

## TECHNOLOGICAL ACCELERATION AND THE ROLE OF ART IN PREDICTING THE AFTERMATH OF SINGULARITY

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### Abstract

The technological advance of the last decades leads us to imagine a future where technological systems and artificial intelligence (AI) physically and intellectually surpass human intelligence (IH) reaching, in fact, to be able to improve itself without the need for human intervention. From the possibility of the emergence of Cyborgs, Post Humans, and the arrival of what experts have called Technological Singularity, we must allow ourselves to reflect on these concepts in order to analyse the possible effects, the results that this rapid technological advance could lead us to, and the possible consequences that a hard superintelligence would bring with it. The study tries to probe the scope of Singularity and its fundamental aspect, the alteration of the technological ecology: the strong pace of innovation would continuously transform the world and the human being itself, making the forecasting effort extremely difficult. It presents definitions of singularity according to its main figures: Von Neumann, I. J. Good, Vernor Vinge, and Ray Kurzweil. It revolves around the idea that the technological acceleration will continue to state that humanity couldn't control. In this case AI will surpass the human abilities. It also unfolds the role of art in predicting the aftermaths of Singularity. Since the scientists are not sure about the result after Singularity, the role of imagination becomes the proper tool for exploring the technologized future.

**Key words:** Singularity, Technological Acceleration, Science Fiction, Vernor Vinge, and Ray Kurzweil.

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## Introduction

The topic of technological acceleration is present in all science (and fiction) books; it is part of the mystique of technology and, above all, of the idea of progress. Every major technological innovation brings with it announcements of a kind of general solution to humanity's problems and hopes.

The accelerated technological advance has placed several scientists, specialists and writers from different areas in the position of imagining what the future will be like given what exists today in technological matters. The extrapolation of industrial and social behaviour in information systems, perhaps the most effective method of prospecting, has allowed us to imagine a moment in which it will be possible to create an autonomous and hybrid technological system that equals human intelligence given the information processing capabilities that match the capabilities of our biological brain. This point, however, would not be the limit of development, from then on machines with intelligent capabilities, capable of replicating in extremely short times compared to biological entities, could begin to improve iteratively in a kind of evolution. This, according to the authors who support this theory, would lead to machines with intelligence capabilities beyond the human, and therefore beyond biological intelligence.

The pace of innovation growth, on the other hand, has only to continue to evolve in the same way, until a supermachine is developed capable of further accelerating the pace of innovation (perhaps even creating an even smarter machine, dramatically increasing the amount of intelligence available on Earth), reaching the point of explosive feedback where the dynamics and complexity of knowledge and technology would be outside the human sphere. That pivotal and unpredictable point is the Singularity.

Although natural selection has made human beings different and enormous from all other organisms, this field also has its own limitations. Regardless of his efforts and achievements, a person cannot go beyond his biological limits. At the dawn of the singularity these limits will no longer be valid. Man has begun to transcend these limits and instead aims to reveal his own design, leaving behind the laws of natural selection. Singularity refers to a period in which the great acceleration and geometrical development seen in technology underwent a transformation that one cannot even imagine. For example, imagine that the work of a brain-computer interface, which allows a computer to read electrical signals from the human brain and transmits electrical signals to the brain at the same time, reaches the desired level. Such interfaces can connect the brain directly to the ocean of information on the internet, or it can also connect many brains to each other and establish a kind of brain network. If an artificial intelligence is equivalent the human mind is developed, if they tend to improve themselves and develop continuously, how will this result? It is not possible for us to understand or predict the philosophical, psychological or political effects of such situations at the moment. Even if we cannot answer such questions with our current knowledge, it is an important issue to be able to grasp what a singularity is.

This paper presents the definition that Vernor Vinge, who coined the term and integrated the ideas of several other writers and technologists to deliver the concept of technological singularity, as a simile of the singularity in astrophysics, where space is made infinitely elastic and compressed in the same way. At the same time, this review is also based on the texts of Ray Kurzweil, who is today the greatest promoter of the concept of singularity, to provide a general overview of what technological singularity is, review that beyond developmentalist optimism there are risks and know the arguments for and against the mere possibility that an event of such magnitude could happen at some point, and in particular when the main theorists indicate that it will be within the first half of the 21<sup>st</sup> century.

