

Decoding algorithms

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Abstract

In this article, we propose to adapt the communication theory concept of ‘decoding’ as a sensitizing device to probe how people come to know and understand algorithms, what they imagine algorithms to do, and their valorization of and responses to algorithmic work in daily media use. We posit the concept of decoding as useful because it highlights a feature that is constitutional in communication: gaps that must be filled by mobilizing our semiotic and socio-cultural knowledge in processes of interpretation before any communication becomes meaningful. If we cannot open the black box itself, we can study the relationships that people experience with algorithms, and by extension how and to what extent these experienced relationships become meaningful and are interwoven with users’ reflections of power, transparency, and justice in digital media. We demonstrate the potential of approaching algorithmic experience as communicative practices of decoding through an exploratory empirical study of how people from different walks of life come to know, feel, evaluate, and do algorithms in daily life. We unpack three prototypical modes of decoding algorithms – along preferred, negotiated, and oppositional modes of engagement with algorithms in daily life.

Keywords

algorithms, circumventing algorithmic profiling, communicative agency, encoding/decoding, tactics

Introduction: algorithms, everywhere

Algorithmic operations form an important part of day-to-day infrastructure for all of us. As we move about and carry out daily activities with the assistance of digital media, our

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data traces are collected, algorithmically sorted, filtered, and so on, and fed back to us in ways that allegedly are supposed to make our lives easier and our work more efficient. We scarcely notice or question these data-based operations, yet they are not neutral, they shape particular social realities for us and should be debated. In academic research, the unnoticeable operations of algorithms have ignited a plethora of critical voices. Algorithmic logics and decisions are seen as intransparent, blackboxed, discriminatory, and oppressive (Eubanks, 2018; Pasquale, 2015), and there is a strong call for critiquing the values, intended classification outcomes, and optimization logics that underpin them. At the same time, *because* they are inaccessible and operate at the backbone of digital infrastructures, we cannot study algorithmic operations directly, although we should study the processes by which they are made, tweaked, and put to work (Dourish, 2016; Flyverbom and Murray, 2018; Thomas et al., 2018). We should also study their consequences for people (Bucher, 2017; Eubanks, 2018).

In this article, we propose to adapt the communication theory concept of ‘decoding’ (Hall, 1973) as a sensitizing device to probe how people come to know and understand algorithms, what they imagine algorithms to do, and their valorization of and responses to algorithmic work in daily media use. We posit the concept of decoding as useful because it highlights a feature that is constitutional in communication: gaps that must be filled by mobilizing our semiotic and socio-cultural knowledge in processes of interpretation before any communication becomes meaningful (Peters, 1994). If we cannot open the black box itself, we *can* study the relationships that people experience with algorithms, and by extension how and to what extent these experienced relationships become meaningful and are interwoven with users’ reflections of power, transparency, and justice in digital media. We demonstrate the potential of approaching algorithmic experience as communicative practices of decoding through an empirical study of how people from all walks of life come to know, feel, evaluate, and do algorithms in daily life. People’s experiences of what algorithms are and what they can do to them is part of the shaping of the output of algorithmic operations. Different tactics for and acts of circumventing, say, algorithmic profiling on social media are manifestations of user agency because these acts feed back into the digital system, disturb its quest for data accuracy, and contributes to reconfiguring it. Hence, while our purpose is exploratory, there are also normative and educative reasons for studying the decoding of algorithms: it may help raise people’s critical consciousness, suggest ways to equip people to know and be able to make more informed decisions, and thereby enable a public conversation about what algorithms should and should not be made to do.

Critical algorithm studies – state of the art

The social and cultural implications of algorithms and algorithmic operations have received quite a bit of scholarly attention over the past couple of years, to a large extent on par with the societal and scholarly hype around big data and emergent possibilities of quantification, prediction, and automation. Humanistic and social science-based approaches have found common ground in what Gillespie (2014) and others have labeled critical algorithm studies, researching the politics and biases inherent in algorithmic operations. As Bucher (2018) observes, this work echoes historical analyses of the

societal role of statistics and metric measurements, with its interest in the reality-making functions of algorithms. Similarly, social critique of algorithmically driven automation reflects a century-old concern over Taylorism and its implications for human work and living (Gillespie, 2014; Moore, 2018).

Scholars, drawing from a mix of science and technology studies (STS), cultural theory, Foucauldian notions of knowledge production, media and communication theory, and institutional theory have raised questions concerning the power algorithms exercise by way of the operations, for example, on streaming services (Beer, 2015; Seaver, 2018), search engines (Andersen, 2018; Noble, 2018), and social media (Ruckenstein and Granroth, 2019), and in the context of media production (Klinger and Svensson, 2018; Napoli, 2013) and advertisement (Turow, 2011). Algorithms have been theorized in relation to identity (Cheney-Lippold, 2017), the business of multinational corporations (Pasquale, 2015) and the market at large (Fourcade and Healy, 2017), and in public sector governance, including the provision of welfare and social services (Eubanks, 2018; Just and Latzer, 2017). Following from these analyses are forceful calls for transparency, auditability, justice, and fairness in algorithmic work – arguing that algorithms have politics.

