

## Conference Paper

# "Brain-mimicking Machine" in Digital Utopias: From Memex to Hypertext and Beyond

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### Abstract

Computer-brain analogies are ubiquitous in contemporary culture. They also have a long and relevant history. Throughout the history of computer development, computers as "brain-mimicking machines" were used as blueprints for computer design, as inspiration for new visionary ideas, as tools of liberation and as ideological construct obscuring actually existing power relations. Today, with the growing disenchantment with the results of digital transformation, we are forced to admit that these analogies often underpin relationships between human and technology that are disempowering and increasingly problematic.

**Keywords:** human-machine symbiosis, augmented reality, memex, hypertext, ideology, Web 2.0, platform capitalism


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Received: 12 February 2019

Accepted: 21 February 2019

Published: 3 March 2020

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Selection and Peer-review under the responsibility of the Man in the world of culture Conference Committee.

## 1. Introduction

"Human as a machine" and "machine as human" analogies have a long and rich cultural history. The use of such metaphors and analogies increased with the pace of the technological progress, and their cultural functions have become increasingly more varied and complex. From La Mettrie's *L'Homme Machine* (1748) to early Soviet experiments in which "a machine becomes a tutor, an object of worship and mimesis" [2], "human-machine" analogy acquired layered of symbolic and practical significance. The use of this analogy in digital computing both followed the previous trends and developed unique characteristic suitable to a computer age.

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## 2. A Brain-mimicking Machine

For obvious reasons, the development of “human–computer” analogy very early on became focused on the “brain–computer” association. Unlike the 19th-century mechanical machinery readily lending itself to comparisons with the body, computers as “thinking” information processing machines were closely associated with the brain and its powers.

Vannevar Bush is generally credited as the originator of the idea of universal “thinking archive” based on associative principles mimicking the “natural” distribution of knowledge and thought processes. In his idea of memex, Bush thought to overcome informational overload and the “artificiality of systems of indexing.” [6, p. 9] He wrote: “The human mind does not work that way. It operates by association. With one item in its grasp, it snaps instantly to the next that is suggested by the association of thoughts, in accordance with some intricate web of trails carried by the cells of the brain.” [Ibid]

Bush, of course, was not the first thinker who grappled with inefficiencies and limitations of the dominant paper-based culture of his time, but he was the first to develop a comprehensive model of a brain-mimicking machine that combined both useful and utopian traits. Memex would be a machine that existed in symbiosis with human mind mimicking general principles of the human brain and influencing it back: “As the human mind moulds the machine, so the machine also ‘remoulds’ the human mind, [remoulding] the trails of the user’s brain, as one lives and works in close interconnection with a machine’.” [1, p. 29]

Echoing 20th-century utopian impulses, Bush even believed that such a machine could be used to improve the humanity in general: by inheriting personal memexes of great minds or by simply using a memex we can evolve better minds: “Can the race thus develop leaders, of such power and intellect, and such forces of conviction, that the world can be saved from its follies?” [1, p. 34]

Bush’s memex was, of course, not digital – it was thoroughly mechanical. [1] However, his main ideas – that we can use technology to create knowledge tools that are more “organic”, that work according to the way our physical brain works – became particularly inspirational with the emergence of a digital computer.

It seems that by the 1960s the development of brain-computer analogy followed the two distinctive trends. The first one was inspired by the cybernetic approach and influenced the emerging computer science: it strove to mimic how the brain works, to “reproduce” the brain through circuits (either in their structure or in their function). As

such, this trend became a precursor of present-day artificial intelligence and neural networks.

The second trend saw an increasingly widespread use of the brain-computer analogy as a metaphor widely applied to different fields and ideas and inspiring a lot of experimentation in the most diverse areas – from structuralist and linguistic theories to poetic visions to self-help tutorials.

In 1960s these two trends intersected within the emerging field of personal computing in two very distinctive and very influential ways. Doug Engelbart and Ted Nelson, the two groundbreaking figures of early computer revolution, represent differing but closely connected approaches to the computer-brain analogy.

Doug Engelbart developed his own theory of technological development based on his understanding on all technology and culture as “augmentation” systems: the systems that are not inherited but “installed” in the brain, as in computer software installation [1, p. 38]. Engelbart believed that humans exist in symbiosis with their technical tools, in what he called an “integrated man-machine relationship”. [1, p. 39] The goal of computer technology was the augmentation of human intellect and creativity and bringing this goal to life required developing and improving our tools.

Importantly, Engelbart did not believe in direct imitation of biological structures: rather, he was convinced of an inherent artificiality of all technology. Since purely “natural” technology does not exist, technological revolution should not be reduced to the imitation of nature. In Engelbart’s view, humans and machines co-exist in constant adjustment loop which is never perfect but could be constantly improved and worked upon. How we use computers is heavily influenced by the tools we use to use them: from physical manipulation of a mouse to the conventions of user interface.