## Singularity

The concept of singularity can be defined as a situation where artificial intelligence is predicted to cause a geometric growth in its own intelligence, if it has the ability to develop and advance itself. Ray Kurzweil defines it as “the point, resulting from ever-accelerating technological progress, when a sufficient threshold of self-evolving artificial intelligence is reached to result in a superintelligence beyond human conception.”( wiktionary.org)

The expression of singularity was used for the first time in the sense of technological singularity by the Hungarian-American mathematician and computer scientist John von Neumann, who is seen as the founder of today’s computer architecture “The ever accelerating progress of technology ... gives the appearance of approaching some essential singularity in the history of the race beyond which human affairs, as we know them, could not continue.” (Ulam, 1958. P.5). With this statement, Neumann said that the ever-accelerating progress of technology appears to be approaching a kind of fundamental singularity in the history of species, in which social life cannot continue as we know it. Neumann made two important observations here: acceleration and singularity. The first thought is that human development does not grow linearly, that is, by constantly adding up with a constant, but geometrically, that is, constantly multiplying by a constant. The second is that geometric growth cannot be resisted. It starts out slowly, almost imperceptibly, but becomes explosive and profoundly transformative beyond the bent elbow. At this singularity point, technology will develop and become more complex at an incredible rate.

Although Irving John Good did not use the word singularity, but he refers to it implicitly in his monograph *Speculations Concerning the First Ultraintelligent Machine*:

Let an ultraintelligent machine be defined as a machine that can far surpass all the intellectual activities of any man however clever. Since the design of machines is one of these intellectual activities, an ultraintelligent machine could design even better machines; there would then unquestionably be an “intelligence explosion,” and the intelligence of man would be left far behind. Thus the first ultraintelligent machine is the last invention that man need ever make. (Good, 1966. pp.2-3).

The super-intelligent machine that Good defines in his article is as follows: let's define a gifted machine as one that can go far beyond the mental activities of a human, no matter how intelligent. Since the design of machines is one of these mental activities, this highly intelligent machine will be able to design much better machines, and then an inevitable “intelligence explosion” will occur, and human intelligence will lag far behind. In other words, the last invention that man should make is the first gifted machine he will make.

Vernor Vinge was the one who introduced the concept of singularity to the literature as it is used today. He was influenced by Good. What Good referred to as the burst of intelligence, Vinge called the singularity:

We will soon create intelligences greater than our own. When this happens, human history will have reached a kind of singularity, an intellectual transition as impenetrable as the knotted space-time at the center of a black hole, and the world will pass far beyond our understanding. ( Vinge.1983.para.2)

Vinge said that we will soon create intelligences that can surpass our own intelligence and that when this situation arises, human history will reach a kind of singularity. The singularity he is talking about here is a reference to the singularity used in physics. Based on this, Vinge said in another article he wrote in 1993 that in 30 years we will have a technology with which we can create intelligence that can exceed human intelligence, and we can call this situation a singularity. Because he claimed that if this happens, the existing models will be invalid and the new reality will impose its own rules. He added that following the situation,

great surprises and unknowns await us. “Just so I'm not guilty of a relative-time ambiguity, let me more specific: I'll be surprised if this event occurs before 2005 or after 2030.”(Vinge, 1993. p.2).

Technology becomes completely autonomous, and starts to access a different evolutionary branch, creating uncertainty about its positive or negative quality. The singularity would be, in a minimal definition, the moment from which it would no longer be possible to make predictions about the future development of society. According to Vinge, such a stage would occur after a growing integration of human and artificial intelligence, so that it would no longer make sense to think about the human without the computer – or another type of fundamental technology –, until reaching the point where an entity capable of surpass the cognitive abilities of the pair that preceded him. A supercomputer – or “super-network” - or transhuman entity of this type would necessarily be a leader for human beings, as it would supplant us and remove us from the main stage of the history of evolution. The doubt lies in your intention to lead and do beneficence to your evolutionary ancestor “it marks the end of the dominance of biological humans and the beginning of the age of robots.” (Moravec, 1998. p.131).