While some tend to place the locus of algorithmic bias and power in the technical workings of the algorithms themselves, recent work commonly suggests the conceptualization of algorithms as dynamic, sociomaterial constructs with performative capabilities (Bucher, 2018, Flyverbom and Murray, 2018; Thomas et al., 2018). This further entails emphasizing a recursive relationship between algorithms and people, acknowledging both the material underpinnings and mathematical logics of algorithms as ‘technical entities’ and the agency and sensemaking of people who experience, valorize, and perhaps tactically try to resist algorithmic operations in their practical pursuits through daily life (Gillespie, 2014; Kitchin and Lauriault, 2014). As Bucher (2018) puts it, algorithms do not just gain power through their operations, but also through ‘the claims made over’ (p. 3) them, and through their contextual embedding. After all, algorithms rely on designers’ and developers’ as well as users’ input to adjust and remain relevant; hence, user input matters for shaping algorithmic operations. Some empirical work in this direction has emerged: Bucher (2017) studied ‘algorithmic imaginaries’ in relation to Facebook through online interviews with Twitter users. Ruckenstein and Granroth (2019) analyzed users’ responses to personalization and targeted ads on social media. Thomas et al. (2018) mobilized the notion of ‘algorithm as fetish’ when interviewing designers, software engineers, and others at the production end of algorithms to understand their making and inscribed meanings.

In alignment with these theoretical assertions and empirical foci, we understand algorithms not only to be shaped by the data work of those who make, implement, and interface with them, but also through the way they become meaningful, helpful, problematic, opaque in and through what they do on a daily basis as part of the digital infrastructures of everyday life. We contend that algorithms *also* become productive and powerful by way of the meanings ascribed to them in concrete contexts. Extending this, we suggest there are theoretical as well as empirical lessons to be learned from communication theory about meaning-making with algorithms.

Theoretically, conceptualizations of how people face algorithmic operations may help sensitize us to the dynamics between different – cognitive, affective, political – aspects

of algorithmic experience and valuation. Empirically, examining what people think, feel, and do about algorithms on their own terms might ignite venues for raising consciousness and public debate around algorithmic fairness and transparency, and by extension, the role and ethics of algorithms, data, and technology in the broad sense in shaping our society.

Decoding texts and technologies

We approach the relationship between users and algorithmically rendered interfaces through Stuart Hall's (1973) semiotic model of the encoding and decoding of media texts. Developed in the study of mass media, television in particular, Hall's work has formed a key pillar in modern media reception analysis. The semiotic model of communication holds the central premise that messages are polysemic – as noted by John Durham Peters (1994), a prominent philosopher of communication, communication is defined by its gaps. The production and circulation of meaning in society through media messages rely on instances of 'coding': producers encode intended meanings in messages, mobilizing their existing frameworks of knowledge, values, and socio-cultural repertoire. The message proper offers semiotic cues to guide the recipient, who decodes it, by leveraging her existing knowledge, values, and so on. It is not always evident and transparent what is the preferred meaning of a message; while the text may not be 'black-boxed' as it does offer cues to guide meaning-making, decoding requires interpretive work at 'the recipient end'. When we decode a message, we also make inferences about the intentions of the producer of the message, and evaluate and valorize the message according to personal and socio-cultural spheres of living. In Hall's original framework, he delineates three prototypical decoding positions: a dominant or preferred, negotiated, and oppositional reading of the message, each defined by their relative alignment with and sympathy to the producers' intention. These positions furthermore reflect underlying tensions of politics and social class. Thus, different decodings in varying ways contribute to reifying or challenging dominant meanings and valorizations in society. These ideas, we contend, may sensitize the study of how users experience and make sense of algorithms in daily life.

To be sure, algorithms are not 'messages' of the same kind as television texts, in fact it would be crude to suggest that algorithms are like texts. Technically, an algorithm may be defined as 'an abstract, formalized description of a computational procedure' (Dourish, 2016: 3). In the context of communication, algorithms are material, rule-based, and thus regulate communication, even if the rules are modified as the algorithm learns through data. They also do not encode meanings in the semiotic sense, but perform processes of social ordering by way of information, or data structures. Yet, the encoding/decoding model helps to sensitize us to the interpretive efforts used when making sense of algorithmic operations performed on us in digital systems, and to the way processes of inscription, design, and use are political by nature (Alaimo and Kallinikos, 2017; Flyverbom and Murray, 2018). To extend the notion of decoding to digital systems, we lend inspiration from Shaw's (2017) efforts at mobilizing the legacy of Stuart Hall in the context of digital media, the nature of which blur established distinctions between media and texts, and between producers and recipients in the media circuit. Specifically, Shaw

synthesizes affordance theory with the encoding/decoding model, suggesting that modes of interaction with specific digital media reflect different ‘using positions’ of the affordances inscribed in technology – preferred, negotiated, and oppositional uses. In other words, decoding is reflected in the very practice of doing something with the media; it may be perceived as a form of communicative agency. Of specific interest to Shaw is what she labels ‘imagined affordances’, which refers to affordances mobilized by users but not intended by the designers of a technology or vice versa:

By introducing imagination to affordances, in addition to bringing design and use back into the picture, they also acknowledge that there are aspects of mediated experiences that are invisible to users. Algorithms, for instance, affect what users can and cannot do in online spaces, but operate out of view. (Shaw, 2017: 600)

For Shaw, it is the use of imagined affordances that allow users to push back on the inscribed, and thus preferred uses of a technology. Their instant feedback to the system plays a role, if minimal, in the ongoing reconfiguration of the system. Thus, in principle, through creative and resistant modes of engagement, users may challenge existing ideologies and power differentials between designers and users promoted by digital media.

Whereas Shaw emphasizes interpretation and communicative practice as a key part of the shaping of affordances, we suggest that her implied critique of the constitutive role of materiality in shaping our encounters with technology might imply bestowing too much agential power on the user. Materiality does matter, greatly, for shaping our experience with digital media. At the same time, the promise of the notion of ‘imagination’ lies not in its ontological fixing of technology, but in its guidance toward meaning in the emic sense. What people believe algorithms to do, and what people think they can do to tweak and influence algorithmic operations is important in its own right. Knowledge at the emic level may help explain what users find fair, problematic, strange, useful, and by extension inform scientific understanding and societal debates around users’ perceivably uncritical engagement with algorithmic systems.

Research design and empirical material

To address questions of meaning in ordinary users’ experience of the algorithmic operations performed on them, we undertook a qualitative, exploratory study of how people come to know, feel, and evaluate algorithms through their use of digital media. The empirical work was carried out in the welfare state of Denmark, a national context with total Internet diffusion and a historically strong strategic backing of e-government, e-business, and e-health initiatives making Denmark among the most digitized countries in the world. There are also comparably high education levels and thus presumably some degree of digital literacy. Notably, Denmark scores comparatively very high on the population’s trust in societal institutions and has a long history of tracking and keeping record of its citizens.

We interviewed 16 people from different walks of life, sampling them purposively to ensure spread in terms of age (from 19 to 72), gender (male, female, non-binary), education (from upper secondary school to an academic degree), and job. Respondents were

recruited through snowballing. The interviews were semi-structured and explored what people think algorithms are, what they perceive them to do, and what tactics they use to act upon algorithms in everyday life. The interview guide was thus designed to probe different aspects of media experiences, which could then be coupled with notions of knowledge, affect, and ideology as drawn from Hall's (1973) semiotic model of communication.

Importantly, because we assumed it to be difficult for respondents to relate to algorithms as an abstract category, we brought a broad set of printed prompts to the interviews, showing logos from more or less familiar services in which algorithms operate, as well as screenshots showing concrete examples of algorithms at work in digital media – for example, newsfeed filtering, personalized ads, recommendation systems, GPS way-finding, image recognition, and so on. These turned out to be invaluable to get people talking about their experiences with algorithms, who were specifically keen on talking to us about their experience of algorithmic operations in everyday media use from streaming to social media to the use of services such as Uber. It was in these everyday encounters with common media services that users' experiences with algorithms were most easily verbalized.

Interviews were transcribed verbatim and coded systematically following a coding scheme designed with an overall focus on understanding decoding of algorithms as a matter of knowing, feeling, and acting upon them. The respondents have been pseudonymized in the analysis below.

Analysis: knowing, feeling, and doing algorithms

Knowing algorithms

While being a user of digital media naturally means interacting with algorithmic infrastructures that give shape to personalized interfaces and media content, we cannot assume that every media user is fully aware of this (Eslami et al., 2015). Neither should we assume, as this exploratory study illustrates, that media users hold a common belief about what algorithms do, nor what meaning they have. Our respondents demonstrate different ways of knowing, feeling, and doing algorithms.

Only two respondents (both aged above 65 but self-proclaimed casual digital media users) appeared to be profoundly unaware of algorithmic operations and influences on the offerings provided to them by services such as Netflix, Facebook, Uber, and so on. This made it difficult to interview them on the topic. The remaining respondents in our study showed a diverse awareness of algorithms, as they encounter them in various uses of digital media and web services in everyday life. They talked about algorithmic experiences in online banking, music streaming, online shopping, social media, targeted ads, search engines, locative media, and different types of intelligent consumer technology – that is, artificial intelligence (AI) assistants. One respondent suggests algorithms have ubiquitous presence, as she finds them to be 'almost everywhere, at least in all online activity' (Mette, female 33 years old). Indeed, from our data, algorithms are imagined (Bucher, 2017: 39) and experienced as multiple, depending on context, usage patterns, and the kinds of pre-existing knowledge that respondents hold. We identified three main

sources for knowing algorithms: professional knowledge, experience-based knowledge, and third-party knowledge (e.g. knowledge acquired from friends or via mainstream media).