On the other hand, Ted Nelson represents the visionary adherence to the idea of computers as liberators from the limitations of existing culture and technology that was very much a part of 1960s–1970s Zeitgeist. “The prison of paper, enforcing sequence and rectangularity, had been the enemy of authors and editors for thousands of years; now at last we could break free.” [1, p. 70] Nelson’s vision is based on the “either–or” approach: paper-based culture represents the “prison” of mind, while computer-empowered hypertext opens the unfettered and unlimited field of creativity.

Nelson’s fusion of computer-based hypertext with the ideas of liberation and creativity represent an important step in the merging of computer culture with counterculture. [8] The “computer–brain” analogy proved its adaptability to different contexts, zigzagging between the idea of augmentation, i.e. adding something that did not exist before, and an expression of “what is already there”.

### 3. From an Idea to an Ideology

Both Engelbart's and Nelson's projects, despite their differences, were bound to a vision of a human-computer symbiosis that was supposed to augment human cognition, memory and creativity. More importantly, this vision placed such a symbiosis at a level beyond market or political forces, inside a realm of scientific, artistic or personal self-fulfillment. Both projects, therefore, were thoroughly undermined and subverted by the commercialization of the Web.

This subversion can be traced back to as early as 1980s, when Apple developed the first commercially successful graphical user interface. In the subsequent competition with Microsoft, both companies succeeded in establishing and monopolizing user interface conventions. Importantly, during this process the idea of an interface that provides human-computer symbiotic interaction was utilized and transformed in ways that completely undermined the original visions of 1960s and 1970s innovators. Unlike Engelbart's vision, in which interface was supposed to be a meeting place between technically aware user and a machine – a meeting place that, in a constant feedback loop, was meant to empower the user and augment his/her creative and cognitive abilities – the “naturalness” of commercialized graphic interfaces was meant to obscure technology from the user, limiting their options and discouraging exploration. The contradiction between these two approaches was noted at the time and still remains a topic of discussion.

The next stage came during the 2000s with the emergence of Web 2.0 and the beginning of platform capitalism. While ostensibly Web 2.0 celebrated human sociality and the freedom provided by digital technology, in reality the concepts borrowed from 1970s countercultural digital utopia were increasingly used to justify creeping monopolization, surveillance and usurpation of user autonomy. The idea that Web 2.0 was undermining hierarchy, opening up borders and providing ways for more “natural” thinking and knowing were ubiquitous during this period. The growing ease of access meant that now users could be expected to be always “plugged in”, always online – a condition that many believed was a logical step towards the perfect human-computer symbiosis. As has been noted repeatedly, Wikipedia became an exemplary project of this era symbolizing collective brain and collectively produced body of non-hierarchical socially-enabled knowledge. The ideological justification of Web 2.0, which was effectively an extension of Silicon Valley ideology, developed the idea of human-computer symbiosis in ways that legitimized and justified the developing platform monopolies.

Technological platforms seek to become “natural” in ways that has nothing to do with personal empowerment or 1960s-like unfettered creativity. Instead of augmenting human cognition, platform monopolies usurp the more low-level, instinctual regions of the brain in their search to capture user attention and maximize their time on the platforms [4], [5]. The human–machine symbiosis thus becomes a self-undermining condition “by which interaction turns into immersion, autonomy into automaticity, control into compulsion” [3] At the same time, the growing success of neural networks and AI technologies produce increasing anxieties about computers “usurping” human intellectual domain, becoming “smarter” than the humans, undermining what was thought to be the essence of humanity.

The pushback against this trend has been well underway for years now. The criticism is everywhere, in what can be termed a “great disappointment” in the lost utopian expectations of the digital age. As Jaron Lanier wrote in his 2010 manifesto: “People degrade themselves in order to make machines seem smart all the time.” [7, p. 26] This “degradation” is as much a product of socio-economic circumstances as it is a result of computers actually getting better at cognition. Instead of augmenting human intellect, current digital interfaces and algorithms actually dumb us down, are now found everywhere

## 4. Conclusion

Over the course of several decades, “brain-computer” analogy emerged as one of the leading metaphors of our digital age. It has become entrenched in our culture, down to the everyday language in which we refer to our thought processes using computer analogies. We now routinely talk about “uploading”, going offline or becoming plugged in, doing thought processing etc. Despite thus becoming “naturalized”, computer-brain analogies play complex and often contradictory roles in contemporary culture. They can drive innovation, create inspiring visions, provide cognitive tools to better adjust ourselves to the ubiquitous digital technology. Equally though, they can become ideologically-laden constructs that obscure and mystify the workings of technology and of the socio-economic forces that govern our world.

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