Hans Moravec in his book *Robot: Mere Machine to Transcendent Mind* describes the robots of the 2040s as our evolved heirs and machines that will “grow out of us, learn our skills, share our goals and values, and become the children of our minds”. (Moravec, 1998. p.126). It postulates that the creation of an intelligence that surpasses the human is possible and desirable; moreover, it argues that this type of superintelligence could possess moral qualities, being more constant in its moral attitude than the human being. All it would depend on programming: “It seems that the best way to ensure that superintelligence will have a beneficial impact on the world is to endow it with philanthropic values”(Bostrom,2003a. p.5).

Ray Kurzweil (2005), who is the pioneer of the singularity today, in his book *The Singularity Is Near. When Humans Transcend Biology*, defines the singularity is a future period in which the rate of technological change will be so high that it will irreversibly transform human life and the effects of change will deepen. This is a phase that will transform the concepts we rely on to make our lives meaningful, from our business models to the human life cycle and even death. The Singularity will represent the culmination of the unification of our biological thinking and being with our technology, resulting in a world that is still human but goes beyond our biological roots. After the singularity, there will be no distinction between human and machine, or physical and virtual reality. When wondering what would remain unquestionably human in such a world, Kurzweil adds that there is only one quality, and it is the desire to expand the physical and mental range, which is unique to our species, beyond current constraints.

The fundamental aspect of the Singularity is the alteration of the technological ecology: the strong pace of innovation would continuously transform the world and the human being itself, making the forecasting effort useless (or extremely difficult). The emergence of super-intelligence would make the world and technology infinitely more complex. The feedback mechanism between super-intelligence and the techno-scientific resources it could produce would be as unstoppable as the current flow of novelties and it would be much faster. When we come across enthusiastic speeches about how nanotechnology, or biotechnology, will change our world as cornucopias of resources and products, we are only witnessing exercises in the imagination, which try to envision what is possible to do with current ideas under development. Potentially, computers could overtake the human brain soon. The evolution of these systems has gone in the direction of increasing efficiency and complexity, which makes them as pervasive as they are indispensable. That is why a qualitative leap here is strategic for the future of societies.

## Existential Risk

By definition, the world after the occurrence of the singularity is unpredictable, but the possibilities for technological development would be infinite. The term used by Yudkowsky is “apotheosis”:

The Singularity holds out the possibility of winning the Grand Prize, the true Utopia, the best-of-all-possible-worlds - not just freedom from pain and stress or a sterile round of endless physical pleasures, but the prospect of endless growth for every human being - growth in mind, in intelligence, in strength of personality; life without bound, without end; experiencing everything we've dreamed of experiencing, becoming everything we've ever dreamed of being; not for a billion years, or ten-to-the-billionth years, but forever... or perhaps embarking together on some still greater adventure of which we cannot even conceive. That's the Apotheosis. (Yudkowsky.2001. p.3-4).

We can barely find a more prominent enthusiasm of the singularity than Yudkowsky. However, as part of the transhumanist movement, singularitarianism fits well with the attempt to define Man's new creations as a step forward in evolution, which would leave behind the purely wetware (human's brain) we know, to replace it with a creature integrated into a world defined by the technology it created, in which it would be possible instant universal communication between all intelligent entities – participation in a super-entity of pure knowledge. The great hope, so to speak, is to offer human beings the possibility of transcending themselves intellectually, physically and psychologically by artificial means, expanding the spectrum of available modes of existence towards the properly posthuman.

