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Coffee Roasters' Data Vernacular

On the Entanglement of Digital Data and Craft

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DOI
10.5117/9789463722971
10.1515/9789048555444-004
10.2307/jj.362382.6

Publication date
2023

Document Version
Final published version

Published in
Situating Data

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Link to publication

Citation for published version (APA):
Stauff, M., van Romondt Vis, P., & van Es, K. (2023). Coffee Roasters' Data Vernacular: On the Entanglement of Digital Data and Craft. In K. van Es, & N. Verhoeff (Eds.), *Situating Data: Inquiries in Algorithmic Culture* (pp. 31-47). (MediaMatters). Amsterdam University Press. https://doi.org/10.5117/9789463722971, https://doi.org/10.1515/9789048555444-004, https://doi.org/10.2307/jj.362382.6

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Download date:08 Sep 2026

Situating Data

Inquiries in Algorithmic Culture

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Amsterdam University Press

Cover illustration: Getty Images, 2020

Cover design: Coördesign, Leiden
Lay-out: Crius Group, Hulshout

ISBN 978 94 6372 297 1
e-ISBN 978 90 4855 544 4
DOI 10.5117/9789463722971
NUR 670

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1. Coffee Roasters' Data Vernacular

On the Entanglement of Digital Data and Craft

Markus Stauff, Pauline van Romondt Vis, and Karin van Es

Abstract
The symbolic opposition between data/datafication and human perception or reasoning is a key feature of contemporary data discourse. This article suggests analyzing how such dominant ideas about data get articulated in specific contexts. We take the use of computerized data in small-scale coffee roasting as an example of a "data vernacular" that reproduces, uses, but also modifies elements of the dominant data discourse. While data's promise of efficiency and consistency is taken up in coffee roasting, the data are embedded in the context of a craft whose insistence on the superiority of human senses actively constrains the impact of data. This ultimately adds vernacular voice and variation to the human versus data semantic.

Keywords: discourse, vernacular, coffee roasting, digital data, human senses, craft

Contemporary debates about digital data are structured by a set of assumptions and key concepts— what we will call "data discourse"—that enable the voicing of different opinions within a shared framework. One conspicuous example for such widely shared assumptions is the symbolic opposition between data/datafication and human perception or reasoning. According to Thylstrup et al. (2020), for instance, the amount of data in society has become too numerous to be accessible to the human mind, and datafication's abstractions and correlations offer insights that are radically different from what is accessible to human senses. Interestingly, this "problematization" grounds opposing takes on data. On the one hand, there are those who praise big data as a chance to gain new insights avoiding

Es, K. van & N. Verhoeff (eds.), *Situating Data: Inquiries in Algorithmic Culture*. Amsterdam: Amsterdam University Press, 2023
DOI 10.5117/9789463722971_CH01

human biases, and on the other hand, there are others who are concerned with the amounts of behavioral data collected on digital platforms and harnessed by machine learning to nudge constant attention and with how that threatens authentic social life and human values. The former plead for more datafication to guarantee social progress; the latter call for strategies of "digital detox" or "disconnectivity" to protect what they consider social and human values (Syvertsen and Enli 2020; Hesselberth 2018). And thus, while the two positions disagree on the evaluation of data, they share the basic assumption that humans and ("big") data have opposing characteristics and epistemic potentials.

However, to get a fuller picture of contemporary data culture, it is worth looking at how such basic ideas about data get articulated in specific contexts that combine human practices and data-based procedures in different ways. In this chapter, we therefore zoom in on the specific context of specialty coffee roasting. While coffee roasting machines, with their steely looks and levers, feel like remnants from the early industrial age, the monitoring and manipulation of the roasting process is supported by digital technology. Sensors and computer screens allow for precise gauging of temperature, time, and color of the roast. Such datafication promises to facilitate consistency and the deliberate development of specific roasting profiles for different beans. However, its overall impact is kept in check by the persistent relevance of manual practices and sensual experiences—like smell, vision, and sound—that are central to coffee roasting's self-characterization as a craft. Crafts are thus an especially interesting example here, since they insist on the inalienability of human senses and manual labor while also increasingly using computerized data to fine-tune production processes. To organize and legitimize this combination, elements of the dominant data discourse, with its opposition of human versus data, are used, reproduced, but also modified. These specific practices thus add to contemporary culture's ideas about, and modes of, using data.

