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Technological Singularity – An Overview of What the Future Holds

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Abstract:-

Background/Objectives: In this research we aim to present a collective analysis of the past ideas and researches on the topic of Technological Singularity and how human kind has developed from it since then.

Methods/Statistical analysis: We used data and evidences from several references to put forth a clear picture of the current developments in the field of singularity. We also used a survey method involving PhD. Researchers in the field of A.I. and asked their opinion on several questions, challenges and achievements in the area of Technological Singularity.

Findings: We found out that the major sectors of development are yet to be discovered which will helps us achieve Technological Singularity. The closest being Nano-bots and a merger of several inter-related fields such as AI, quantum computing, machine learning and many more to help develop a completely independent robot. A majority of Researchers also believe that we will achieve technological singularity within the next 80 years or so.

Improvements/Applications: This research only consists of existing data and the survey conducted is done on a small scale at one single place. The resources and background of research might impact the opinion of researchers elsewhere.

Keywords: Technological Singularity, Artificial Intelligence, Technology, Robotics

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1. Introduction

Let us start with the simple definition of Singularity. A hypothetical point when an Artificial General Intelligence device can exceed a human's intelligence is Singularity. It is believed that to attain Singularity, A.I. should gain consciousness. There are mainly three types of A.I. including:-

1. A computer system that works exactly like a human brain
2. A computer system that solves some problems previously solvable only by the human brain
3. A computer system with the same cognitive capabilities as the human brain.

The computer systems which can pass the Turing test belong to type 1 A.I. Since the concept of A.I. came into

existence, scientists have been trying to build machines with capabilities comparable to that of the human brain. However, almost all direct attempts toward such goals failed. Although research on type 2 A.I. has made impressive achievements, many people still believe that this computer system is closer to traditional computing than true intelligence, which should be general-purpose. This is why "AGI," a new label, was introduced around a decade ago, even though this type of research project has existed for many years. What distinguishes AGI from mainstream A.I. is that the former treats "intelligence" as one function, while the latter treats AGI as a collection of loosely related capabilities. Therefore, AGI is the type 3 A.I. listed above. The commonly used phrase "Strong A.I." roughly refers to type 1 A.I. and type 3 A.I. (AGI), whereas "Weak A.I." referring to type 2 A.I.

1.1 Singularity

"Singularity," or "Technological Singularity," is another concept with no accurate and widely accepted definition. It has not been considered a scientific or technical term, even though it has become well-known for some general public writings. In its general usage, the belief that "A.I. will lead to singularity" can be analyzed into the conjunction of the following statements:

•An actual number can measure the intelligence of a system.

• By learning or recursive self-improvement, A.I. should be able to increase its intelligence.

•After A.I. passes the intelligence of the human level, its entire future will be comprehended as a single point as it will be beyond human intelligence.

1.2 Impact on Human Life

The technological Singularity might impact political systems through changes in government policies and human rights such as providing changes like increased ability to protect citizen's ban on some technologies, less privacy. Citizens might be able to prevent crimes better. It will also impact leadership and control by which government may have more power to control everything; this might be particularly scary if there were a dictatorship. Maybe law and order also change. Pact on Human Cultures The technological Singularity might impact Human Culture in different aspects such as communication. Talking to hundreds of people without even moving and hacking would allow someone to win an argument or dispute. It will also impact beliefs and values to the computer chip in the brain might modify values, make a human more susceptible to being controlled. Safety might also compromise, as we see in fiction movies. The technological Singularity might also impact economic systems where humans will not have required to work anymore, robots can take over almost all the tasks, and human roles in society can change. It impacts the source of wealth where money may be less critical because something else will replace the money.

2. Related Work

The term "singularity" was first seen in an article about the life and accomplishments of John von Neumann – One conversation - written by Stanislaw Ulam. The article revolved around the exponential progress of technology and changes in the mode of human life, which gives the appearance of approaching Singularity. In 1965 I. J. Good made a more specific prediction, calling it an "intelligence explosion" rather than a "singularity," He mentioned – "Let an ultra-intelligent machine be defined as a machine that can far surpass all the intellectual activities of humans." An ultra-intelligent machine could design even better machines; there would then unquestionably be an intelligence explosion, and man's intelligence would be left far behind. Thus the first ultra-intelligent machine is the last invention that man need ever make. Vernor Vinge –A science fiction author – popularized the term "Technological singularity "in his 1993 book: "The Coming Technological Singularity", in which he wrote that Technological Singularity would mark the end of the human era, as the new A.I. would continue to upgrade itself and advance technologically at an incomprehensible rate.

The real question is whether such a technological singularity will ever happen. Just because some have predicted it does not mean it will, and there is plenty of debate on both sides of the argument. Raymond Kurzweil (An American inventor and futurist) 2006 published his book: The Singularity Is Near. He pointed out that as technology evolves exponentially, progress would eventually become virtually instantaneous and hence – A singularity. These predictions were declared outlandish by many at that time. On the contrary, today, these ideas do not look so outlandish, with the development of several robots making the use of artificial intelligence to perform complex operations, one prominent among them: 'Sophia '– a social humanoid robot developed by Hanson Robotics.

