The Eye of the Master: A Social History of Artificial Intelligence

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AI is at the centre of a vast body of research that spans STS, critical theory, cultural studies, philosophy, computer science, engineering, and beyond. Although it may appear as a fashionable and accessible topic, it is in reality hard to tackle, especially because of the number of studies and the diversity of perspectives it generates.

The Eye of the Master situates AI within a robust post-Marxist tradition, employing historical epistemology as its principal analytical framework. It conceptualizes AI as the (provisional) point of arrival of a long historical development of automation technologies. The book is written by Matteo Pasquinelli, professor at the Department of Philosophy and Cultural Heritage at Ca' Foscari, University of Venice. In using historical epistemology, he explicitly challenges the social construction of technology framework, eschewing its standardised concepts of users and relevant social groups, interpretative flexibility, etc. In this regard, the book represents a valuable invitation to integrate with new stimuli or overcome one of the most important frameworks for STS scholars.

Knowledge-making constitutes the book's central object of analysis, described as «a historical and often conflicting process» (p. 234). Pasquinelli explores how knowledge is shaped through labour, and how technological innovations were historically dependent on political drives for fostering the division of labour, as an extraction of collective knowledge. AI is thus positioned within this dialectic of knowledge and labour «as the primary source of the very "intelligence" that AI comes to extract, encode, and commodify» (p. 12). The book is therefore a valid contribution to critical AI studies. The idea of algorithms and AI as socially derived has been extensively explored, particularly in the intersection of algorithms and racism (Benjamin 2020). Another wide range of studies has also examined the role of algorithms in surveillance practices in the capitalist system (following the pivotal book of Zuboff 2019), as well as their capacity for emotional extractivism (Padios 2017). Pasquinelli's contribution to this field lies in his analysis of the epistemic structure of AI, which he links to the techno-economic imperatives driving labour automation.

The book is divided into two parts: the first one is dedicated to the industrial age, the second to the information age. Before those two parts, there is a "stand-alone" first chapter dedicated to the origins of algorithms. Here, Pasquinelli focuses more on sciences rather than

technology (as in the rest of the book). This may represent a potential limitation of the overall framework: the distinct division of the analysis between the scientific and mathematical dimensions of algorithms and their technological implementation within AI. Nonetheless, Pasquinelli's account of algorithms as both forms of mathematical reasoning and historical constructs aligns well with his broader theoretical approach.

In this first chapter, algorithms are treated as cultural techniques, highlighting in this way the role of material practices in the making of symbols. Referencing works such as those of Peter Damerow and Wolfgang Lefèvre, Pasquinelli states that all abstractions operate within material constraints: «speculative process starts with labour that invents tools and technologies which, subsequently, project new ontological dimensions and scientific fields» (p. 39). After this first clarification of the nature of numerical abstractions, the use and development of algorithms follow a classical Marxist interpretation. Started with Hindu numerals around 825 CE, algorithms spread in Europe in the Middle Ages as the best tool to answer calculus needs in mercantilist Europe, until they evolved into nowadays machine learning algorithms. In this large period, we see then two breakthroughs. The first one has been driven by mercantilism and its calculus revolution, from abacus to algorithms, while the second one by industrial capitalism and data analytics techniques. In this latter breakthrough, data from passive information becomes active information: «algorithms for data analytics become dynamic and change their rigid inferential structure to adapt properties of data – usually logical and spatial relations» (p. 47).

As previously noted, the first part of the book is dedicated to the industrial age. Here, the author lays the theoretical foundations of his framework, critically engaging with figures such as Charles Babbage, Adam Smith, and Ada Lovelace. The techno-economic objectives underlying industrial automation are criticized drawing together the Engines inventions and Smith's theories. This is well described referencing Charles Babbage's *On the Economy of Machinery and Manufactures* (1832). While Smith canonised the division of labour to produce profits, Babbage applied it to design machines and (most importantly) to compute the cost of production: dividing production processes into small tasks would make evident the quantity of labour necessary, thereby facilitating the extraction of surplus value from that labour. On the other hand, turning to early socialist authors, the detailed perusal of William Thompson and Thomas Hodgskin's *knowledge theory of labour* is used by Pasquinelli to historically place a long strand of studies about immaterial labour. He demonstrates that already at the start of the XIX century, those two authors affirmed that the most important component of labour, and therefore machines – if we see them as mimicry of labour – is not energy and motion, but knowledge and intelligence. Pasquinelli then reaffirms the notion that knowledge itself is a productive and economic force. While this is nothing new in Marxist and post-Marxist analysis, Pasquinelli's strongest argument is linking XIX century mechanical automation to today's AI. The industrial age marked the beginning of the separation of knowledge from labour, transferring it into machines. Hodgskin's writings had already emphasized that all labour is, at its core, mental labour: the division between hand and thought is more of a construct. For example, to automate driving cars today, a driver has a series of mental operations that need to be broken down to transfer them to algorithms. While the Engines automated hand calculation, artificial networks for pattern recognition did the same for perception and supervision. For Pasquinelli, knowledge is collectively produced and shared, and this collective

knowledge constitutes the core of capital, together with machinery and infrastructures. In this light, automation should always be understood as a capitalisation of collective knowledge, in the hands of those who create the machines: «it is a systematic mechanisation and capitalisation of collective knowledge into new apparatuses, into the datasets, algorithms, and statistical models of machine learning, among other techniques» (p. 94).