Professional knowledge. The most comprehensive knowledge of algorithms comes from respondents, who have learned about them during education in, for example, computer science or deal with them in a professional work setting. Sif (female 28 years old), a young office trainee, works with search engine optimization (SEO). Thus, she naturally associates algorithms with automated and data-driven segmentation, used for marketing purposes. Jonas, who works with algorithmic personalization for a big media company, presents an understanding of algorithms as enabling smarter and better user experiences – which allegedly fits his professional interests: ‘[Algorithms] learn from user behavior, they learn to recognize patterns, voice recognition, pattern recognition in images and many other things’ (Jonas, male 40 years old). Similarly, Lars, a professional data analyst, draws on his daily work experience as a source of knowing algorithms, that is, when he talks about how algorithms: ‘Lately, [have] become more concrete, because we need to use algorithms to control user behavior. Well not control user behavior, user behavior will control what users will experience through algorithms’. (Lars, male 43 years old).

Having in common a technical and professional experience with algorithms, these respondents also seem to advance an understanding that algorithms are a means of efficiency and convenience. Such as when Sif finds algorithms to be brilliant and convenient tools: ‘they save me a lot of time’ (Sif, female 28 years old).

Experience-based knowledge. Not all users share the same professionally based prerequisites for knowing algorithms. But they may come to know them through their (end-user) experience. As one respondent puts it: ‘It’s not something you really talk about. But you notice it, you know, once in a while [...] by interacting with the media’ (Noel, male 19 years old). In this case, Noel seems to have gained an understanding of different algorithmic outputs, how algorithms shape his newsfeeds and search queries, and how they suggest new music and videos for him to stream through his daily media use. While most respondents have experience-based knowledge like Noel’s, some of them appear uncertain about how to identify algorithmic operations performed in their media use. Mark, who is an unskilled warehouse worker, is not able to articulate a general understanding of algorithms, yet he thinks he recognizes (a few) specific algorithms that influence his daily life: ‘I don’t know if [Google Maps] scans where I spend most of my time [...] I always come back to the same address right, then it must know it is there’ (Mark, male 23 years old). Here, Mark suspects that Google Maps may rely on algorithmic operations because it automatically suggested his home address. Correspondingly Benjamin, a student doing his last year of high school, recognizes how personalized ads get shaped by his search and purchase history, and how his list of top friends on Facebook gets influenced by who he interacts with the most: ‘this must also have something to do with algorithms’ (Benjamin, male 18 years old).

Third party knowledge. Traditional mainstream media might also play a role in how people come to know algorithms. In the interview with anthropologist Rikke, she

continuously makes references to a TV program about algorithms. This program purportedly helped change the way she thinks about algorithms, to her initially conceived as ‘something related to math’ (Rikke, female 54 years old). Because she watched the specific TV show, she is now able to identify and somewhat explain how (some) algorithms are being put to work in digital media, for example, how Tinder is using algorithms to match people.

In addition, some respondents express that they have learned from friends and acquaintances about algorithms: ‘There was one who told me that [algorithms] notice when people stop series and start them again and that it has implications for how series are actually being produced. At least potentially’ (Kim, non-binary 27 years old).

Noteworthy, when respondents recall coming to know algorithms through personal experience or third-party knowledge, they typically recount them in terms of surprising or disturbing encounters. This stands in contrast to formulations by the respondents with work or other formal knowledge of algorithms. Interestingly, most respondents identify and talk about algorithms ‘by proxy’, tapping into topics that flourish in the mainstream media, such as surveillance, echo chambers, filter bubbles, and so on. Rikke, for instance, speaks of algorithms by the proxy of fake news: ‘It’s super relevant in relation to fake news and all that, about, do you really know what kind of selection you’ve made or that has been made?’ (Rikke, female 54 years old). Throughout the interviews, we heard echoes of critique of algorithms also being played by mass media.

Feeling algorithms: positive and negative evaluations

If recognizing the presence of algorithms is a condition for the algorithmic imaginary, a crucial aspect of understanding how people decode algorithms lies in affective encounters and responses – **how people feel algorithms**. To pick up from Bucher: ‘what people experience is not the mathematical recipe as such but, rather, **the moods, affects and sensations that the algorithm helps to generate**’ (Bucher, 2017: 32).