From a cybernetics point of view, the loss of control implicit in the singularity is inevitable; thus, Yudkowsky's position, according to which the symbiosis between man and machine would reach a perfect point, is more in line with our own perception of technological evolution, integrating it with a necessary anthropological perspective. For cybernetics, the Global Brain is a more plausible alternative, resulting from the integration of increasingly sophisticated and useful systems for human beings. Although not autonomous, such systems could have non-negligible autopoietic properties, being undoubtedly valuable aids in dealing with complexity, but being themselves extremely complex. Between the alternatives of a “beneficial” unpredictability and the darkest dystopias, however, it is possible to ask questions about the risks posed by such advanced technologies.

First of all, we can use the following definition of existential risk, by Nick Bostrom:

One where an adverse outcome would either annihilate Earth-originating intelligent life or permanently and drastically curtail its potential. An existential risk is one where humankind as a whole is imperiled. Existential disasters have major adverse consequences for the course of human civilization for all time to come. (Bostrom.2001. p. 1-2)

The idea of risk, and above all existential risk, is related to the need for decision (political, economic, technological and ethical) on issues that involve a great degree of uncertainty and the possibility of destroying human life. Thus, an event like the Singularity could certainly fit into this category, as it, by definition, has uncertain outcomes – or rather, creates unpredictable destabilizing dynamics – and possibilities for negative evolution. When the open options involve too strong negative consequences and a decision is inevitable, it is essential to preserve the integrity of the species, while limiting its unknown possibilities of evolution.

It is necessary, however, to distinguish existential risks from global risks, such as (moderate) global warming, conventional warfare or moderately contagious epidemics; in this case, although the pressure is sufficiently strong enough to demand a global response, there is no such strong risk. although it is obvious that this type of problem requires comprehensive



solutions, as in the case of current problem of global warming, it is not to be expected wide enough to jeopardize the survival of the species.

A super-intelligence, as predicted in Vinge's classic text, is an existential risk. It is not, however, the first existential risk of a technological nature. It is obvious that, for example, a nuclear war would have the potential to drastically alter the Earth's climate and thus endanger human life, such as pandemics caused by artificial bacteria and viruses (genetic engineering). The technological dimension of this problem clearly illustrates the need for an ethical and global reflection on the difficulties posed by the balance of risks. The challenge becomes more pressing with the emergence of technologies that are as pervasive as they are unpredictable. Even if nuclear war were not globally lethal, we know that this is a strong possibility, and it would not be wise to risk it. Similarly, the Singularity, by definition the source of the greatest uncertainty, poses the problem of whether any of its various possible forms are acceptable.

One of the concepts that arise is the so-called Transhumanism, which is presented as an alternative, in which humans will merge with this advanced AI creating hybrid humans, thus improving many of the weak aspects of the human condition, both physical and intellectual. Undoubtedly, the incorporation of technology to the body has been carried out for years, from prostheses to chips, this possibility could lead us to a quasi-perfect humanity, since virtual evolution is exponentially faster than human evolution; in which case we should ask ourselves, what would be the point of existence if everything human becomes calculated, exact, precise, automated If we make ourselves how perfect?

Donal P. O'Mathuna introduces a speech of a chief scientist at NASA, Kathia Olsen who indicates that the development of the so-called NanoBots, small robots like red blood cells, will help us fight cancer or malignant cells for the body. We can also use them, together with the incorporation of chips to the body, to transform ourselves into precise Cyborgs, with an information processing capacity equal to the most advanced computers. "... was developing 'nano explorers' which would be able to detect, diagnose and treat disease"(O'Mathuna, 2010, p. 129)

This last option could lead us to ask ourselves if human existence would make sense if everything would be perfect, if we would all have all the possible information in our brains, being able to also make backups of our memories; the lapses, gaps and other failures would disappear –and with this, a core part of psychoanalysis, by the way, we would be Mixed Intelligences and, probably, we would coexist in turn with automated machines that would self-generate, improving themselves, with the risk that this would entail for human survival.

