Technological evolution (AI): an extension of biological evolution?

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Abstract:

The evolution of intelligent systems leads us to question the status of technology, as well as our own and the historical link we humans have with nature. This is the result of a collaboration between the staff of a robotics laboratory and an anthropological delegation. The fruit of this synergy was the following thesis: intelligent systems have a different mode of intelligence. That is to say, they lack the muscular thinking that is essential in the development of the representation of nature by modern science.

At the end of the investigation, a question was raised: is the technological an extension of the biological? If we take into account the current situation of climate change, which all living organisms are facing today, technological evolution can be seen as an adaptive response. A means of prolonging life.

Keywords: Anthropology; Artificial intelligence; Ethnography; Evolution; Technology

Introduction

Proposing the idea that technology might be an extension of biology is not unprecedented. In *Le dernier qui s'en va éteint la lumière* (2016) and *Défense et illustration du genre humain* (2018), Paul Jorion defends this thesis. The anthropologist emphasizes, drawing on studies of past and present human environments, that the manipulation and creation of tools in the form of designs is a universal constant (JORION 2018). Today, the presence of tools such as robots and artificial intelligence attests that we, representatives of the human species, are technological geniuses. But also that we have created and continue to design unprecedented objects within nature.

This article will deepen this idea of extension based on my analyses and lines of thought. It involves reflecting, among other things, through heuristic comparative points, on the implications of technological evolution being an extension of the biological. The following statements must, of course, be subjected to critical examination. However, the strength of my reasoning lies in the fact that I have observed and collaborated with a team of experienced roboticists and computer scientists.

First, I will present the field, methodology, and materials. Then, I will defend the central thesis of my fieldwork: intelligent systems have a mode of intelligence different from ours. And I will conclude by contextualizing intelligent systems within the current ecological and political landscape.

Field, Methodology, and Materials

In 2016, as part of a master's degree in anthropology, the heads of the robotics laboratory at the Institute of Intelligent Systems and Robotics (ISIR), affiliated with Pierre and Marie Curie University in Paris, accredited me as an external observer. Over three months, I spent approximately 300 hours and conducted 32 interviews with roboticists, engineers, computer scientists, mechanics, doctors... cautious and attentive researchers engaged in work in neuroscience and psychology, as well as biology and physics. And one thing first piqued my curiosity, then my attention: conversations related to the creation of an intelligent system often turned into a glossing activity, giving rise to societal, ethical, philosophical, and metaphysical questions. "What place should robots occupy in society?", "Should we plan for robot rights?", "Will robots become more intelligent than us?", "How to combat the bureaucracy of appearances, that is, how to explain to the general public the internal workings of a complex machine playing on our affects and anthropomorphic reflexes?", "What is an intelligent system?", "What does it mean to be human today?", etc. Behind this influx of questions and issues, a common concern manifested among ISIR researchers: the fear that the boundary between human and machine would become blurred, in other words, that the distinction between a living being and a technological entity deemed intelligent would become porous. Added to this apprehension is an aporia, fueling passionate debates within the scientific community and intellectual gatherings: I am, of course, referring to the definition of "artificial intelligence" (I will return to this below).

To problematize this social phenomenon and attempt to provide some answers, I presented the laboratory technicians with a mirror of emic concerns, so they could respond to my research question, akin to a delegation. From there, we began to reflect together on what constitutes the specificity of an intelligent system. And one day, an interviewee uttered this sentence, which was a turning point in the investigation's direction: "A robot is not a reproduction of the living, but an inspiration from the living." This implied that intelligent systems come from us, speak of us, but are different from us. Later, a third party stated: "There is a qualitative difference between us and intelligent systems," meaning that the technological is irreducible to the biological. In short, to think about and situate the technological, it appeared necessary to make a qualitative leap to develop a new paradigm.

The history of science contains similar periods of questioning. For example, in biology. In the 19th century, Jean-Baptiste de Lamarck (1744-1829) asked the question "What is a living being?", driven by the desire to understand what distinguished living beings from inanimate objects (LAMARCK 1999). Lamarck sensed that modern physics alone would be insufficient to explain the logic of life. Hence the need to found biology and build its own epistemology (LAMARCK 2018). Very briefly, Lamarck described the living as organized, organic, autocatalytic bodies, that is, bodies generating their own conditions of development. Hegel, Lamarck's contemporary, for his part, examined the specificity of objects constituting the universe. He wrote in *Philosophy of Nature*, Volume II of his Encyclopedia of Philosophical Sciences: in the physical realm, bodies are indifferent; in the chemical, bodies attract or repel; in the biological, bodies anticipate their own behavior as well as that of others (HEGEL 2004). I propose here, in a way, to repeat Lamarck's approach, not by comparing and distinguishing, like him, the biological from the physical, but the technological and the human, to reflect on the question "What is an intelligent system?". Then we will complete Hegel's sequence with the introduction of technological bodies within nature.