A central observation in our study is **how algorithms often go unnoticed** – not just for those who lack a general awareness of them. When users of digital media experience algorithmic operations as smart, convenient, and efficient, they will quickly stop noticing them and maybe even forget about them. ‘The good user experience is when the algorithm is clean and hidden. When it’s pleasant and easy to use’, as suggested by Jonas (male, 40 years old). **Academic research has similarly suggested that media users might prefer hidden algorithms**, implying a seamless user experience (UX) design ‘[wherein] the user, some argue, never needs to know the model of processing at work, and the role of their actions within it’ (Hamilton et al., 2014). However, **algorithms do become visible as they provoke, disturb or surprise the user**, and so on, typically in instances where respondents recall feeling unseen or wrongly categorized by an algorithm in a specific context. **In these situations, strong emotional responses were generated**. This suggests that affective encounters with algorithms, especially those generating strong emotions, entail evaluations – positive or negative, and these, in turn, inform the meaning-making process, the decoding of algorithms.

Positive evaluations. Most of the respondents widely consider algorithms to be a necessary part of digital media and web services, as they help navigate endless streams of information and options online. However, not all algorithms are seen as equally valuable or good. For example, Noel asserts that Spotify's algorithm in his view is the best: '[the algorithm] doesn't hit the spot every time, but more often with Spotify than with other services, I find myself getting a new artist, that I actually think is cool' (Noel, male 19 years old). Others similarly praise Spotify, establishing expectations that its algorithm will provide them new and compelling music that fits their taste. Consequently, Spotify's recommendation algorithm is described as 'cool', 'smart', and 'best', constituting a crucial and meaningful part of listening to music in these respondents' daily lives.

Our interview data contain many similar examples, showing how positive experiences induce supporting valuations and positive expectations of specific algorithms. When respondents evaluate Google as being the best search engine, it is because they expect its algorithms to give the most precise results. The Netflix recommendation algorithm is similarly recognized as highly convenient and perceived to know (the taste of) the user very well. One respondent is particularly fond of Facebook's newsfeed algorithm, emphasizing the ability of the user to shape its output: 'You can go and choose, for example, this and that friend should always be at the top of my newsfeed' (Mette, female 33 years old). While she also finds algorithms to be disruptive and irritating at times, for example, when they push work-related ads when she is in a private context, it does not bother her much, as 'That's how you pay, that is why there are advertisements' (Mette, female 33 years old). This response is certainly not unique to Mette. Most respondents voicing positive valorizations of algorithms indicate readiness to trade data-based exposure to personalized ads for efficient use and relevant content.

Negative evaluations. Many of respondents show to have had both negative and positive experiences with algorithms. Negative experiences are often portrayed as mild irritations and have rarely led to pronounced negative evaluations. Noel for example, who evaluated Spotify's recommendation algorithm positively, also reports to have had annoying, even uncomfortable experiences with algorithms: 'personal [algorithms] try to adapt to me, so that they can sell me stuff. This, I am less comfortable with'. He continues by characterizing these incidents of profiling for selling him products to be not decidedly negative: 'It is just small irritations where you think it is not optimized well enough' (Noel, male 19 years old).

In contrast, we found that when algorithms are evaluated outright negatively, it is often based on strongly affective encounters. These are hardly provoked by the experience of algorithms as 'smart' and 'convenient', yet neither as 'irritating' and 'disrupting'. Instead, strong affective encounters happen when algorithms are experienced as being 'discriminating', 'offensive', 'disturbing', 'harmful', and so on. For instance, the anthropologist Rikke found some personalized ads to be deeply offensive: 'There were all such old-person advertisements, stuff like "your retirement savings" because it obviously branded me as being old [...] I was very offended' (Rikke, female 54 years old). This happened at a time when Rikke was playing a lot of online bridge (a card game), which allegedly influenced the type of personalized ads she got served online. Seeing these ads, she felt a strong resentment, labeling the

algorithmically curated ads for old people ‘an assault on my identity’ (Rikke, female 54 years old). This experience echoes what Ruckenstein and Granroth (2019) write about when noting that users want to be seen by the market. For Rikke, not being properly seen and recognized by Facebook’s algorithms is deeply problematic. Algorithms render a mirrored image of the user, a kind of shadow body that Rikke senses through the targeted ads: ‘[...] the slippage between the anticipated user and the user themselves that [shadow bodies] represent can be either politically problematic or politically productive’ (Gillespie, 2014: 8). Arguably, what emerges is a discrepancy between Rikke’s own sense of identity and the identity assigned to her by the algorithm – and this is felt as an assault, creating strong sense of indignation and resentment.

