and Gendolla 2013) to recognize the stakes of non-human actors in (re)assembling the social (Latour 2005), it is by no means a settled question how human and non-human agency is distributed in data practice(s). To what extent might semi-autonomous actors like robots, drones, and algorithms – and also less evocative elements such as dashboard dials and indicators – be said to engage in practices? This becomes all the more relevant when data processing happens without human oversight, e.g., within the layered architecture of a neural network-based machine learning algorithm (Hansen 2020). The question for a praxeology of data might, therefore, be in how the availability of data relates to and *intervenes in* processes of automation. A common way to talk about automation is framing it as *destroying* certain practices, most notably in how "robots" are framed as "taking jobs." Yet a praxeological approach might instead argue that practices are co-operative, but that certain kinds of automation may lead to categorical shifts in the *type* or *form* of data-related practices. For example, in how automation leads to the rise of new kinds of algorithmic "supervision" rendering decision-making procedures "opaque," as Annelie Pentenrieder's contribution to this volume on delivery couriers explores.

A second major challenge relates to the extent to which data-related phenomena are observable *in principle*. Whilst social practices do, in general, transcend the spatiotemporal confines of any given situation, data practices are inherently *trans-situational*. Only in particularly rare cases are data produced, gathered, archived, viewed, analyzed, or presented in one isolated situation, or a single location. Instead, one of the defining features of data is their capacity to detach from their original contexts and to be remotely processed (Leonelli and Tempini 2020). The development of a praxeology of data therefore requires the further refinement of multi-situated methods to describe data practices both *in situ* and *across situations*, which is required for the study of in our media landscape prominent highly distributed data infrastructures such as app ecosystems (Dieter et al. 2019; 2021) and the sensory media apps build and operate on (Chao et al. forthcoming). Such an approach is in line with George Marcus's proposal to not merely multiply studies of geographically bounded "sites" (Marcus 1995) but to draw attention to the environments conditioning people's circumstances of action (Paßmann and Schubert 2021). In opposition to traditional ethnographic approaches that focus their atten-

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tion on "local" situations and processes of embodied inter-corporeality (i.e. forms of "co-presence"), a praxeology of data needs to deal with scalar and temporal *mediations* between situations. That is, to take into account what may *precede* any given situation and what it is prone to *develop into* (Gießmann and Röhl 2019; cf. also Goodwin 2018).

A third challenge is the extent to which data-related phenomena are *accessible*. While many media practices can be documented using established observational methods, data practices require *additional methods* that are sensitive to the dimension of background cooperation or partially autonomous processes characterizing contemporary digital culture. For example, gaining access to data processed on proprietary platforms, through closed ecosystems, or by sensor-equipped devices is often difficult if not impossible. This problem is usually framed around the notion of the black box these technologies present to both certain types of practitioners as well as researchers (Carabantes 2020; Latour 1999; Pinch 1992). It is also not entirely clear what access to data actually implies, and if, for example, the data practice of scraping social media data via an API already constitutes a privileged form of access in itself. The black box of digital media technologies is not a purely technical phenomenon either: it relates as well to the skill sets and expertise required by researchers to make sense of the investigated phenomena, thus necessitating the forming of inter- and transdisciplinary research teams. Data ethnographers need not – and from a certain perspective, should not – be data scientists themselves, but they are encouraged to develop inventive methods (Lury and Wakeford 2012) and experimental setups, such as breaching experiments (Rafalovich 2006), to make sense of the black boxes they encounter.

In summary, then, interrogating datafication from a praxeological perspective requires grappling with manifold challenges: from offering forms of critique that take seriously the societal implications of datafication (i.e. abstraction, automation, decontextualization, re-situation etc.), to developing creative methodologies that tackle the closed ecosystems common to contemporary media (e.g., data ethnography, interdisciplinarity, experimentation etc.). In the following, we provide a brief overview of the subsequent sections and chapters of the book, considering how they collectively interrogate datafication through studies of the data practices found in various social and cultural settings.

Chapter overview

The volume consists of four sections that discuss the history of data practices, the possibilities and challenges of data ethnography, the entanglements of data and care practices as well as the relationship between data practices and mobility.

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Section 1 opens with a contribution by Kyle Stine about the history of film as a data medium. Stine makes the case that before the advent of electronic digital computing, motion picture film served as the first universal data medium in its ability to translate between image, sound, text, and machine movement. Within the period of "the long 1920s," which Colin Koopman has cited as the genealogical root of the "informational person," film acted as a point of coordination for different data sources, a medium of coherence and universality, that mirrored the informational person as a common body for disparate data being collected in the forms and checkboxes of birth and death certificates, identification papers, medical records, racialized credit information, and police files (Koopman 2019). Across a variety of fields, inventors sought to use film as a more economical and efficient way to search and retrieve data from these growing stacks of information. Ultimately, film would not live up to the visions its advocates had of it, as microfilm search-and-retrieval systems such as Emanuel Goldberg's Statistical Machine and Vannevar Bush's Memex would find narrow applications or not be implemented at all. But the ambitions to use film for data-processing purposes provides unique insight into the problems that digital computing would be mobilized to solve, and the cultural and political values that drove such efforts.