Coffee connoisseurship, as a particular subculture, creates its own "data vernacular" that is related to but also distinct from other small-scale use of operational data by individuals and organizations. Like "vernacular photographies" (Batchen 2000) or "vernacular creativity" (Burgess 2007), the more idiosyncratic and rather local manners of using data, at least in public perception, often get overshadowed by strongly formalized and institutionalized applications. A data vernacular builds on but also contributes to the wider data discourse. Instead of taking any characteristics of digital data for granted, one needs to situate their features and potentials in the changing relationship with other practices and technologies. After all, the

impression that data are universal and the enticing power of "big data" only result from the "cleaning" of data that eradicates their local embeddedness and heterogeneity. In contrast, "[l]earning to look for the local in data can help us see data infrastructures as composites" (Loukissas 2019, 90).

In this chapter, we analyze the datafication of coffee roasting and how it ambivalently entangles data with the display and cultivation of human skills. First, we unpack what is meant by data discourse. Subsequently, we explore coffee roasting as a data-driven craft. In the final three sections, we reflect on the data practices of different roasters based on our interviews and contextual corpus. Here, we seek to understand how the specific combination of machines, knowledge exchange, apprenticeship, the senses, and collectively shared ideas gives meaning and function to datafication. More specifically, we aim to analyze how these coffee roasters negotiate their own use of (and reflection on) data with the generally shared ideas about characteristics and (dis-)advantages of data. The vernacular data practices of these coffee roasters can be considered a contribution to the wider data discourse that shapes societies' engagement with new forms of knowledge.

Data Discourse

Many scholars have underlined that the impact of data on contemporary culture cannot be separated from their "mythologies" (boyd and Crawford 2012), "ideologies" (van Dijck 2014), or "imaginaries" (Beer 2016). Like all technologies, processes of datafication are embedded in and achieve cultural significance through representations and ideas that delineate their alleged potentials and connect them to wider maps of social meaning and "epistemological hierarchies" (Millington and Millington 2019). *Moneyball*, for example, a popular non-fiction book (Lewis 2008) that was made into a successful movie (Miller 2011), introduced a wider audience to the idea that fine-grained statistics can help a sports team to identify players whose qualities have been overlooked by traditional scouts who base their decisions on mere observation. This superiority of data is similarly articulated when tracking apps offer new insights into aspects of everyday life from sleep patterns to learning progress. This always implies a performance of data: they need to be displayed and staged to convince a specific audience not only of the validity of the facts but also of the superiority of datafied knowledge (Ruppert and Scheel 2019). A broad variety of data visualizations translates abstract statistics into immediately comprehensive and often affective forms. Curve charts in particular display the temporal developments of

everything from COVID-19 infections to stock prices to individual fitness practices in dramatic ups and downs that make progress and regression immediately evident (Link 2004).

More generally, the design of all technologies is guided by "collectively imagined forms of social life and social order" (Jasanoff and Kim 2009, 120). On the one hand, technologies react to and aim to temper concerns about inhuman rationalization; on the other hand, they are made to embody the promise of social well-being and progress. Often, such cultural embedding of technologies is part of their institutional, coordinated implementation. Yet, it can just as much arise from vernacular applications and popular narratives. Bruno Latour underlined that such symbolic or rhetorical layers that connect technologies with imagined modes of use and promises of progress are no less substantial than the "actual" technical features of some machinery; rather, it depends on the conjunctural circumstances if (and to what extent) a "technical" element or a "rhetorical" element becomes essential for the durability and impact of a technology (1991, 114–16).

