

Technology Singularity in Culture:

The Urgency of the Problem in the COVID-19 Pandemic

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Abstract

In response to the global pandemic COVID-19, the possibility of organizing the artistic process without presence of a human being at the moment of the artifact's manufacture is now being updated. This article discusses AI possibilities and prospects for the further development of technological art. The author explores the specifics and uniqueness of works created using AI technology. By the example of the paintings "Next Rembrandt" and "Kandinsky" it is evident that the images reproduce the creative styles of artists with exceptional accuracy, but are not a copy of famous works of art masters. The author finds out the possibilities of algorithmic analysis to identify a certain ratio of iconic systems of musical and pictorial works. The revealed unpredictability for the result of the art work creation process gives rise to a theory of technological singularity in culture. Thus, the author insists on the AI's unique ability to create cultural artifacts in a global pandemic.

Keywords: Culture, AI Art, Global Pandemic, Artificial Intelligence, Algorithmic Analysis, Technological Singularity

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Introduction

During technological progress, new technical devices and tools are created in order to exceed human's natural capabilities and strength, curb the effects of nature. The results of the technical evolution are really impressive: the car moves faster than Achilles; airplanes and helicopters fly faster than birds; ships, radios, satellites, the latest gadgets – this does not surprise us anymore. Modern nano-computers can perform certain algorithmic calculations and combinations faster than humans. However, all technical devices are human controlled. That is the strength of the human mind which is able to create such results of mental activity that are millions of times higher than the physical capabilities of a man.

As in ancient times, there is a need to develop technical devices and sophisticated technologies. The notorious phrase of Archimedes “Give me a point of support – I will turn the Earth” (212 years BC) is a clear case in point. Due to the overly rapid development of the scientific and technological process, interest in the introduction of technologies in various spheres of life is constantly growing.

At present, there is an opinion about artificial intelligence's uniqueness and the ability to reproduce itself and function without human programming (control). Moreover, the illusion of equating human intelligence with AI occurs.

Machine learning is the study of computer algorithms which are automatically improve based on experience. Due to this, the performance of digital systems is increasing, computer program manipulations are constantly being developed.

In this study, we were interested in unsupervised learning, the algorithm type that considers patterns based on untagged data. Unsupervised learning assumes the computer's ability to find patterns in the input data stream without requiring a person to label the input data in advance.

In this case, the robotic mechanism activity can give unique results, unpredictable by humans. Consequently, the concepts of technological determinism and singularity have appeared in the scientific literature.

This concept is based on the “Moore's Law,” an empirical observation by the scientist Gordon Moore (1965), which suggests that by 2035 the computing power of cyber machines will have exceeded the power of the human brain (Moore, 1975).

One of the founders of the technological singularity theory was the British mathematician Irving John Goode. In the 1960s, he suggested that very soon an ultra-intelligent machine would be invented; namely a machine that could “far surpass the intellectual activity of any person, no matter how smart it was” (Good, 1965:31–88).

According to supporters of the “techno-singularity” concept, the generation of artificial intelligence and cyber machines will lead to the improvement of the technical and technological production component (machines can self-repair, perform certain manipulations faster and better than a human being).

The so-called “intellectual explosion” is possible in the near future. V. Vernor in the article “The Coming Technological Singularity: How to Survive the Post-Human Era” (1993) predicts that the emergence of artificial intelligence, which can dominate the human in the functional component, will occur within the next 30 years. The author argues that singularity is an inevitable consequence of people’s natural competitiveness and the development of technology capabilities. If you believe the critic’s statement, this event should take place before 2023 (Vinge, 1993:11-22).

Eric Drexler agrees that superhuman mental abilities will be available in the near future, but, in his opinion, such formations pose a threat to society. Therefore, he emphasizes the need to establish the boundaries for the development of such device capabilities so that their results can be safely studied and used.

In the scientific literature, along with the works where singularity is interpreted as a result of the inevitable development of modern technologies, a number of thoughts that refute the content of this concept appear (Hofstadter, 1999; Penrose, 2016).

American physicist and computer scientist Douglas Hofstadter specifies that it is the mind that is the feature which distinguishes man from all newly digital organisms (Searle, 1980:417–457). Human consciousness is not algorithmic, and therefore cannot be modeled with a conventional computer (Penrose, 2016).