In the second contribution to the first section, Liam Cole Young explores the emergence of Hollywood box office charts, arguing such charts offer a crucial step in the genealogy of contemporary cloud-based forms of tracking, prediction, and decision-making as found in recommendation and newsfeed algorithms. Young adopts a praxeological approach that emphasizes where and how box office data came to be aggregated and displayed, as well as some of the motivations that led people to *datafy* the production, distribution, and reception of cinema. This approach allows us to see how box office data was put to work, how it came to reconfigure chains of decision-making and resource distribution within the film industry. Box office charts and other *datafied* forms rarely appear in histories of culture, while accounts of contemporary data analytics typically begin only with the digital computer. Young's aims are thus historical and deflationary, to show how deeper histories of counting culture prefigure and anticipate today's Big Data, and to weave practices of accounting into stories about cultural industries that can complement the usual emphasis on production and consumption.

Section 2 consists of two contributions that explore the lens, advantages and possibility of data ethnography as a praxeologically informed approach to the study of the datafication of everyday, social life. The first contribution features a moderated conversation about the challenges that studying data practices brings about, its epistemological consequences, and the methodological prerequisites this enterprise asks for. The second chapter in this section is an empirical experiment in data ethnography, combining a politico-technological perspective on institutional

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data practices with the perspective of the subject who is confronted with datafied systems of state governance.

In the moderated conversation on "Doing Data Ethnography," Daniela van Geenen and Danny Lämmerhirt discuss with Emma Garnett, Minna Ruckenstein, Tommaso Venturini, and Malte Ziewitz, four scholars with backgrounds in anthropology, sociology and STS who study data-intensive phenomena, how ethnography informs their research *with* and *on* data. Probing the question of what data ethnographic research practices could look like, the conversation addresses several pertinent questions of a social study of data: How do ethnographic sensibilities create unexpected perspectives on data? How can ethnographic studies account for distributed data practices? How should one methodologically attune to the study of data practices? What kinds of collaboration and positions may ethnographers take with and about data? The chapter emphasizes the importance of ethnographic sensibilities to consider and reflect on one's own entanglement with involved devices, data, and practices. An important aspect of data ethnographic research is the ability to situate data, to inquire into and document people's own understandings of data, and to provide reflexive accounts of one's own research practices. As such, data ethnography may foster and furnish important praxeological sensibilities in response to dominant data science paradigms. Data ethnographic approaches may open up spaces for dialog and reflection on the ideologies and values underpinning data collections, the often messy practices involved in the construction and use of data, and the surprising perspectives, unexpected questions, and insights one might gain from situating data.

Building on these ethnographic sensibilities, the empirical chapter in section 2 by Araa Al Jaramani, Sandra Ponzanesi, and Gerwin van Schie shows the relevance of the immigration procedure of the Dutch Immigration and Naturalization Service (IND) from the perspective of the data subjects forced to relate to the ways in which the IND's datafied bureaucratic system governs the asylum procedure. The authors combine a top-down perspective (data system) with a bottom-up perspective (data subjects) integrating an analysis of data and information about five Syrian refugee women who have faced the IND's opaque decision-making process for granting (or denying) the right to asylum. In this chapter, the women speak back to the system, producing alternative knowledge and representations to the dominant and mainstream stories of migration and integration in the Netherlands. The authors have backgrounds in (digital) media, post-colonial and critical data studies, gender studies, and accounts by the first author are partially auto-ethnographic.

The contributions in *section 3* unpack the entanglements of data and care practices from different perspectives. Here, data as well as data-intensive technologies appear not only as increasingly important means of care in contexts such as healthcare and elderly care, but as genuine objects of care. The contributors show the various ways in which data requires care and is cared for when it is recorded, in-

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terpreted, used, shared, archived, or reused. From a critical perspective this focus on data as an object of care confronts the imaginaries of big and open data with the realities of data practices that are contingent, full of frictions, and laborious. As a mode of care this work is far from automatic but is involved, engaged, attentive, and reflexive. Such a perspective contributes to a more nuanced analysis of data power as much as it feeds back into the design of technologies that support reflexive, caring data practices and the careful design of future technologies.