The subtle but important analytical and theoretical differences of scholarly approaches to such rhetorical and symbolic layers of technologies are beyond the scope of this chapter. However, applying their main insights to data, we use the concept of "data discourse" to highlight two aspects. First, in line with discourse analysis more broadly, we understand individual "opinions" and "ideas" to be connected to a patterned and structured way of speaking about data. Instead of purely idiosyncratic "sense making," the vernacular uses and meanings of data in each individual instance are of interest for how they emerge from and position themselves within the broader "problematizations" (Foucault 1997) characterizing contemporary data culture. Second, we understand data (their technologies, uses, and meanings) to be linked to questions of power and knowledge. The capability of shaping things (or behaviors) is both a condition for and a consequence of the knowledge that is enabled (and promised) through "big" or "small" data.

To understand coffee roastings' specific contribution to, and inflection of a wider data discourse, we base our analysis on semi-structured in-depth interviews (Kvale and Brinkmann 2014) with nine coffee roasters at five different sites in Amsterdam and observations of their coffee roasting process. We also looked at the broader context within which their situated data practices took shape by examining homepages of roasters and the coffee roasting handbooks by Scott Rao (2014) and Rob Hoos (2015) that are recurring reference points in the field. The interviews took place before and during the roasting of coffee and were recorded and transcribed. They were structured around our topic list (Galletta 2013) but moved freely between

topics. We asked our interviewees how they had learned to roast coffee, to describe the roasting process, and about the role of software and the human senses in that process. We took notes, photographs, and short video clips which, together with the transcribed interviews and the homepages of the different roasters, formed our corpus.

Coffee Roasting as Data-Driven Craft

Coffee first arrived in Europe during the seventeenth century when the colonial trade companies of Great Britain and the Netherlands compensated for the decreasing profit from spices and cotton with the import of coffee and tea (Reinhard 2016). Fueled by the advent of the more resilient Robusta coffee plant, different national coffee cultures emerged during industrialization (Morris 2017). Jonathan Morris (2017) links present-day roast type preferences to historical developments. The post–World War II era popularized the "cup of Joe" in the USA, which was served in large volume to complement food consumption. The light roasts predominant in Scandinavia, he speculates, are linked to the persistence of home roasting, which created a desire to reduce wastage. The French roast involved a dark roast to counteract the bitterness of the Robusta bean imported from their colonies. This is similarly true for countries such as the Netherlands and Belgium, which roasted medium-dark. The Italian coffee culture was driven by technological innovations and is distinct through the emergence of espresso, an elite beverage at the time, and the crema layer.

Rather than a collective national coffee culture, postmodern consumers "use coffee as a prop for the expression of individual personality" (Morris 2017, 487). Herein, however, Morris identifies a quest for authenticity which spurs a narrative that "present[s] a shift away from drinking commodity coffee as not so much a break with, as a reconnection to, the routines, rituals, and meanings that were manufactured around coffee consumption in the past" (2017, 488). Local coffee roasting is now part of a wider set of practices that harness a certain discontent with standardized mass consumption and transform it into both a subculture and an element of the creative industries. Coffee culture was part of a broader trend in consumer products that demanded more transparency regarding the resources, production lines, and sometimes the work conditions used. Like microbreweries, artisanal markets, and urban gardening, it injects local flavor, authenticity, and individualizing taste differences into consumer culture (Reckwitz 2010). Instead of merely returning to a pre-industrial form of coffee roasting,

this process opened many previously inaccessible or black-boxed aspects of coffee making to create craft-based approaches: the roasting, preparing, and even the drinking of coffee became connected to skill, knowledgeability, and distinction.