Discussion

Before beginning the comparison between intelligent systems and humans, it is first useful to briefly examine the expression "artificial intelligence" within the context of the investigation.

Any attempt to provide a definition among ISIR actors encountered reluctance or hesitation – due to the noun "intelligence," a notion deemed too sibylline and multivocal. However, the analysis of interviews reveals a social definition of artificial intelligence. "Artificial intelligence" refers to any progress not yet achieved and not categorized within external categories (digital, for example). Artificial intelligence is ultimately a dynamic and utopian expression. It concerns what has not yet happened or what is held as fanciful, in other words, impossible to achieve. During interviews, the interviewees and I preferred the expression "intelligent system" as it designates more concrete objects and processes, despite the indistinct adjective "intelligent."

Now, let us unfold the central idea, supported by my ethnographic results.

At the outset of the investigation, I thought the fundamental difference between humans and an intelligent system lay in language. However, I became skeptical of this perspective. I changed my mind. Intelligent systems do indeed have the capacity to create concepts (e.g., *deep learning* from images of the same object). Or further: the ability to assign functional meaning to material objects. How? By interacting with them through learning capabilities. I then asked the following question: "Can an intelligent system understand a metaphysical concept? Can it grasp the representation of a thing lacking proven materiality?" (Brooks 1991). Roboticists told me they did not see how an intelligent system could accomplish this.

I therefore questioned this capacity for abstraction, for imagination that we practice: "Where does it come from? What makes this capacity possible?" Upon rereading my field notebooks, a number of interviewees insisted on a specific point. This point was that machines possess a non-sentient body; they cannot (re)feel, strictly speaking. Thus, I linked the incapacity for abstraction to the non-sentience of a technological entity's body. And if we consider this thesis valid, then the fundamental difference between us and intelligent systems is the body. The implications are, according to my observations and exchanges with ISIR researchers, a variation in the way of reasoning. I defend the position that intelligent systems lack muscular thinking. Among other things, a mode of intelligence different from ours.

The concept of muscular thinking is a reference to Albert Einstein (1879-1955). In a letter to mathematician Jacques Hadamard, Einstein recounts that in November 1907 he performed a thought experiment in his office that later led him to develop the theory of general relativity in 1915 (Einstein et al. 1989). What does Einstein do? The physicist stages his own body in free fall and wonders what his body would feel in such a situation. His conclusion: during the fall, we do not feel our own weight. What is important to note here is the verb "to feel." Can a robot do that? Can "embodied" software retrieve the equations of general relativity theory through this process? Everything suggests not. It is likely that the origin of certain theories explaining reality comes from mental experiments, made possible by the sensitivity of our bodies. For a non-sentient body, incapable of performing this kind of mental staging, the consequence, if we push this reasoning, is that its perception is confined to the immanence of the physical world. The world of a technological entity would thus be limited to the perception of the material objects it has. Conversely, a human being can imagine other worlds and resort to non-visible, even invisible, realities, real or not, to explain the world in which they live and are situated. Wittgenstein wrote: "The limits of my language mean the limits of my world" (Wittgenstein 2001), I would reformulate this aphorism, saying: "The limits of my language and my body are the limits of my world." Because language depends on a body. Consequently, a sentient body endowed with language can undoubtedly perform thought actions that a non-sentient body cannot, such as staging its own body and world.

If we consider the idea defended so far as valid, there is one case worth examining: the representation of nature operated by modern science. Works like *The Assayer* (1623) and *The Nature of the Physical Reality* (1950) are important for understanding the foundation and epistemological framework of modern physics. Galileo declares, for example, in *The Assayer*, that mathematics is the language of the universe (Chauvière 1980). However, relying on Henry Margenau's thought, we are also confronted with a representation staging an abstract (mathematical) reality situated between the sensible world – the reality we perceive and often deem deceptive – and the world of things as they truly are, but to which we have no direct access. This representation rests on the principle of causality. A principle emphasized by modern science (Jorion 2009). According to the implication of my results, an intelligent system is incapable of having this representation of nature and, consequently, can bypass the principle of causality. The question we can then ask is how an intelligent system establishes an explanatory reasoning or a general law, if slipping layers of abstract realities onto the sensible reality is impossible for it? According to my dialectical interviews at ISIR, it does so based on the correlation of phenomena. Software needs to collect and analyze data to be able to explain, provided that past phenomena resemble present ones. This is optional for a human being – if we refer to the Einstein case supported above – who can dispense with "objective" empirical data through the practice of mental experiments, based on sensitivity and bodily experience.

Henceforth, let us address the part devoted to technological evolution in relation to biological evolution.

