Massimo Airoldi

Machine Habitus: Toward a Sociology of Algorithms, Cambridge, Polity Press, 2022, pp. 192

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A lot has been written about algorithms over the past decade. The idea of algorithms as neutral and value-free is being challenged even at a mainstream level, as works like Safiya Noble's *Algorithms of Oppression* (2018) and Shoshana Zuboff's *Surveillance capitalism* (2019) became talking points in places like the White House. At the same time, productions like *The Social Dilemma* (a docudrama released by Netflix in 2020) reached millions of viewers around the world. So why another book on algorithms when critical approaches to digital technology, its potential negative social impact, and the business models of tech companies have flooded academic classrooms, conference hallways, and even pub night conversations? For Airoldi, it all comes down to the (lack of) understanding of both what machine learning systems and what things like social structures are. If all we have left is reproducing approaches to algorithms that keep splitting the world between the order "we" humans inhabit on one side and the technical order on the other, then there is, in fact, not much one could add to the mainstream critique of algorithms or to avoid the fight between *apocalittici* and *integrati*.

That is where Airoldi's *Machine Habitus: toward a sociology of algorithms* comes in handy. In Chapter 1 ("Why not a Sociology of Algorithms?"), Airoldi fully embraces a sociotechnical view of reality, aiming to comprehend "how culture enters the code of algorithmic systems, and how it is shaped by algorithms in turn" (p. 4). Moving away from debates around human-machine interaction centered on concepts like consciousness and intelligence, Airoldi highlights the importance of an agentic notion of sociality to account for machine systems as social agents inhabiting a techno-social structure, something especially true for machine learning systems. But is that all? Recognizing algorithms as social agents is all that is left as a research agenda? If that is the case, then Airoldi came too late to the party as critical algorithm studies contributions have for more than a decade now recognized algorithms as fully integrated within sociotechnical assemblages (e.g., Gillespie 2014). However, there is much more to the book than that. For Airoldi, it is not enough for STS scholars to address human-machine interactions in terms of "sampling bias," "collection methods," or subjective limitations on the part of the agents involved in the technological process (Symons and Alvarado 2016, 5). Sociological and political inquiries of machine systems should also not have to choose between focusing on some sort of soft "technological determinism" on one side and the resistance capabilities of agentic subjects, changing technology from

below, on the other. To understand machines as social agents, we need to consider how machines are socialized and how socialized machines participate in society. For that, Airoldi extends Bourdieu's concept of "habitus" to the study of algorithms and machine learning systems.

In Bourdieu's words, habitus are "systems of durable, transposable dispositions, *structured structures predisposed to function as structuring structures*" (Bourdieu 1977, 72, emphasis added). For Airoldi, the main insight from Bourdieu's theory of habitus is that it allows us to talk about agents and their actions not as a result of deterministic impulses from the "outside" or self-determined. Agents act within habitus in the sense that their actions are structured structures, that is, the result of embodied dispositions from one's environment and social setting, whilst being structuring structures, in the sense of ordering and changing the very social structure they inhabit. Airoldi uses the concept to complicate (in a good way) sociological studies of machine systems. For him, habitus is not just an attribute of humans as we can look at machines through the lenses of habitus. After all, he says, "the code is in the social world, but the social world is in the code" (p. 28). Cultural propensities and social structures are encoded in machine learning systems that, at the same time, shape what these social structures look like. Our techno-social environment is neither the effect of algorithmic oppression nor human achievements (or failures) but a result of the interactions between human habitus and machine habitus.

Airoldi devotes Chapter 2 and 3 to understand the dynamics of the culture in the code and the code in the culture, respectively. The most common answer in critical data studies and STS for the question "where does the culture in the code come from?" (p. 36) would probably be through the cultural biases that come to the machine through design or from the code's creators. An overwhelming amount of works over the past few years have focused on how to solve the problem of cultural biases in the design of technology and create a more inclusive and equal digital environment. That includes scrutinizing the definitions of what the algorithms are supposed to evaluate (e.g., "relevant," "high risk," "meaningful") and also databases, statistical postulates, and methods employed by companies or public agents for algorithms to function. However, for Airoldi, a sociology of algorithms cannot just be a sociology of algorithm creators (or of *deus in machina*), especially with the rise of unsupervised machine learning systems. The role of trainers, for instance, those who advertently or inadvertently "prepare" the data for machine learning systems, has been overlooked. There is more to the sociotechnical analysis of algorithms than looking at companies, economic models, or designers. Following Bourdieu's habitus, Airoldi invites us to look at the specific cultural contexts which give rise to machine habitus, starting with the local and global data contexts for and through which machines operate and make sense of the

world. Like with humans, machines' predispositions and affordances, inherited by design, would interact with the cultural structures through time, producing specific forms of socialization and internalizing culture in different ways. Those specificities would add more complexity to the study of algorithms in fields like STS, for example.