As a result of the literature review, certain contradictions appear regarding the determination of the development prospects of modern technologies. Consequently, it is necessary to study the influence of modern technologies on contemporary art and to identify prospects for the further development of technological art and the possibility of using artificial intelligence technologies in art production.

The Possibility of Artificial Intelligence Technology

The theory of “technological singularity” has been considered hypothetical for a long time. However, several technological experiments have already been known, indicating the unpredictable results of the so-called “artificial intelligence activity” created by humans.

On May 11, 1997, the Deep Blue chess computer manufactured by the developer IBM - International Business Machines, won a match against world chess champion Garry Kasparov. Although this event is not in the field of art, it has shown that the activity of artificial intelligence can be not only unpredictable (unplanned), but also overwhelms a human expert.

Artificial intelligence technologies are being introduced in all spheres of life: cosmology, science, medicine and even art. The latter is the least explored area for implementing digital capabilities. AI is a technology which helps you perform a series of manipulations in a certain sequence, programmed by a human. It is well

known that in the field of art, copies of the works of famous artists, composers, architects and representatives of other creative industries are created using artificial intelligence. Therefore, now artificial intelligence is not only the technical embodiment of human thinking, but also creativity.

Artificial intelligence is the property of intelligent systems to perform creative functions that are traditionally considered the prerogative of a person. Artificial intelligence is demonstrated by machines, unlike the natural intelligence displayed by humans and animals, which involves consciousness and emotionality.

A famous event was an auction in New York 2018, where a copy of Rembrandt's painting "Edmond de Belamy, from La Famille de Belamy" was sold for \$432,500 (New York Times). However, among a large number of copies and invariants of the artist's original images created with artificial intelligence technologies, a work that is interesting in the framework of this study and unique in its specificity was found. "The Next Rembrandt" is a portrait painting that reproduces Rembrandt's creative style with exceptional accuracy, but it is not a copy of the image of the master's paintings. It became possible due to the technologies of "artificial intelligence."

Algorithmic Analysis of Art Works

Specialists from Microsoft, the University of Delft Technical University, the Royal Mauritshuis Gallery and the Rembrandt House Museum in Amsterdam, using Microsoft's Azure computing resources and a number of specialized algorithms, performed a three-dimensional scan of 346 artist's paintings and discovered not only genre and stylistic specifics, but also techniques specific to the artist and oil painting techniques. "The Next Rembrandt" is a 3D-printed picture created in 2016. The process of creating the canvas was extremely complex and lengthy. About twenty data analysts, software developers, scientists, engineers, art historians and professors in the field of artificial intelligence and 3D printing worked on the project.

The process of creating the work was preceded by analysis of the existing master paintings and the identification of patterns in the combination of colors, applying strokes and compositional image construction.

The complete collection of 346 images included paintings by Rembrandt was those whom most look extremely realistic. There are several explanations for this. Rembrandt, using the play of light and shadow, created unique picturesque compositions that looked very realistic and voluminous. As a result of these manipulations in his work there is a desire for accuracy and truthfulness. The master prefers psychological expressiveness instead of violent pathos and external effects. "The main formative element of the composition, which allowed the artist to fully materialize and convey to the viewer his own plan – chiaroscuro, or rather, the scheme of alternating spots of light and shadow that he constructed with mathematical precision." (Tarasov, 2014)

The artworks provided by TU Delft and the Mauritshuis Museum were scanned in high resolution ("The Laughing Man," 1629–1630; "Andromeda," 1630; "Simeon's Song of Praise," 1631; "The Anatomy Lesson of Dr. Nicolaes Tulp," 1632; "Susanna," 1636; "Saul and David," 1651–1658; "Two African Men," 1661; "Homer," 1663; "'Tronie' of a Man with a Feathered Beret," 1635–1640; "Portrait of an Elderly Man," 1667; "Rembrandt van Rijn," Self-Portrait, 1669) (Rembrandt).

The remaining works were taken from other archival sources. Thus, the resolution of all images was different and incompatible, which was a problem for systematizing and identifying the necessary algorithms for image similarity. To solve this problem, the team used the Deep Neural Network algorithm to scale images, increasing resolution by 300% and reducing visual noise (Pickett-Groen, 2016).