Until the end of the eighteenth century, craft was largely understood in terms of replication and "variation from norm was seen as a mark of poor quality" (Adamson 2014, 144). But today, craft is associated with the creative application of skill, experience, and attention to detail. This includes the public performance of "quality." In many branches, the use of (and knowledge about) either old-fashioned, "original" techniques or of state-of-the-art tools and technology highlights the artisanal character of the work. After all, there is nothing that can display the quality and originality of work like a set of exclusive tools. Manual skills and tacit knowledge become visible when they are organized around a set of specialized devices whose selection and pertinent application demand and thus embody depth and breadth of knowledge.

The use of data as a key tool in the craft of coffee roasting—and thus the contribution of coffee roasting to the wider data discourse—gained relevance through the emergence of "specialty coffee," a term used to signal and to technically standardize high quality coffee. Deviating from coffee sold in supermarkets and traditional Italian coffee culture, specialty coffee tends towards a "light" roasting of the beans to create a more complex flavor. Internationally well-known coffee expert and book author Scott Rao states: "The lighter one roasts, the more challenging it is to fully develop the bean centers" (2014, 178–79). Specialty coffee roasting presents itself as a craft combining manual skill, sensual awareness, and the appropriate application of tools and knowledge. As such, it highlights so-called "human" characteristics which are in rhetorical opposition to the "cold rationality" of data: datafication aims at abstraction and its power results from its distant and aggregating objectivity that is markedly different from local, embodied, and qualitatively rich human subjectivity (Peters 2001).

While technical knowledge—following a distinction by Oakeshott—"can be learned from a book," the practical knowledge characterizing craft and skill is "only imparted and acquired" (Oakeshott in Adamson 2014, 63) through repetitive practice. This allows (and requires) one to pay attention to the differences in material qualities and utilize them as a starting point to learn not only how to do things, but also to develop a sense of self and reflect on what we consider to be "good" (Sennett 2008, 8). But as we will see, the skills are practiced, performed, and disciplined through the use of data.

The craft of roasting is impossible without a diligent training of the senses. Controlling the roasting process involves smell (during roasting, the smell of the beans transitions from grass to hay to bread), sight (the color of the beans goes from green to yellow and then cinnamon—but preferably not to the dark brown or even black like industrial roasts), taste (identifying the degree of sweetness and acidity in the roasted beans), and even hearing (the beans make a cracking noise twice during the roasting process). The training of the senses is supported by note-taking (on paper or in spreadsheet software) that connects them with basic measurements: time and temperature of the roasting process. This enforces the quantification and thus commensuration of endless varieties of tastes and smells.

Far from being an individual process, this goes hand in hand with certain standardization of observations and evaluations. Not unlike the scientific communities analyzed by Lorraine Daston (2008), the coffee roaster community, as divulged by our informants, is a "well-trained collective" with shared manners of creating distinctions and identifying entities where the novice would only experience sensual chaos. During coffee tasting ("cupping"), the roasters all use a score sheet from the Specialty Coffee Association to determine the quality by quantifying fourteen different dimensions of their coffee (e.g., fragrance, aftertaste, acidity); international workshops and competitions contribute to the adjustment of individual observations and the acquisition of a collectively shared vocabulary.

Next to developing and partly standardizing the individual senses, a craft also implies careful attention to and knowledge about the raw material one works with—first, the beans, but eventually this extends to the beans' environment and the devices used. For specialty coffee roasting, the aim is to extract the best possible taste out of the particular bean. This triggers interest in using technology that allows roasters to perform their craft with insights into and the ability to manipulate ever more minute details of the process. Such focus on quality, taste differentiation, and technological knowledgeability creates a fertile ground for the application of data that safeguards and communicates high standards but also offers additional and fine-tuned ways of manipulating the object, fostering innovation and creativity.