On the other hand, the very cultural structures in which machines are socialized are also shaped by the code. This symbiosis is never symmetric as the interactions always occur between different habitus and cultural propensities. Humans never respond to machinic input with the expected output and vice-versa. In his words, "interaction orders of humans and machines blend within the layered techno-social order of the Internet" (p. 89). Tracing causal relations between algorithms and social world changes will only produce technocratic and fatalist accounts.

Airoldi highlights that interactions between users and machines always occur in peculiar environments (platforms and their business models), which in their turn are always shaped by cultural and economic fields. Both users and machines learn from each other, as even the famous feedback systems, so commonly mentioned in relation to filter bubbles, work both ways. Finally, interactions between users and machines are always crossed by what he terms "informational asymmetry", the fact that the knowledge the user has of the machine functioning is not always the same a machine has of the user, and "cultural alignment," or whether the propensities of socialized machines "match" with the ones of the users (or whether there is a clash between habitus[es]). He proposes a typology of four types of user-machine interactions (which entails reinforcement, co-production, transformation, and disillusionment), a useful theoretical contribution for STS scholars to address the code's relations and influence on culture vice-versa.

In the final two chapters, "Theory of Machine Habitus" (Chapter 4) and "Techno-social reproduction" (Chapter 5), Airoldi seeks to answer the following questions: "what is the extent of machine habitus in comparison to the original "habitus" theorized by Bourdieu? How do different propensities "embodied as habitus and encoded as machine habitus" (p. 110) mediate human life in techno-social fields? What are the effects of the entangled relations between humans and socialized machines over time and what are the global (overall) effects of such relations? For the first one, to understand the differences between machine habitus and the original habitus, it is important to account for the limitations given to machine habitus by its digital infrastructure, namely platforms. As recent STS scholarship has demonstrated (e.g., Helmond 2015), platforms offer particular affordances to machine learning systems, from a variety of levels, including political-economical, that "modulate possibilities of action" (p. 117). Airoldi brings a concept very dear to STS for the second and fourth ques-

tions: that of *entanglement*s. He warns scholars that there is never an interaction between autonomous me and an autonomous machine, but a relation between a set of cultural propensities mediated by an active environment (platform) and different habitus (what he mentioned when referring to cultural alignment). "There is nothing personal in automated music recommendation," for instance, as "things like taste and behaviour are a product of shared social conditions" (p. 121). How the author relates the idea of entanglements and its ontological indistinguishability perspective with other terms he uses, like sociotechnical order or sociotechnical evolution, is nowhere to be found in the book, perhaps a shortcoming not only of the book but of certain STS approaches lacking theoretical rigor when using terms interchangeably.

For the third question, he highlights the importance of another concept dear to STS scholars: boundaries. For him, at least four processes of boundaries happen in techno-social fields over time: boundary differentiation (reinforcing the local culture of social subjects – e.g., filter bubbles), boundary fragmentation (nudging users towards certain behaviors or directions they are not familiar with), boundary mobilization (reinforcing the global scale, collective culture of social subjects – e.g., Google's autocomplete algorithm), and boundary reconfiguration (transforming practices of users with a top-down approach – e.g., algorithmic ranking on Instagram).

The inclusion of these typologies and concepts showcases Airoldi's main objective with the book: to amplify the scope of sociological analysis of machine systems beyond calls to "fix" biases. These strategies aim to "provide researchers interested in the social world with ways to include artificial agents in their analyses, and researchers studying artificial agents with ways to consider them as part of the social world" by means of "investigating machine learning systems as social agents culturally entangled with humans in the context of platformized fields" (p. 149).

All in all, Airoldi provides a powerful reimagination of the study of machine learning systems. Fields like STS and Critical Data Studies have been looking at particular instances of human-machine interaction, such as ethnographies of machine design or even of algorithms *per se* (e.g., Delfanti 2021), studies of user reception and interaction with algorithms, and platform studies investigating the political economy of digital platforms. Airoldi adds to these specific research strategies a solid theoretical background that brings together the most fundamental concerns at play in human-machine interaction. While not disregarding the contribution of critical approaches to algorithms that focus on issues of bias and "incorrect" databases, he offers researchers a chance to investigate such issues "in light of the socio-cultural data contexts behind its formation" (p. 156). However, I wonder how further researchers should take the concept of habitus to address those fundamental concerns. Airoldi himself recognizes limitations in Bourdieu's original concept, even though he avoids spending too

much time addressing criticisms of Bourdieu's formulation, especially how habitus in Bourdieu appears as some sort of a "print" with little possibility of change over time. While machine habitus is a fascinating and useful insight, studying techno-social reproductions and machine socialization can move through different paths as the ones formulated by Bourdieu decades ago.

This book should be of interest to any STS scholar investigating human-machine interactions, in particular to early-career scholars and STS graduate students who want to not only study the impact of machine learning systems on society but also empirically understand the ways in which machines become part of society in the first place and in which users, designers, policymakers, and machines are entangled in techno-social structures.

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