Hereafter, the authors of the project had to decide on the content of the planned picture: the depicted object and the composition of the canvas. In this regard more than 400 faces were examined on Rembrandt's canvases, where after it became clear that the subject should be from 30 to 40 years old. The master most often depicted males in his works, so "The Next Rembrandt" is a man wearing a black hat, a black jacket with a white collar.

It was necessary to extract the techniques of the master to depict the face of this man. In this regard, developers needed Microsoft software that could "understand" Rembrandt, based on his use of geometry, composition. As a result of the face recognition algorithm application, typical geometric patterns intended for drawing human features were identified. More than 6,000 facial landmarks were used to classify features in terms of relevance and repeatability.

The third stage of the creation "The Next Rembrandt" was the preparation for printing the created image and the identification of a specific technology for applying paint. As known, Rembrandt van Rijn revolutionized painting with a three-dimensional effect using the impasto technique, namely applying paint to the canvas in very thick layers. As a result, his canvases looked three-dimensional. To create a picture that would resemble the artist's work, it was necessary to study the impasto technique and thanks to X-ray photographs, to study each layer of the existing paintings. After that, the image of the future "The Next Rembrandt" needed to add another dimension namely 2D to 3D. The final layout of the 3D painting consists of more than 148 million pixels and is based on 168,263 fragments of Rembrandt's painting.

The fourth stage was printing. At first, the developers used the manipulator to paint a new portrait. But the robot arm could not convey the desired realistic effect. The manipulator has only nine degrees of freedom. Instead, the human hand has 26. This indicated that it still could not draw in great detail.

Since the digital image was already voluminous, it was necessary to print 13 layers of special ink based on UV ink on a 3D Canon printer. Thus, the image became three-dimensional.

The fifth creation stage of the project is the presentation and use of the created canvas "The Next Rembrandt." As is well known, after its presentation in the Netherlands, the project was displayed in many cities. This was facilitated by the original version of the image being in electronic form, so it can be numerously replicated.

The result of this 18-month artist's work study was the creation of a work which showed that artificial intelligence technologies can produce an unique artistic product. It can mimic the work of a famous artist, but it has its own meaningful content. The example of the work "The Next Rembrandt" shows that technological singularity in art is quite possible. But we do not exclude the uniqueness of human activity and artistic creation. In addition, we emphasize the need to develop the symbiosis between man and digital technologies in art: a combination of the capabilities of "artificial intelligence" and the aesthetic sensitivity of people.



Figure 1. "The Next Rembrandt," 2016. Creators: ING Bank, J. Walter Thompson Amsterdam, Microsoft, TU Delft, Mauritshuis, Museum Het Rembrandthis.

The example of "The Next Rembrandt" shows that due to the mathematical analysis of the artists' creativity, certain algorithms of the artist's (author's) work can be found, the main components of the work of art can be analyzed and the art sign system can be transformed into a system of a different order, that is numerical. Thus, the color, shape, location of the displayed objects on the canvas (composition), that means, everything turns into numerical formulas and combinations. The graphic drawing is transformed into digital, algorithmic. A certain number system is being built, which allows with the numerical combinations obtained to group works (one artist, era, artistic direction) into single collection systems, analyze and identify similar algorithmic chains, and create new art products based on these algorithms.

If modern art products are created with algorithmic analysis, the production process can be considered to be algorithmic art. Algorithmic analysis is possible in various fields of art: graphics, painting, architecture, music and the like.

Role of the Artist in the Process of Creating an Artifact With Digital Technology

All technologies, including artificial intelligence, are only tools in the hands of human. They cannot replace a person, although many researchers strive for this. When a person loses control over technology, the question of technological singularity arises. Otherwise, we can only talk about the purpose of technology application. A weapon is also a tool, but depending on the purpose of its use by a person, it turns out to be harmful or not.

“The Next Rembrandt” is a collective product of human activity. The author of the works created using AI-technology often has a collective mind, because a lot of specialists in the field of IT-technologies, art, museums are working on the creation of the project. All technologies are only a tool in the hands of man, including artificial intelligence that is not a substitute for man. It is a tool.