At the end of my stay at ISIR, the omnipresence of active robots, of mechatronic bodies under construction or deconstruction on display, led me to see in these entities our descendants, born of human genius. It was during an exchange with the laboratory director, Raja Chatila, while we were trying to identify the fundamentals and major principles on which a human being and a robot differ, that he stated: "For me, the human is purely physico-chemical inside." This gave me an idea. I played the evolution card and reasoned as follows: if the physical engendered the chemical, which in turn engendered the biological, then the human species, representative of the biological, engendered the technological. This reasoning matched the logic of the discourses I heard here and there ("qualitative difference," "they come from us but are not us"). This induction nevertheless renders the term "artificial" obsolete. If we indeed consider technological evolution as the extension of the biological, we can no longer speak of "artificial" intelligence since we would imply that it lies outside nature. However, my perspective led me to see intelligent systems not as mere tools intended to satisfy economic, social, cultural, or scientific needs, but as a new kind of entity participating in and belonging to our world. And, in this paradigm, we can complete Hegel's sequence.

Here is Hegel's sequence completed by a restricted proposition:

- In the physical, bodies are indifferent;
- In the chemical, bodies attract or repel;
- In the biological, bodies anticipate their own behavior as well as that of others;

  Note: The anticipation of behaviors is undoubtedly made possible, at least in part, by somesthesia (sensitivity of the biological body) which develops an intuitive physics in living beings[1].

- In the technological, bodies are modulable, can connect, and mimic the other types of bodies.

Why a "restricted proposition"? Because depending on the selected scope, it is refutable. If we expand the scope to include all known tools, including the most rudimentary, difficulties arise. Should we distinguish between "technical objects" and "technological objects" (endowed with a certain degree of autonomy)? The question remains open. We can at least agree on the following proposition: all primarily respond to the satisfaction of a need.

Another limitation: a technological intelligence can use multi-dimensional mathematical models to apprehend the physical world. Would a multi-dimensional framework (let's take the number 17 here) prove the possibility of a form of abstraction capability in a technological intelligence? In other words, the possibility of surpassing the immanence of the physical world by adding dimensions – are mathematical models partly speculative? Or would its perception remain immanent but more advanced than ours: a four-dimensional framework based on the perception offered by our sensory toolkit? This differential would appear abstract to us given that it would be difficult for us to imagine 13 additional dimensions. The addition of dimensions would furthermore lead to the retreat, or even disappearance, of the illusion of non-determinism in physical processes, as defended by René Thom (POMIAN & AMSTERDAMSKI 1990). Finally, doesn't the use of computer simu-

1 This addition is personal. Hegel does not put forward this assumption.

lation have something to do with a mental experiment staging the world or a certain conception of the world? A technological body can call upon a simulation to calculate the probability or improbability of an event, then adopt a behavior accordingly.

Technological Evolution in Light of the Ecological and Political Context

In 2018, NASA (National Aeronautics and Space Administration), the US government agency responsible for the civilian space program, adopted, with the support of the US Congress, a new approach to detect intelligent extraterrestrial life[2] : the search for "technosignatures" (radio emissions, laser emissions, orbital structures, atmospheres containing pollutants[3]). In other words, the detection of technological objects becomes an indicator of a possible advanced extraterrestrial civilization. Or evidence of a vanished civilization.

Today, the human species is on a slippery slope. Numerous scientific reports (Ripple et al. 2017) and organizations like the United Nations are sounding the alarm[4]. Alarming events are occurring: climate disruption, the carrying capacity of our environment to support us as a colonizing species, a significant disappearance of living species (Sánchez-Bayo & Wyckhuys 2019), a critical concentration of wealth (Jorion 2016), the rise of resentment and nationalism, acts of war and political interference, the absence of major citizen demands within decision-making bodies in representative democracy (Gilens & Page 2014), a military arsenal capable of annihilating a considerable number of lives. Perhaps technological evolution is an adaptive response to an extinction danger that we feel and are beginning to become aware of. Perhaps the advent of relatively autonomous intelligent systems is not accidental. Perhaps it is a means of prolonging activity on Earth. As anthropologist Paul Jorion notes, a ruse of reason may be concealed through our behaviors, which our discourses try to rationalize after the fact within a framework of representations sometimes distant from the actual ongoing processes (Jorion 2018). Perhaps the human species is passing the baton to a more robust offspring, better suited to live in a polluted, resource-depleted, hot environment where drinking water, assimilable food, and clean air will be compromised. Or perhaps we are preparing for another

2 *On September 26, 27, and 28, 2018, at the Lunar and Planetary Institute in Houston, NASA organized the "NASA Technosignatures Workshop" symposium, aiming to present and reflect on this new technosignature detection strategy.*

3 Cf. Joël Ignasse's article "La technosignature ou comment chercher la vie extraterrestre," published on the Sciences et Avenir website in September 2018: https://www.sciencesetavenir.fr/espace/univers/la-technosignature-ou-comment-chercher-la-vie-extraterrestre_128007 [accessed: 30/09/2019].