2.2 Impact on Economic growth

In recent years, people started believing that the world's economic output that earlier was assumed to double every fifteen years is now expected to double at least quarterly, and even perhaps on a weekly basis. As a result, the emerging potential of exponential economic growth for countries that adopt these emerging artificial intelligence and various technologies will most likely affect the division of income between human labour and capital—challenging the very nature of economic principles that nations are built on today. A 2008 research by Robin Hanson outlines the fact that singularity in economy refers to a period of extremely rapid growth as a result of technological singularity. In synthesis, Hanson supports that global economy transits a period which presents an extremely rapid growth in all its sectors, by referring to some macro-economic indicators from the last centuries. Hanson's conclusion is that human society will reach the level of economic singularity only and

only with the support of technological singularity. The substitution of the human mind in different activities by robots with artificial minds, possible to be multiplied infinitely within the so-called Copy Economy, this claim is not only supported by Hanson's research in 2008 in Economics of the Singularity, but also in his 2014 research by identifying the idea of this substitution in When the Economy Transcends Humanity (Hanson, 2014).

3. Methodology

Present examples and hypotheses:-

We can find A.I. everywhere around us, from hospitals to schools and from military to factory. When A.I. singularity does emerge, it will likely have profound implications for tactical capabilities, as well as strategic and operational decision-making.

Medical advancements:-

Kurzweil(author of the book- The Singularity Is Near: When Humans Transcend Biology) asserts that when technology surpasses the human brain's processing, the medical will increase people's life expectancy. Nanobots will be able to repair and replace any body part that wears out.

Limit of the human brain:-

Kurzweil stated that the brain's functionality is limited in terms of technology that we can build in the near future. However, Once the Singularity is achieved, A.I. will be capable of increasing its intelligence exponentially, which will benefit our civilization as we can utilize it for our development and technological advancements. It can also help us advance space technology to provide the Earth permanent protection from the threat of asteroid impacts.

4. Results and Discussion

Futurist and singularity enthusiast Ray Kurzweil has declared 2029 as the date when A.I. will pass a Turing test and achieve the intelligence levels of humans. He thinks that Singularity will take place in 2045. He said, "we will multiply our effective intelligence a billionfold by combining with the intelligence we have created." Moreover, Emerj, an A.I. research company, conducted a survey. We also interviewed 46 Ph.D. researchers in the A.I. field and asked them about technological Singularity: a hypothetical future event when computer intelligence surpasses and exceeds human intelligence with profound consequences for society. We asked the participants when will Singularity occur. 62% of respondents predict a date before 2100, 17% expect a date after 2100, and 21% believe that Singularity is unlikely to occur.

5. Future Scope and Limitations

5.1 Outdating Of Moore's Law:-

In 1965, Intel's co-founder, Gordon Moore, predicted that chip improvements would double processor speeds and overall processing performance would double every two years. Although this law has been held until now, it has slowed down in the past few years. While chip technology is still advancing, we are approaching the theoretical limit of shrinking transistors. Kurzweil also argues that the number of transistors on a chip is an arbitrary method to measure performance; recently, we have found various methods to improve overall performance, such as quantum computing, 3D stacking, etc.

5.2 Robots Are Doing Human Jobs:-

We are not unfamiliar with this development and are already aware of the advancements in this field mainly. To no surprise, since the introduction of the first industrialized robot, ' Unimate '– used on the General Motors assembly line to weld auto bodies – in 1962 to the most recent Humanoid Robots have taken over and caused many employment fields to become obsolete. Such as 'Vyommitra' by ISRO (Indian Space Research Organisation), a half-humanoid robot capable of switching panel operations on a spaceship and has a large scope for development. Another example is 'Amelia,' which is used for providing customer service.

5.3 Gene Editing:-

Clustered regularly interspaced short palindromic repeats (CRISPR)-Cas9 is a genome-editing technology. It is used to remove, replace, or add pieces of DNA. While not the first genome editor, CRISPR-Cas9 is efficient and cost-effective. With 'CRISPR' and the recent growth in the field of biotechnology, merging humans and robots, although controversial but still a possibility.

5.4 Limitations

The current state of performing essential cognitive functions, including the perception and understanding of natural language, is very different from human capacity. Real-world thinking is an inevitable part of the process. Great help to many advanced forms of computer vision and natural language comprehension.

5.5 Future Scope

Reverse Engineering the Brain

By the year 2025, humanity will reach a critical stage in the path to unity: the construction of computers and the "thinking ability of the human brain." Computers will be able to "recreate human capacity for pattern recognition, intelligence and emotional intelligence" in just a few decades.

All of this would have been meaningless if scientists had not been "transforming the brain into a revolution." Brain modeling is improving, and the prediction is that scientists will soon use nanobots to draw the brain and then develop, repair, and scan, and store its contents.

Nanotechnology - The Next Little Thing

Mankind will use nanotechnology to rebuild the body at the atomic level. It will make healing and rebuilding happen. However, before that level of development can be achieved, scientists will need to design other tools: computers that can work on a small scale, "nanobots," "command-building" to guide them, power to power them, and a way to prevent external things from interfering with them.

Experimental Test

Humans will use robots to perform many physical tasks and tasks, but the most important development for robots will be the development of artificial intelligence. You are already using some form of A.I., but in the future, a powerful A.I. will be developed. By robust A.I., we mean artificial intelligence that passes the Turing test and surpasses human ingenuity. You can expect solid A.I. to create more important changes than nanotechnology.

Challenges faced by the root of Singularity:-

Real-world Consultation As a barrier to other A.I. activities, Real-world interaction is not as important as the end itself but is an integral part of other A.I. functions, including processing and natural language. The difficulty of using real-world thinking, therefore, limits the quality in which these tasks can be performed.

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