Expensive devices allow the roasters to measure the moisture and density of the green beans before roasting or to determine the color and thus the "roast degree" of the roasted coffee. Most conspicuously, the entire roasting process is supported by computer software that logs and potentially steers the temperature and duration of coffee roasting. On the one hand, this is just a more efficient and precise way to handle data that before were collected

and noted manually. On the other hand, though, the use of computerized data has a different status symbolically and practically, and it changes the balance between data and sensorial observations. Both the pre-established analogue data practices and the relevance of sensual expertise characterize the "data vernacular" of coffee roasting and trigger an explicit reflection on data and its relation to craft. The next sections discuss 1) how data's promise of efficiency and consistency is taken up in coffee roasting, 2) how the data are embedded in the context of a craft, and 3) how the craft's insistence on the superiority of human senses actively constraints the impact of data.

The Promise of Efficiency and Consistency

Coffee roasting software helps to collect and log data while roasting coffee. What are the specific promises of (digital) data's application in coffee roasting and how does datafication increase the self-identification of roasting as a craft? Scott Rao (2014, 7–8) praises data-logging software as key to "a systematic, objective, evidence based" approach to roasting coffee that sits uneasily with intuitive roasters who celebrate the "feel" for roasting. This fits within larger debates about the relation between craft and technology, between intuition and data-based insights that characterize data discourse far beyond coffee roasting: In many fields, ranging from teaching and journalism to sports or medicine, the tension between (or ideal combination of) holistic human judgment and dissecting quantified analysis remains an ongoing issue. In 1996, Malcom McCullough foresaw a future in which digital craft was possible. Back then, the computer was regarded as a "tool for the mind not the hands" and technology as "order imposed on skill" (1996, 17–21). Adamson (2014, 166) remarks that the promise of completely computer-based craftsmanship foreseen by McCullough has not been realized. While he points to the public perception of craft as an intuitive practice centered on *making* rather than *thinking,* our example of coffee roasting might help to see how digital data get integrated into (partly) analogue craft.

Roasting software such as *Cropster* (market leader) and *Artisan* (open source) offer roasters a curve displaying the temporal development of the temperature. Of relevance for the taste of the coffee are not only the total duration and temperature of the roasting process, but also the time between the different phases of the roasting process. As outlined above, this can be classified through smell, color, or a cracking noise, which all are related to chemical processes like the Maillard reaction or "caramelization." On their

computers, roasters annotate the curve to record the moments when they increase the temperature or airflow. This creates a roasting *profile* that can easily be reproduced.

Additionally, the curve supports the development of pertinent roasting profiles for different beans. When roasters get a new bean, they might first apply the profile of a similar bean. Often, they roast smaller batches with three slightly different profiles to determine which one delivers the best taste and then fine-tune this profile. Thus, it combines the craft-typical attention to each bean (different from industrial coffee roasting) with a data-based form of reproducibility. In line with the interest to increase the aspects one can "craft," the curve enables roasters, as one of our informants put it, to determine not only the destination of your journey (e.g., the darkness of the roasted bean) but to understand and fine-tune the path there.

Peter tells us how the software increases control over the process.[1] Roasting coffee sometimes felt like "steering a large boat": the effect of changing direction is only noticeable later. Coffee roasting is similar in that the effect of adding heat or airflow only becomes apparent with a delay. The Cropster software offers a metric (the "rate of rise") that continuously indicates how quickly the temperature is rising and thus allows for much more subtle and rapid intervention. Mark confirms this; he now mostly looks at the curve rather than the temperature gauge of the roasting machine. Consequently, roasters mostly abstain from taking out sample beans during the process to check color and taste—a process that has the disadvantage of impacting the temperature in the roasting drum.

The rationale for using data in coffee roasting is largely in line with the contemporary data discourse: Digital data promises a certain non-invasive efficiency and consistency compared to the analogue notation of data. At the same time, and of special importance to a self-understanding as craft, the data open new, refined incentives and possibilities for constant experiments with more details becoming accessible through the digital data. It is mostly economic reasons that deter experimentation. The people at *Kaffee* mentioned that it becomes infeasible to find the optimal roasting profile if they get a small batch of very expensive coffee. For both objectives, consistency or experimentation, the digital data are firmly embedded in analogue protocols and human taste and decision making.