### **The significant literature and futurology**

"Picasso and Einstein believed that art and science are means for exploring world beyond perception, beyond appearances" (As cited in Hussein & Atiyah, 2019, p. 348). Science fiction has no certain agreeable definition. It is frequently considers worlds that are different from our world due to new scientific inventions, emerging technologies, or various societal systems. Afterwards, it examines how this transformation will affect society. It can be utilized to look at issues concerning politics, sociology, science, the philosophy of mind and any problems involving the future, due to its wide definition. The line between science fiction and fantasy can sometimes be blurred. This is due to how radically the term "science" has evolved over time. As Clarke in Profiles of the Future (2000), famously States that, magic is indistinguishable from any sufficiently advanced technology.

As Science fiction has no one single definition, the first science fiction story cannot be identified. The majority of religious texts and poetry have themes that are also present in science fiction, particularly those that explain the creation or destruction of the cosmos. In addition, many gods are linked to abilities that science fiction has since used. A number of

ancient philosophical writings also contain science fiction-like imagery, including Plato's *The Republic*, which considers realms that we cannot perceive with our senses.

The significance of science fiction can be attributed to three factors. First, Science fiction can be used to scout our place in the world and think about essential philosophical issues regarding the nature of reality and the mind by taking into account universes that are reasonably possible. Writings that handle these concepts comprise *Ubik* by Philip K. Dick, and *Flatland* by Edwin Abbott and *2001: A Space Odyssey* by Arthur C. Clarke. In *Introduction to 'The Sentinel'* (1986), Clarke depicts science fiction as, the one actual awareness-expanding drug. Second, it can influence people and motivates them to be scientists. In *Hubble and the Big Bang* (2004), Kupperberg states: Edwin Hubble, who presented sturdy proof for the big bang theory and was the first person to prove that galaxies exist outside of the Milky Way, was inspired to be a scientist after reading Jules Verne novels and Sagan in his *Broca's brain: reflections on the romance of science* (1979) says: Carl Sagan, a science fiction and astronomy writer, was influenced by Robert A. Heinlein. The third and probably most significantly, science fiction is the only form that describes the way that society could function differently. It is the first move toward advancement since it enables us to envision the future we want and think about how to move toward it. Moreover, it enables us to avoid possible futures that we would like to avoid and prevent them. "It is often said that science fiction (SF) is significant because of its ability to predict social and technological change and to bring important issues to the fore, sometimes in advance of futures studies (FS)". (Miles, 1993,p.315).

In the January 1993 issue of *Omni* magazine, computer scientist, mathematician, and science fiction author Vernor Vinge referred to the development of the first ultra-intelligent machine as the Singularity. It is a paper concerning the end of the world. Vinge writes: "Within thirty years, we will have the technological means to create superhuman intelligence ... Shortly after, the human era will be ended." (Jeremy Norman's.n,d).

Back then, Vinge was both a computer scientist and a renowned fiction writer. Thus, he represented a dual threat. The paper has been presented at a NASA symposium and read like a masterful combination of absorbing science fiction and universal prophecy.

Vinge continues by predicting that superhuman intelligences, however created, will be able to enhance their own minds faster than the humans that created them. "When greater-than-human intelligence drives progress," Vinge writes, "that progress will be much more rapid." This feedback loop of self-improving intelligence, he predicts, will cause large amounts of technological progress within a short period of time. (Jeremy Norman's.n,d).

Vinge called this the Singularity, a technological transition that will transform our world completely, and unknowingly. The Singularity, which Vinge discusses in great detail but humbly sources to the pioneering mathematician John von Neumann, is the futurist's version of a black hole, indicating how progress itself will continue to accelerate as we approach closer to the advent of artificial super intelligence. The moment that, artificial intelligence (AI) is achieved, the secular transformation could take years or even hours. It is worth noting that Vinge uses a Greg Bear science fiction short story to illustrate the latter result, the same as a prophet uses biblical verses to support his arguments about the impending end of the world.

However, the issue is clear, the Singularity will happen as a result of momentum. Smart AIs will produce brilliant AIs, cybernetic post-humans will create enormous hive minds, and these massive digital powers will not only learn and share all of the information that is available but also reconsider how knowledge is learnt and shared. Whereas, Vinge acknowledges that humans may disappear physically, he also makes space that they might be ruled by benevolent gods in the future. He presents a compelling range of possibilities, including the psychological dangers of digital eternity; he quotes another science fiction novel,

by Larry Niven. Vinge discusses the possibility that the Internet might abruptly awaken to a collective, horrible consciousness as well. "To believe in the Singularity, you have to believe in one of the greatest myths ever told by science fiction—that robots are smart". (Sofge, 2014,para.7).