4 Read the IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) report published in May 2019, "Press Release: Nature's Dangerous Decline: 'Unprecedented' Species Extinction Rates Accelerating": https://www.ipbes.net/news/Media-Release-Global-Assessment-Fr [accessed: 25/07/2019].

path, that of reforming nature by becoming technological bodies ourselves – the transhumanist movement – not primarily aiming to "enhance" ourselves as some transhumanist voices propose[5], but rather to survive in a degraded environment with an alternative body, less and less sensitive, less and less biological. Given current events, this hypothesis is conceivable.

Conclusion

The analysis and reflections based on my ethnography invite a general reconsideration of the perspective on the evolution of intelligent systems. On one hand, regarding their commonly underestimated learning capacities. On the other hand, concerning the singularity of their mode of intelligence. Furthermore, the natural/artificial dichotomy must be relativized if technology is indeed the extension of biology.

On this point, we can question the reluctance or irritation encountered when removing technology from the realm of the artificial, at ISIR in particular and in the West in general. Two sources may be the cause, likely transmitted by an unconscious cultural lineage: Genesis (Old Testament) and the myth of Prometheus. In the Bible's first book, knowledge, represented by the apple, is a threat and causes the fall of Adam and Eve, condemned to leave Eden, the place of innocence, primitive simplicities, and blissful happiness. In ancient Greece, the titan Prometheus suffered divine punishment after secretly giving technique to men. These two myths maintain a negative relationship with progress (scientific and technical), in other words, with the artificial. Nature must not be disrupted, in short.

Anthropology presents itself here as an exercise in detachment from its origins and an opportunity to develop a sensitivity to the scale of events. Technological evolution is an anthropological phenomenon of particular interest. Its evolution poses two questions: "Who are we?" and "What are we?". The first question highlights cultural singularities; the second, the traits of our species as a whole throughout its evolutionary history.

To conclude, what about consciousness within this reflection? Psychologist Benjamin Libet demonstrated through a series of experiments that spontaneous decisions in human subjects are unconscious (LIBET et al. 1983)[6]. of the action; it is an after-the-fact evaluation. In short, the body is

5 *Aubrey de Grey, for example.*

6 Libet's methodology involved attaching electrodes to the participant's scalp, then asking them to sit facing an oscilloscope and perform a simple motor activity, like pressing a button within a certain timeframe, but with no frequency limit. The participant had to note the position of a dot on the oscilloscope when they had the intention to perform their action. Simultaneously, pressing the button also electronically recorded the dot's position on the

the seat of will. Consciousness appears more as a by-product of the body, an epiphenomenon of brain activity (Wegner 2002)[7]. Anthropologist Paul Jorion argues in *Principes des systèmes intelligents* that consciousness is dispensable in the emergence of thought (JORION 2012). Language and affect are its foundations (ibid.). Consciousness would rather be "the product of a mechanism synchronizing information from the various sensors that are our sense organs" (JORION 2018: 313), whose function would be deliberation enabling the long-term planning of goals "that will constitute the 'final cause' of our actions: the objective to be achieved" (Ibid.: 311). In summary, the body decides and consciousness anchors the realization over time through representation. My reflection extends the results of Libet (all our spontaneous decisions are unconscious) and those of Jorion (thought emerges from language and affect): the capacity for abstraction is possible because our body, the seat of will, is sentient. Combined with language, ceaselessly traversed by a dynamic of affect, this potential becomes muscular thinking. But the role of consciousness may be more important than Jorion assumes. Indeed, if the unconscious (the body) is the seat of will, consciousness (imagination) can launch the body's sensitivity into the search and arrangement of ideas for explanatory purposes.

oscilloscope. The key element remains the results recorded by the electrodes: the electroencephalograph shows that any "conscious initiative" is preceded by targeted unconscious brain activity. A gap of about half a second was recorded. In 2008, the gap between the "conscious initiative," on one hand, and the brain activity responsible for the requested action, on the other, could be up to 10 seconds. The result of a decision was located in the prefrontal and parietal cortex (cf. SOON C. S., BRASS M., HEINZE H.-J., 2008, Unconscious determinants of free decisions in the human brain, Nature neuroscience, 11(5), p. 543-545).

7 *Programming consciousness in artificial intelligence thus appears futile. Indeed, if consciousness is a by-product of the body, an epiphenomenon in the history of life's evolution, it suffices to program the necessary principle(s) on which it rests in order to make it emerge.*

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