Ultimately, coffee roasters are in search of consistency to satisfy customers with good coffee (Schenker and Rothgeb 2017, 265). Consistency is considered the main advantage of the roast curve. It ensures that batches

1 All names of interviewed roasters and their roasteries are pseudonyms.

of the same bean are roasted the same way. As Mark explained, this is also an economic necessity because it guarantees reliable quality without constant experimentation and a lot of waste. It furthermore allows him to monitor his staff, who need to deliver a roast within a certain margin of the benchmark profile.

Digital Data are Embedded in Specific Contexts

The digital data and their visualization in roasting curves change what roasters can manipulate, what they pay attention to, and even how they define the quality of coffee. As long as this figures as a thoughtful, intentional use of a pertinent tool, it is in accordance with the notion of craft. As is well known from other fields, however, measurements with their seemingly objective authority tend to replace other (more sensual) ways of decision-making and shape the values that can be imagined (Beer 2016, 9). Our roasters restrain the looming authority of data through a self-understanding of roasting as a craft. The use of (digital) data is carefully embedded in a context that highlights the persistent relevance of ("analogue") skills for the achievement of quality.

The roasters underlined that, to guarantee consistency, the digital curve needs to be combined with analogue practices before, during, and after roasting. Paul called it "his protocol" several times, which referred to following a systematic and strict procedure. This protocol included how long to heat up the roaster, what he did in between batches, and when to mark the first crack with the software (e.g., when you hear some beans crack or wait for full-fledged cracking). Barry provided a similar reflection, discussing coffee roasting as choreography.

Additionally, the coffee roasters all highlighted the necessity to interpret and constantly adapt the data depending on the circumstances. They discussed the limitations of their tools and especially the sensors. Peter explained how the data-logging software only reads "relative measuring points," whereas the color of the beans is an actual result of energy transmission, an actual value. Two other roasters stated the data are mere representations of "something" happening in the drum. That "something" is specific for each machine, because the data are output from specific thermocouples. The type of sensor, the sensitivity, the positioning, and the number of sensors are different for *every* machine, even of the same type. This means that the data these sensors produce are *entangled* with a specific machine and the particular beans being roasted. Roasters highlight the role of data as a tool

that asks for careful, well-trained application, undermining the equation of data with automation and the objectivity that is dominant in the wider data discourse.

Moreover, the coffee roasters need to get a feel for the machine and how these data are specific to it. They know, for instance, that the drum is colder for the first batch than for consecutive batches. Exemplifying the craft approach to data, Paul explains how he has created different profiles for the first, second, and third roast. Similarly, Barry says that the first batch is always the worst. He compares it to the first pancake. Knowing it is the first batch changes their interpretation of the data output. We witnessed how this interpretation also takes place during roasting, as Paul remarked that he is a bit under the curve line: "Last week it was really a lot colder, which can make a difference in what you see by a degree or two." The readings are thus also influenced by the environment in which they operate (e.g., a hot or cold day). Data can help to cope with such volatility. Measuring the density and moisture of the bean before roasting can, for example, inform the choice of a roasting profile. However, a recurring motif in our interviews was context. This limits the explanatory power and the transferability of metrics. In accordance with the common characteristics of a craft, the insistence on the organic complexity of coffee beans—whose quality changes during the seasons because of temperature and humidity—undermines the authority of data and precludes data from replacing skill.

In the end, the curves and values are not seen as the secret sauce of coffee roasting, because they can be interpreted differently by someone in a different context. Additionally, the specifics of each machine foreclose a "blind" transfer of data from one machine or from one roaster to another. The roasters use both digital and sensory data. The interplay between these showed that digital data are not the holy grail, but that they are firmly embedded in specific contexts and personal tastes and are used in relation to the knowledge and experience roasters accumulate over the years.