The second part of the book is probably of greater interest to STS scholars, as it unfolds the processes he described to nowadays developments in AI and neural networks. It is therefore here that the historical epistemology can be better seen as an overall framework, starting from a point of view already familiar within STS: «machine as a social relation, not a thing» (p. 119). Pasquinelli addresses the notions of autonomy and automation as two opposing political visions in the mid-XX century. According to his account, autonomy was imbued with political and social objectives, as theorized by some of the countercultural and leftist movements of the 1960s and 1970s. Aspirations that were, to some extent, taken up by the field of computer science. Automation, by contrast, is rooted in the theme of self-organization: a conceptual lens used to study both organisms and society across various disciplines from the 1940s, ranging from biology to economics. While this opposition of autonomy/automation is conceptually intriguing, it is only briefly outlined in the book. A broader analysis would be necessary to avoid deterministic interpretations of this duality, as well as a reductionist portrayal of the 1960s-1970s movements – that cannot be enclosed into a single political vision.

The perspective of self-organization in relation to automation receives broader attention in the book, demonstrating its transversality across disciplines. In this regard, Pasquinelli engages in a critical analysis of Hayek's *The Use of Knowledge in Society* (1945) and *The Sensory Order* (1952). In dealing with knowledge, rationality, and mental order, Hayek builds the foundations of his neoliberal theory. In his view, tacit knowledge operates at a supra-conscious level and is therefore superior to the conscious mind. He defined the mind as a creator of models and classifications, and he also speculated about the possibility of translating classification into machines. Still, for him, the model of the physical world could only be distorted and dispersed in translation. The market is conceived as a spontaneous form of self-organisation, where the main problem lies in the use of knowledge as possessed by no one (therefore not negotiable or regulated by the State). Hayek was the first to describe the market as a form of computation – or more precisely, a system of telecommunication, given that computers were not yet a common technology. However, he argued that the complexity of the market would surpass the computational limits of any conceivable calculating apparatus, plus it would be harmful to market autonomy. Ironically, the neoliberal theorist failed to anticipate how capitalism and neoliberal ideologies would make use of artificial neural networks in capitalist economies.

Many of Hayek's arguments are grounded in Gestalt and cybernetics connectionist theories developed during the 1940s and 1950s. The Gestalt and cybernetics controversy is the core of Pasquinelli's analysis of the epistemological roots of neural networks and AI, mainly referring to the battle between connectionist AI over symbolic AI. This controversy can be summarized by the debate around the transformation of an image into a logical construct: when does the image get processed? Directly in the eye "perception", or in the brain "reasoning"? The 1959 paper *What the Frog's Eye Tells the Frog's Brain* put an end to the controversy, setting the basis of today's AI image and pattern recognition within the eye "intelligence". But, as Pasquinelli

elegantly puts it, «they [the cybernetics who won the controversy] projected onto nature forms of self-organisation that were already part of the division of labour and technical organisation of their surrounding society» (p. 154), without understanding the situated knowledge and cultural values of reasoning needed for the image manipulation. As Pasquinelli notes when talking about Rosenblatt's Perceptron, one of the first *classifiers* of images in today's ML taxonomy, it «record *external rules* – that is, social conventions» (p. 234). Image recognition needs to follow societal classifications: the cultural heritage of a given context (our own taxonomies are rooted into our ideas of dichotomies, objects, ideas, etc.). As Simon Schaffer already noted, «[c]laims that certain systems can mimic, or even exhibit, intelligence are sustained by social hierarchies of head and hand. Minds are known because these social conventions are known» (1999). *The Eye of the Master* accounts lie within this path. Information algorithms – Pasquinelli affirms – were designed following the Perceptron logic of self-organisation that derived from connectionism: modelling the brain in solving the paradigm of learning through statistical reasoning.

Connectionism implied the mind «as an intuitive statistician» (p. 229). This concept arose in the aftermath of World War II, and found a good ally in the psychometrics. For Pasquinelli psychometrics aimed to classify "normal" and "abnormal" behaviours. In the midst of the rebellious 1960s and 1970s management and the establishment sought ways to tame the growing wave of workers' struggles. In this account, AI emerged not as a tool for understanding intelligence, but as a tool relying on brute-force approximation and mathematical optimisation for imposing standards and propagating social hierarchies. All of this paved the way for the normalisation of today's statistical view of the world, in which algorithmic governance is the primary tool for capitalist cultures.

Pasquinelli concludes the book with a strong description of algorithmic governance, that may resonate very well with STS readership. This readership is likely to be interested in how the book unfolds the embedded ideas of knowledge and techno-economic interests underlying work automation. Historical epistemology may be a useful framework for giving more depth to political understandings of technology. The book, though, may appear too quick in describing some important aspects of political history and not giving enough space to the complexity of the workers' movements and practices. Practices are, in a way, left outside in framing a picture that stands very well within its own theoretic borders. It would be interesting in seeing if, going into the everyday histories of usages and mediations, that theory would yet stand still.

References

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