Experiences of being wrongly categorized are similarly recounted by Anton (35 years old), who identifies as non-binary (prefer he) and lives in a same-sex marriage. Yet, his experience has less to do with being put in a wrong box than oversimplified, stereotyped boxing. Specifically, he refers to what he defines as ‘homo-spam’ in algorithmically served sponsored ads and events:

[...] honestly, it has completely misunderstood me, it believes that because I am gay, I must like events such as [Copenhagen] Pride [...] it thinks that I’d like the same as everyone else with male genitals who like male genitals, and that’s just not how it is. (Anton, non-binary 35 years old)

Anton’s quote suggests he does not see his homosexuality as a good standalone classifier for his identity; when he is assigned an algorithmic identity strongly influenced by this classifier, it is felt like an act of stereotypical offense. Furthermore, he associates algorithms with surveillance, in which he finds them to be potentially dangerous, for example, if people get profiled by algorithms, and thus ‘outed as gay’, in countries where homosexuals are persecuted: ‘Homosexuality is okay in the social structure we have right now, but when are we suddenly in a situation where those data are dangerous to me?’ (Anton, non-binary 35 years old).

Another type of negative evaluation stems from the feeling of not being recognized at all. Jesse, who identifies as non-binary (spec. agender), talks about the power of social media and how they limit the possibility of non-binary people in being represented: ‘Before Facebook implemented a non-binary understanding of gender, or an opportunity to choose non-binary gender identities, it was very invisibilizing’ (Jesse, non-binary 23 years old). While now being able to choose a gender category fitting their identity, Jesse still experiences being profiled as a woman: ‘I get a lot of advertising about women’s groups, women’s networks on Facebook because I still think there is data from the time I was categorized as a woman on Facebook’. (Jesse, non-binary 23 years old) (see also Bivens and Haimson, 2016).

These examples show how users, based on strong affective encounters, evaluate certain algorithms in predominantly negative terms. However, as will be shown, they demonstrate different ways of reacting and coping with these experiences – in their way of doing algorithms.

Doing algorithms through *different modes of decoding*

As suggested by Shaw (2017), *decoding is reflected in how users interact with digital media – how they take up what she terms *using positions**. The work upon algorithms that respondents do in and through usage practices, by extension, reflects knowledge and affective stances toward algorithmic operations.

To be clear, while our data support that algorithms certainly may give people ‘a reason to react’ (Bucher, 2017), we also find that often they do not. How people interact with digital media might not always rely on purposive evaluations of and attempts to influence the algorithmic mode of operation as such. However, we did find several accounts of users performing protective tactics and deliberate attempts to influence or circumvent algorithmic systems through interactions with them, *underlining that while algorithms do things to people, people also do things to algorithms*. These doings may be organized along Shaw’s (2017) adaption of Hall to describe modes of interaction with digital media.

The dominant position of decoding algorithms. The dominant or preferred decoding position describes instances of using algorithms as intended, thereby reifying their encoded meanings and biases. Taking this position is chiefly reflected in respondents’ embracing and praising of the smartness and convenience of algorithmic operations in daily life. Jonas, the personalization engineer, confesses the following regarding his use of Google Photos to automatically catalogue his photos: ‘I’ve surrendered my life to an image recognition algorithm because it’s just so much smarter’ (Jonas, male 40 years old). At a general level, *dominant decodings buy into the perception of algorithms as an essential part of digital media*, conveniently automating processes that used to be done manually, and enhancing the experience of using streaming services, search engines, social media, AI-assistants and dating apps, and so on. The dominant decoding further entails recognizing that algorithms work optimally if the user interacts with the algorithmic system as intended by the design(ers). When doing algorithms, this implies feeding the system excessively with content, user information, and behavioral data, consequently reinforcing a dominant way of interacting with algorithms.

A dominant decoding position is reflected when respondents find themselves actively *feeding algorithm-driven media with as much data as possible, to make them work in the best way*; such as when Terrence (male 37 years old), an IT-service supporter who ‘loves’ LinkedIn, feeds the system with as much relevant data as possible to optimize his newsfeed; and when *respondents use the rating system of Netflix intentionally*, to help shape the suggestions of movies and series to fit their taste. Accordingly, a dominant decoding position describes an acceptance of being a commodity in a digital infrastructure: ‘On the one hand, you don’t want to be surveilled, but on the other hand you want to have some cool choices. And those two things just go together’ (Jonas, male 40 years old). Jonas’ quote echoes a hegemonic logic in which users must agree to be monitored if they want ‘cool choices’, good services and products. Allegedly, this is perceived as a natural and fair bargain. As stated by Gudrun (female 67 years old), ‘Something has to finance these services’.

The negotiated position of decoding algorithms. The negotiated decoding position describes an intermediate position, characterized by a mix of positive and negative evaluations that, in turn, lead to more cautious engagements with algorithmic systems. Typically, users who take up a negotiated position find algorithms to be an indispensable part of digital media, as they help getting access to information and serve personalized content and recommendations. However, this usage position might at the same time reflect contestation of specific features and outputs. Put in a different way, while users might evaluate some algorithms slightly negatively, they will typically support the general premise of their operation in digital systems. To exemplify, Anton essentially finds the algorithmic operations of Google Search to be ‘necessary’, however, he also finds them to be ‘normalizing’ and ‘mainstream’: ‘[Algorithms] can make you far less experimental, because you are constantly being offered the things that you already know that you like or that the algorithm knows that you like’. (Anton, non-binary 35 years old).