Constraining the Role of Digital Data

An emphasis on the inconclusiveness of data was a shared sentiment among all roasters, creating symbolic space within the data discourse that can and needs to be filled with human skills and senses. This can be compared to streaming services like Netflix, where data analytics plays an increasing role in decision making. Here, despite the surrounding rhetoric and hype, the acquisition of a series like *House of Cards* was "a very human decision" (Frey

2021, 108). In their daily practices, roasters develop different strategies to combine the promises of datafication (consistency, multiplication of access points) with the articulation of specific human qualities, thus offering subtle variations on the human versus data semantic that structures contemporary data discourse. Underlining the status of the human–data relationship as a "problematization" rather than a consistent and unanimously shared ideology, roasters position themselves differently toward the relationship between humans and data. Most radically, Amsterdam coffee roaster *Rovers* (whom we did not interview) state on their homepage: "We are craft coffee roasters, there is [*sic*] no computers involved in our coffee roasting profiles, we see, smell and taste our coffees like no other." *Brandmeesters* similarly emphasizes the senses: "Real coffee roasting is not guided by a computer, but by the senses; our eyes, our ears and our nose." Both clearly put craft and computerization in opposition, whereas *Stooker* expresses their entanglement: "But in addition to craftsmen we also see ourselves as researchers. Using new innovations in the coffee world we keep on testing our knowledge and scrutinize our product. So, craftsmanship with a healthy dose of high-tech innovation." *Rum Baba* does the same: "Roasting coffee at *Rum Baba* is a precise and man-operated job, manual work with [*sic*] help of digital technology." Notably, we have not interviewed roasters who promote full automation, but we know of roasters who mostly base the roasting process on the execution of a profile they get with each batch of beans.

Returning to our interlocutors, Peter for example finds there is a danger in working too much with the screen, because it creates distance from the *actual process* of roasting coffee. Discussing fully automatic roasting, Paul states that he does not want the simplified reality captured by the computer. He explains how the senses are important because certain events in the process cannot be recorded automatically. Even though the software can predict the first crack, it is still registered based on a host of indicators: sound, smell, and looking at smoke development. Moreover, the senses are more accurate: "If it doesn't crack, it doesn't crack even if it says 180 degrees." We witnessed how the roasters continuously oscillated between their computer screen and looking at, listening to, and smelling the beans.

At *Roast*, they struggled to explain what they use the data for. Feeling and intuition clearly dominated their work. Repeatedly they answered "intuition" when we asked how they decided to adjust their roasting. They use the curve to get an idea of what aspects they could tweak and less to identify a particular problem.

At *Kaffee*, the unavoidable subjective dimension of the data logging was highlighted, as it is the human who makes the notation of the transition

from grass to hay. An aversion toward too much quantitative standardization was explicitly connected to the social and human characteristics of the specialty coffee circle. Mark wants to keep it "more poetic and less scientific." Significantly, several of the people we spoke to told us that they learned the craft by traveling and meeting people. If data discourse more generally tends to place human and (digital) data in symbolic opposition, the craft of coffee roasting describes itself as so based on social, personal, and sensual human qualities that digital data have a limited role to play.

The complex entanglement of human senses and data in the coffee roasting craft is especially visible in the relation between the taste and the adaptations to the roasting process. Peter remarks, "There is no direct relation between a nice curve and a nice coffee, even though on average the ones with the nice curve are better coffees." Barry, for instance, had an underdeveloped roast with a seemingly perfect curve. A desired change in taste cannot be achieved by a specific intervention in the roasting process.

The personal and sometimes volatile nature of human taste is another reason why some of the roasters doubt the increasing "scientificity" of coffee roasting through datafication. Thomas highlighted that the first cup of coffee of the day always tastes better than the second cup. At *Kaffee*, we heard that a different roast might be more appropriate for coffee with milk. This focus on taste also questions the quantified standardization and the respective protocols. At *Roast*, they highlighted their own taste as the definite guiding principle. They worry that collective taste will develop along predefined criteria through the scoring sheets (which they use as default) and too many rules. The exchange of profiles for them is mostly to get inspiration about radical or surprising alternative approaches or perspectives.