The principle of algorithmic analysis of the musical series can be shown by the example of the project of “Neuron Soundware” and sound producer M. Staszewski. Based on the algorithms of creativity of the Czech composer Antonin Dvorák, the musical work “Christmas song” was created. A neural network analyzes the primary material (the work of A. Dvorák), detects the algorithmic sequence of sound combinations and systematizes them into a single digital circuit. Then, due to the derivative function, the process of creating a new digital audio drawing begins. It saves the detected sound combinations and simultaneously creates new sequences. Thus, a new musical series (drawing) is created, which compositionally and stylistically resembles the primary material.

Based on the aforementioned discussion, we offer our own definition of the “algorithmic art.” It is the production process of art products created on the basis of an algorithmic analysis of primary information sources. The primary sources are works of art, artifacts, the work of artists of various art types.

This means that with algorithmic calculation it is possible to compare and even combine different types of art in one plane, in one form, in one art product. It turned out that with the help of artificial intelligence it is possible to create unique works that have no analogues among the finished artifacts created in the traditional way.

Combination of Iconic Painting and Music Systems Using AI-technology

From time immemorial, art historians have been comparing the various fields of art: painting and graphics, music and choreography, sculpture and architecture, theater and cinema. Many artists, inspired by music, create works of fine or spatial art and conversely under the influence of painting, musical, architectural and screen works are created. These forms of mutual influence or aesthetization of the arts have been known for a long time.

However presently, it is possible on the basis of algorithmic calculation, to carry out a comparative analysis of several works of art and establish a certain ratio of the expressive means of art in a digital (mathematical) equivalent.

Illustrative in the context of this study is the work “Kandinsky” by Microsoft, created by algorithmic analysis of Kandinsky’s paintings and musical works of Richard Wagner (the opera “Lohengrin,” 1916) with the atonal works of Arnold Schoenberg, as well as works of modern music.



Figure 2. “Kandinsky,” creator Microsoft, 2019.

Due to the generative neural network, the algorithmic construction of the artist’s works and musical works of R. Wagner and A. Schoenberg is analyzed resulting in a certain correlation of the visual and sound series being revealed. For example, each color shade corresponds to a certain sound and especially, the combination of dots and strokes correlates with a specific leitmotif.

By changing the melodic pattern, the image changes accordingly. If random combinations are added to the sound rows, then the visual content begins to change. There is an internal creative improvisation in the creation of a picturesque series. Works of modern musical directions are also subjected to comparative algorithmic analysis and are accompanied by pictorial visualization in accordance with the algorithms for creating a picture by the artist Kandinsky.

Thus, artificial intelligence demonstrates to us how the artist Kandinsky may have painted a picture today – if he listened to modern music, and not the work of famous expressionists.

The example of this project shows how, through algorithmic analysis and modeling, a certain ratio of iconic systems of musical and pictorial works is clarified.

A person cannot predict how images will change and eventually what the final result of the work will be. Thus, we can state the fact that a person cannot fully re-

produce a product created with digital technology, but it sometimes also provides a desired result. The production of art products created through digital technology is an algorithmic art.

Let's focus next on the work of Cloud Painter by the artist Pindar van Arman, who won a competition of works created with the help of "AI-technology" Robotart. "It doesn't look like it was painted by a machine, but it doesn't devalue the work of art itself," says art critic J. Salz (Musiyenko, 2018).