Negotiated decodings are furthermore reflected in respondents’ broad acceptance of data collection and profiling as long as it is used in an appropriate context to provide better service and to provide better products and options in that context. This also includes instances of trying to shape the output of algorithms toward specific ends, such as when Jonas (male, 40 years old), in trying to avoid rising customized flight prices online, browses in incognito-mode, and plays around with geo-location. While he does not oppose the algorithm as such – it helps him in comparing and finding the ‘best’ tickets – he tries to avoid having to pay more for his travels based on being recognized by the system. Supporting the basic premise of finding flight tickets online, using a travel fare search engine, can go hand-in-hand with opposing a personalized pricing mechanism built into that system.

The oppositional position of decoding algorithms. In stark contrast to the dominant position, the oppositional decoding position describes a type of work done on algorithms based largely on negative evaluations. Thus, algorithms are perceived as problematic technologies, whose gaze must be evaded, and whose operations must be undermined. The oppositional position is taken up by people with activist purposes, by people who refrain from using algorithm-driven media and web services, and by those who find specific systems or media unethical, discriminatory, and otherwise problematic in the way they use algorithms. It is chiefly described in studies of activist contestations of algorithms (e.g. Milan, 2018). This involves deployment of *subversive* tactics to circumvent, manipulate, or disrupt the system (Brunton and Nissenbaum, 2016).

However marginally represented in our study, a few respondents do take up an oppositional decoding position in their everyday encounters with algorithmic media. One example is Kim, a political activist identifying as non-binary (prefer they), who holds a master’s degree in political economy and perceives the commercial purposes of algorithms to be deeply problematic. Accordingly, Kim finds that algorithm-driven media exploit the user as free labor, create economic inequality, and amplifies the circulation of heteronormative cultural products: ‘I think it’s pretty creepy that how people interact with each other is used to create profit for very few people, and then they can sell it to all possible companies. I don’t think it’s super cool’. (Kim, non-binary 27 years old). As a way of pushing back against the algorithmic intentions, Kim uses several subversive

tactics, including the alternative non-commercial and privacy-enhancing search engine DuckDuckGo, Ad-Blockers to avoid targeted advertising and virtual private network (VPN) to ensure a higher degree of online anonymity: 'like, to hide IP addresses and hide things we do not want to share, like cookies, or find ways around, even though it is difficult'. (Kim, non-binary 27 years old). Jesse represents a perhaps more activist type of subversion, using the flagging system on Facebook to promote specific political causes, for example, veganism, through algorithmic logics of content distribution:

Every time I see a post with meat on Facebook, I flag it as violent or illegal material and that's one way where I'm cheating a bit, to portray my political beliefs and values. [...] I know that if I flag many of these posts, there are some people or algorithms that need to look at data that looks like this and assess it. And I hope it gives attention. (Jesse, non-binary 23 years old)

While it is implemented to enable the user in doing content moderation, Jesse uses the flagging mechanism on Facebook in a purposefully disruptive way, in attempt to criticize and possibly alter the order and rules of content and prevent it from being exposed elsewhere on the platform. Such examples testify to users' work against the intended user engagement with the system, thereby critiquing the algorithmic logics through subversive communicative actions.

Discussion

We have demonstrated the presence of preferred, negotiated, and oppositional modes of decoding algorithms in people's use of digital media. A next step in following Hall's model would be to unravel the politics of decoding, coupling empirical decoding positions to questions of class. However, we cannot draw conclusions on connections between decoding patterns and socio-demographic characteristics of users in this study. The sample is small and composed of Danish media users, a generally well-educated, economically safe, and relatively homogeneous population. Our analysis nonetheless raises a number of important points for future empirical work as well as theory development about users' relationships with algorithms.

First, knowledge itself does not seem to prompt more critical engagement with and valuation of algorithms. If we take the different degrees of knowledge and awareness of algorithmic operations in digital media expressed by our respondents into account, it is perhaps surprising how homogeneous their affective valuations and usage positions seem. Overall, the acceptance and welcoming of algorithmic operations to enhance user experiences, sort and curate the most relevant content and through this make everyday life more efficient is the common stance. This raises questions for digital or data literacy, the boldest proponents of which might mistake users' indifference or lack of critical attitudes and actions toward algorithmic operations for ignorance. While education, improving skills and competencies, is certainly useful for navigating digital media, it is not per se an instrument for critical consciousness-raising and engagement – at least in a high-trust national context like Denmark. However, it might be a condition of the possibility, at least, for enabling people to think about algorithms and make more informed decisions when using algorithm-driven media.