Although one of the roasters mentioned that the curve makes it easier to train new roasters, everyone with whom we spoke emphasized that learning how to roast coffee is best done through an apprenticeship. There are some basic principles, but most skills are learned by doing and experimenting. Barry went through a great deal of trial and error, working his way through hundreds of roasts, reading about roasting, embodying the knowledge. Kevin states that it is about "Doing time on the machine." Paul compared this process to building a reference library through experience: "You cannot write it down, read and then have that. It's different from doing it." Mark similarly spoke of creating a library of tastes.

Roasters use their experience when roasting new coffees. However, as discussed, it is possible to use existing roasting profiles from similar beans, and some of our interviewees mentioned liking roasting new beans by staying within the parameters of their practical knowledge. Relying

on experience alone when roasting coffee could be too expensive, as it is more difficult to reproduce the same taste in all batches. This is where the curve comes in handy. So, while data's role in coffee roasting is constrained through the focus on craft and personal taste, roasters still enact the promise of reproducibility. We see again how data is negotiated: earlier, it was by embedding data in the specific context of the craft, and now through the senses and the experience of the roasters.

Conclusion

In contrast to scientific disciplines and industrial production, specialty coffee roasting is a proudly and publicly displayed craft; the informal conversations at the counter and the homepages of coffeehouses and roasteries all contribute to broader concerns with achieving the appropriate balance of the authenticity of the human senses with the latest, advanced technology. At points, the use of advanced technology, including data, becomes a conspicuous element of craft: it extends the skill set for honing a product, thus performing individuality and creativity. Building on, and combined with, analogue forms of notation, standardization, and commensuration (e.g., taste vocabulary), datafication is here constrained as a tool for increasing human agency. In line with the symbolic opposition between data and humans in the wider data discourse, this impression of human agency, however, can only be sustained through an emphasis on the limitations of data. The organic unpredictability of the bean, the complexity of the roasting process (combining analogue and digital elements with natural ones like the weather), and, most importantly, the individuality of human senses and taste support a radical questioning of data's authority. This leaves ample room for experience, intuition, and other allegedly "human" qualities.

The specific requirements and traditions of embedded practices, like coffee roasting, add a vernacular voice and variation to the seemingly binary data discourse structured by a symbolic opposition between data/datafication and human ways of reasoning and thinking. Contemporary data discourse is far from homogeneous with respect to its conceptualization and evaluation of data. Most characteristically, this data vernacular, the use (and reflection) of data in specific contexts and practices, navigates a certain, intentional use of computerized data with a clear skepticism towards the overreach of data. Between the utopian and dystopian voices of the current data discourse, this might sound like a more "realist" middle ground resulting from vernacular data practices. Instead, however, we suggest understanding

coffee roasting as one of many actualizations of a wider data discourse that comprises different ways of balancing the human versus data distinction emerging from and made plausible by specific practices and contexts.

Our interviews and observations enabled us to consider how coffee roasting uses, enrolls, and appropriates digital tools. We are beyond an essential distinction between analogue and digital; the two are constantly embedded in hybrid situations. In this respect, coffee roasting is part of a broader emergence of "postdigital" practices. Especially in the arts, the label postdigital has been coined to describe aesthetic strategies that intentionally combine analogue and digital techniques to question the assumption of a "digital revolution" and the alleged singularity of all things digital (e.g., Berry and Dieter 2015). Without denying the epistemic and political challenges that result from large scale data traces and their algorithmic ordering, we would argue that the vernacular of coffee roasting—and quite probably other craft-based uses of digital data—offer important insights into the entanglement of human and data, too.

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