In their paper *Everyday Curation* Kate Weiner et al. discuss practices of self-monitoring of health-related data such as blood pressure or body weight. Drawing on an interview study the authors propose to conceptualize the data practices of individuals as curatorial practices. These practices of data curation entail *discerning work*, for example in the selection of relevant readings to become part of data records. As a result, such records only consist of *partial data* according to the authors that is recorded, interpreted, and circulated by engaged individuals rather than by disengaged (quasi-)machinic processes. The contribution of Claudia Müller and David Struzek is concerned with user practices of data-intensive technologies as well. With their background in Socio-Informatics they ask how future users can be involved in the development and design of digital technologies that aim to support them. This is of special importance for user groups that have little or no knowledge, expertise, or affinity to digital technologies. Building upon experiences gained from a participatory project for developing sensor technologies *with* and *for* older adults in rural areas the authors argue for grounding technology development in everyday practices and user needs. Contrary to many high-tech imaginaries the digital revolution begins here with off-the shelf devices and the participatory design of mutual practices.

Within academic research the Open Science movement has promoted the idea of openly accessibly and reusable research data. While this development was mainly driven by the natural sciences and engineering it by now affects academic research at large. Against this background Wolfgang Kraus and Igor Eberhard discuss in their contribution the challenges they face in setting up the *Ethnographic Data Archive* (EDA) at the University of Vienna. Struggling with both a reductionist understanding of research that underlies many discussions on Open Research Data, and the skepticism of many qualitative researchers, the EDA aims at developing best-practice models for archiving ethnographic research data that are sensitive to the specificities of ethnographic research and the dialogic creation of ethnographic data. The contribution by Gaia Mosconi et al. is similarly concerned with qualitative and ethnographic research data. Drawing on insights from discourses on data storytelling and empirical research of data practices of ethnographic researchers, the authors propose the design concept of Data Story that aims at supporting researchers to select relevant data snippets and to enhance them with contextual information in narrative structure. The creation of such Data

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Stories is conceptualized as a form of selective care that increases the usefulness as well as reusability of qualitative data by interweaving formal descriptions with informal narratives of data in a structured, yet adaptable process.

Section 4 focuses on the relationship of data practices and mobility. Generating "real-time" data about people and things on the move and thus in dynamic, real-world settings is one of the main trajectories of datafication, and is increasingly taken up in inventive and (mobile) digital methods to study social phenomena in motion. The contributions in this section focus on urban pedestrian mobility (O'Grady), the datafication of driving (Hind), and the logistics sector (Pentenrieder). Together, they explore the ways in which the tracking and monitoring of behaviors, actions, and experiences produces data, but also how data acts to inform and modulate everyday practices.

Nathaniel O'Grady offers an analysis of a public WiFi infrastructure that has the capacity to generate what he calls "affective atmospheres," actively shaping public practices in New York. LinkNYC, the operator of 10ft high WiFi kiosks found across the city, offers the opportunity for advertisers who use the kiosks' 55inch screens for their adverts, to understand – and target – the daily journeys of prospective customers. Here, we see the possibility of such an infrastructure as firstly being able to triangulate pedestrian movements as people drop in and out of each kiosk's WiFi range, courtesy of their mobile phone's connectivity. But, secondly, in capturing these user journeys, how their embodied and affective *experience* of walking through the city – i.e. principally what they might *see* – can be *modulated* in relation to the specific encounters that the LinkNYC kiosks offer.

Sam Hind likewise considers how a range of driving-related phenomena are turned into data, and how particular systems and interfaces within the car are designed to re-structure relations between driver and vehicle, and in the process transforming the driving experience into a datafied one. What is interesting here is the extent to which new driving experiences emerge when automobiles become platformized hubs of multiple data streams. Hind outlines the various ways geodata is transformed into navigational data, i.e. data informing and remodeling the navigational process on a *turn-by-turn* basis, and vehicle data is surfaced as driving data, best exemplified by how car dashboard interfaces are converging both spatially and operationally. The contribution delves deeper into two strategies employed by car manufacturers to hook drivers in: a process of "representational transparency" meant to smooth the navigational experience, and the offering of forms of "customizable control" designed to personalize the driving experience.

Annelie Pentenrieder considers how software modulates the work of drivers in the logistics sector, and specifically, how route planners and digital maps help coordinate trips, distributes tasks, and control the execution of work-related activities. Here, Pentenrieder considers how such software generates *algorithmic opacities* such that drivers are unable to see or challenge the distribution of, for example, incom-

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ing delivery orders assigned to them. Unlike human supervisors, as Pentenrieder explores, algorithms cannot be questioned, leaving drivers oblivious to the reasoning behind decisions. Accordingly, the contribution calls for a re-examination of algorithmic opacities from the perspective of the user. In short, to make sense of the *user experience*, from long-distance lorry drivers to food couriers. In this (re)focus on the everyday interactions these users have with software that governs their daily activities, we gain a deeper understanding of how they develop strategies and deploy tricks to make sense of the logics of software as they are deployed.

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