Second, our analysis raises questions about the relationships between decodings, political engagement, and previous negative experiences of classification, profiling, and discrimination based on (at least) gender. The respondents who voice an elaborate critique of algorithmic biases in search engines, social media, and so forth in our sample identify their gender as non-binary and invoke general experiences of not fitting predefined, socially normalized categories of ‘male’ and ‘female’. That is to say, resisting personal categorization and profiling is already political for them, and this may trigger their particularly critical reflections and actions toward algorithmic assignment of identities to people. Yet, further research will have to clarify whether our tentative finding of the role of previous experiences of bias and discrimination holds empirical water. This may further inform the politics of decoding at the collective level of social groups and their stratification.

Finally, our results connect to the notion of contextual integrity, developed in law scholar Helen Nissenbaum’s seminal work on privacy (Nissenbaum, 2010). Contextual integrity suggests that context matters immensely for how people expect and assess possible uses of their personal information. The context of algorithmic operation is arguably an important part of the explanation for the acceptance and quite positive evaluations of algorithmic operations we find among our respondents. These evaluations are strongly tied to respondents’ experiences with social media, online maps and transportation service, search and streaming services. Most of such services’ obvious uses of data from people are seen as very helpful and relatively acceptable (such as an algorithm using a person’s location data to devise the quickest route from A to B), whereas other uses are deemed less reasonable (such as using social media data for algorithmically based profiling for commercial use or social sorting). Following a recent report from the PEW Internet and American Life (Smith, 2018), contexts of algorithmic operations matter for users’ acceptance. Users may more easily identify and discern critical implications of algorithmic operations in contexts where real-world stakes are perceived as high: personal finance, the job market, personal health, and distribution of welfare services based on citizen scoring. Such scenarios were not prompted for in our interviews, and few respondents addressed them at their own initiative. When they did, they spoke very critically – particularly of the idea of such algorithmic systems being fueled with data from social media and other leisure contexts (see also Cath et al., 2018).

Returning to Shaw (2017) and the idea that different modes of interaction with digital media reflect preferred, negotiated, and oppositional decodings of their affordances, our study speaks to theories of communication, and more specifically communicative agency in digital infrastructures. While users may seem stripped of agency once they are looped in algorithmic systems in everyday life, the small acts of actively curating, withholding or flagging information to tweak the system to enhance privacy and evade precise profiling are indeed subversive means to speak back to the system. These testify to the power of communication. It also suggests an important contribution from communication theory to current thinking about algorithms and digital media as such. Digital media – their messages as well as technological underpinnings – are encoded in specific ways to invite particular types of action, yet these must be actualized by users, who may bring other ideas, values, and unintended actions into the communication.

Frameworks such as the encoding-decoding model offers helpful sensitizing devices to the complex dynamics of meaning-making in digital systems, and to assessing the scope and modes of user agency in feeding algorithmic renderings of everyday life.

Conclusion

In this article, we have laid out a sketch for how algorithmic imaginaries may be studied from the perspective of classical communication theory. We have used Stuart Hall's seminal work on the encoding and decoding of media messages as a sensitizing framework for understanding how ordinary people come to know, evaluate, and possibly push back on algorithmic operations performed on them in everyday life. If algorithms are the central mechanisms of encoding in digital systems, it matters how people become aware of and make sense of them. Our exploratory study of how people decode algorithms along preferred, negotiated, and oppositional dimensions, or modes of engagement testifies to the ways in which users come to tacitly reinforce or subvert algorithmic logics through their communicative agency. Future research may build on these findings to establish robust empirical insight into how algorithmic decodings and their implied politics may vary with social groups within specific societies, or between nations with different values, histories, and organization of state, commercial and civil society interests.

Underpinning the encoding-decoding model is the suggestion that media have consciousness-raising potentials, alerting people to matters of politics and identity – individual and collective. The study aligns with other current empirical studies of how algorithms are blackboxed, and how people do not know much about what they are, what they do, and with what implications. It also – albeit tentatively – suggests that knowledge is not necessarily a strong stand-alone incubator for critical reflection and actions. People's algorithmic imaginations may not be so lively, after all, when it comes to foreseeing possibly problematic scenarios of algorithmic decision-making systems, or the mechanisms of categorization, filtering and profiling, and so on, on which these systems rely.

We suggest that mobilizing data literacy should focus not only on technical knowledge and skills, but also on showcasing real life examples of algorithmic work in different contexts, relatable to the life of ordinary people. There is a methodological point to this observation, namely, that by way of showing possible outcomes of algorithmic predictions and profiles to people, we might be able to better collaborate on responding to the challenges to personal integrity and social justice in data-tracking futures. Future critical research into algorithms and datafication may further explore participatory paths to engage ordinary people in reflections and actions to shape their personal agency, and our collective effort and responsibility to define good and meaningful places for algorithmic operations in daily living.

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