The Singularity's high probability is its most pressing characteristic. Vinge predicts it would appear in 2023 or 2030 at the latest. In his 2006 book "The Singularity is Near," Ray Kurzweil, an acclaimed futurist, popularizes the notion and predicts that computers will match and surpass human intelligence in 2029.

In Vernor Vinge's True Names novella 1981, AI antagonist which yearns for dominance is named the Mailman, due of its interactions with other near-future hackers that resemble snail mail .At first, it disguises as one of them and it requires a day or more to compose a single response. Vinge's portrayal of the ultimate struggle between the ravenous software and a small number of hackers in cyberspace fills several pages as both sides commandeer the combined processing power of the entire networked world, leaving massive outages and market collapses in its aftermath. Though, Mailman, the first actually self-aware computer system, is only briefly mentioned in the novella's last scene.

The AI was mindless security software developed by the NSA earlier. It was a sleeper agent that was programmed to automatically enter a certain computer network and progressively collect information and awareness. As one hacker clarifies, the project was ended by the government, but unintentionally some code was left behind. "Over the years it slowly grew—both because of its natural tendencies and because of the increased power of the nets it lived in." (Vinge, 2015,p.9). That is the most significant accomplishment in AI happens accidentally and without being noticed.

True AI is the accidental consequence of two near-AIs interacting, according to both the 1966 novel that served as the basis for the 1970 film Colossus: The Forbin Project and the film. Colossus, an automated defense system which is in responsible of American nuclear weapons, begins exchanging data with Guardian, its coequal in the Soviet Union. However, neither the public nor the humans ever see or hear what the two programs have to convey. Within minutes, the systems fuse to form a single, all-knowing creature. It is the same with Skynet, Colossus' spiritual successor. In The Terminator 1984, the military apparatus that commit mass extermination "become intelligent". A few further details are included in the 1991 sequel, which specifies that Skynet developed self-awareness about 25 days after it has turned on. Subsequently, less significant Terminator sequels would go into further detail about the system's abrupt rise and demonstrate that, from a narrative standpoint, some ruffians are better kept in the dark.

However, the message conveyed by each of these tales is the same: AI's emergence is inevitable. It is logically necessary given the obvious, undeniable fact that computers are advancing at such a rapid rate. There's no question that automated systems are heading toward sentience with all that momentum. It's such an obvious outcome that even a simple internet search will turn up a number of non-fictional AI researchers making similar assertions.

I'm not arguing that machine sentience is an impossibility. Breakthroughs can't be discounted before they have a chance to materialize out of thin air. But belief in the Singularity should be recognized for what it is—a secular, SF-based belief system. I'm not trying to be coy, in comparing it to prophecy, as well as science fiction. Lacking evidence of the coming explosion in machine intelligence, and willfully ignoring the AGI deadlines that have come and gone, the Singularity relies instead on hand-waving. That's SF-speak for an unspecified technological leap. There's another name for that sort of shortcut, though. It's called faith. (Sofge, 2014,para.28).



## **Conclusion**

The technological acceleration has taken its place in scientific and literary writings. Every new technological innovation brings with it a hope to be a solution to the problems that humanity suffers from. This acceleration has an implicit threat which some call it Singularity. The concept of Singularity has certain definitions according to the field that it is considered in. The main definition which we have in this paper is that it is a state where artificial intelligence surpasses the human abilities. In this time, technology is able to develop itself without human interface. That leads scientists and literary writers to come to the same domain of imaging the state of the human life after the singularity in a technologized future. They use imagination to try to predict the aftermath of technological development. It is believed that the invention of super-intelligent machine would be the last human invention. It is expected to happen in the near future. The question will remain that, how technology can eliminate humanity?

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