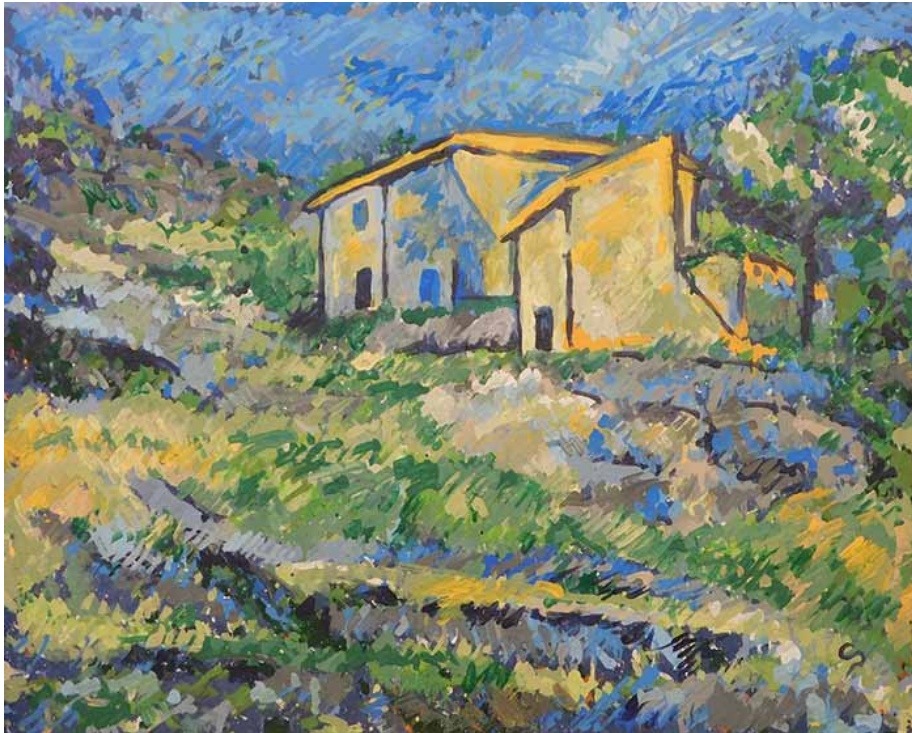


Figure 3. Creator "Cloud Painter" and artist Pindar van Arman, 2018.

Prospects for the Development of Artificial Intelligence

Mankind needs robotic technologies in order to primarily reduce the cost of production. For example, the project of the University of Nantes (France) shows that the manufacture of artifacts, especially unique architectural structures using a 3D scanner, is much more economical compared to the conventional manufacturing method. The walls of the house, whose area is 95 m² were printed in 54 hours. The final construction cost of £ 176,000 was 20% lower than with traditional technologies (Vergunova, 2017:57-60).

However, along with the benefits of introducing "artificial intelligence" technologies, there is a theory that progress will lead to technological singularity and unemployment for a significant part of the population. Joseph Stiglitz a Nobel Prize winner in economics and professor at Columbia University published his study where he pointed out that technological revolution instead of improving economic conditions will lead to increased economic inequality (Stiglitz, 2014). He estimated that fifteen million people will lose their jobs in the UK due to technological ad-

vances and about eighty million in the United States. In general by 2030 robotic mechanisms will have left 800 million people without work. Economists predict that Chinese workers will be replaced by robots in eight years. It is known that at the Henn na Hotel (Tokyo), 80% of the staff are robotic mechanisms. In Dubai, the entire metro network is controlled by robotic technology and customs robots guard the border of South Korea.

Currently, artificial intelligence technologies create art products based on algorithmic analysis of pictorial, musical, architectural masterpieces already created. However, this practice is not solitary. In the early stages of formation other forms of art also borrowed the specifics of creating works from their predecessors. Cinema is based on theatrical art. While theater in turn, is a synthesis of literature and music; television is rooted in movies and radio. Therefore, we can state the fact that digital algorithmic art is in its first stage of development and has significant prospects for expanded development. Technological singularity in art is quite possible. But we do not exclude the uniqueness of human activity and artistic creation. Moreover, we emphasize the need to develop the symbiosis between man and digital technologies in art: combining the capabilities of “artificial intelligence” and the aesthetic sensitivity of people.

Conclusion

Modern technology has exceeded several times the human power. However, all technical devices are controlled by humans. This is the power of the human mind. It is able to create such results of mental activity that are millions of times higher than the physical capabilities of man.

So, with the help of “artificial intelligence,” one can recreate lost images, copies of works by famous artists, composers, architects and representatives of other creative industries. In addition, the author investigated a number of paintings created by AI, unique in their specificity and artistic content. “The Next Rembrandt,” “Kandinsky” are canvases that reproduce the creative styles of artists with exceptional accuracy, but they are not copies of the master’s works. Moreover, with the help of algorithmic analysis and modeling it is possible to discover a certain ratio of iconic systems of musical and pictorial works.

A person cannot predict how the image will change or what the final results will be. The unpredictability of the results of the process and of an artistic context creation gives rise to a theory of technological singularity and uniqueness of works created by artificial intelligence.

But still one can insist that AI-technology is a collective product of human activity. All technologies are just a tool in the hands of man, including artificial intelligence. It is not a substitute for man, but a tool.

Despite the fact that the technology of artificial intelligence technology is a result of progress it is perceived by many technophobes as a threat to humanity in the current COVID-19 pandemic, it remains a tool for serving human communications and expression in creating new products and even artifacts.

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