

ARTIFICIAL INTELLIGENCE TODAY

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Abstract: The article aims to analyze the possibility of creative processes in artificial intelligence neural networks. In the past, AI was used to help people complete routine tasks. Whether automating functions, delivering optimized solutions, or a personal assistant, artificial intelligence is excellent at recognizing patterns and generating results that would be hard for the human brain to detect. Now we are seeing a shift in the use of AI in creative projects. AI can showcase a wide variety of work, and artists are using it as a tool to push creative boundaries in ways we have never seen before. Artificial intelligence is shaking the foundations of our existence, demonstrating how much of what people do, machines can do just as well, if not better. Based on the study of the functioning of modern artificial networks, the idea is substantiated that AI can participate at certain stages in the creative process as an independent actor. The creative process includes the steps of discovery and composition. At the same time, the latter in artificial neural networks takes place as a choice of known algorithmic combinations for creating a new object. The study explores the abilities of AI neural networks and determines the advantages of human creativity as a conception of new knowledge about the globe.

Keywords: Artificial intelligence, Creativity, Neural networks, Technological evolution.

1 Introduction

With the development and changes in information systems and their qualitative complication, they have delegated more unique operations to humans [24]. In many processes, humans have ceased competing with machines, and even information management functions are no longer exclusive to them. At the same time, the role of creativity, including the creation of new knowledge, remains fundamental for a person, not only in comparison with the animal world but also concerning "smart" information systems.

Whether a modern device, such as a neural network, is capable of creativity is, on the one hand, a matter of time and, on the other, a matter of principle [19]. This scientific article will present and discuss the main arguments for the issue raised. For this, the issue of creating models of the creative process in artificial intelligence (AI) neural network ecosystems, excluding human participation, will be investigated.

2 Literature Review

In scientific terms, "artificial intelligence" is a computer program or machine that can apply its intelligence to infinite tasks, from making coffee to building nanorobots, and can also reason critically and think outside the box [1]. For such reasons, the system for determining a dog's breed from a photo cannot be called real artificial intelligence, although it was built using different techniques. It was proposed to introduce additional terms for dividing artificial intelligence into subcategories following its capabilities to avoid confusion. Three types of AI were identified: (i) narrow (weak) AI, (ii) general (strong) AI, and (iii) super AI [29].

Narrow AI applies its "intelligence" to a limited range of tasks. These include virtual helpers, Google Assistant and Siri, and recommendation systems on Netflix, YouTube, or Google Translator [3]. It would be appropriate to call all the technologies that today are called "artificial intelligence" weak since the scope of their application is relatively narrow. They cannot think creatively, develop something new, or act spontaneously, but general AI is opposed to weak artificial intelligence. It is a system capable of applying intelligence to many unintended problems [5]. This quality can probably be called flexibility of mind, multitasking, or creativity among people. That is, the general AI will correspond to the human level of intelligence. It will not need instructions and support from a person. It is expected to understand the existence of the environment and be able to act autonomously in various situations. Autonomy also refers to the ability to think critically and express one's opinion.

Such a machine will be able to communicate with a person almost on an equal footing and offer its solutions to problems that are important for a person, such as, for example, the creation of new drugs.

Many scientists agree that the fundamental factor for the emergence of such a machine will be the ability to learn because learning is one of the main components of intelligence [2, 12, 27]. Computers will be able to acquire knowledge and life experience like a person, learn from their experience, and, following this, constantly improve their thought patterns and behavior strategies. In the language of computer science, they will reprogram themselves with the goal of continuous self-improvement. Most likely, they will become partially or entirely autonomous because they will understand their needs and be able to adapt to environmental conditions [23]. There are already examples of AI that act as independent artists, writers, and musicians [9, 11, 15].

According to some predictions, general intelligence with the ability to learn will be reached in 2030 [4]. At some point, it will inevitably surpass a person's brightness due to unlimited computing resources, a large amount of memory, and the absence of other limitations inherent in a person. As a result, computers are expected to be billions of times more intelligent than humans by 2045. Then the level of superhuman or super AI will be reached, which is described as "intelligence that is much smarter than the best human brain in almost all areas, including scientific creativity, general wisdom, and social skills" [23]. But for that to happen, you first need a computer with the ability to learn – this is the subsection of artificial intelligence called "machine learning."

3 Materials and Methods

The research methodology is based on the principles of modern cognitive philosophy and the theory that creativity is a complex of analytical, synthetic, and practical abilities for processing new information with the subsequent transition of information processes into automatic ones, free from consciousness control.

A detailed analysis of the emerging trends towards the development of existing and the construction of new neural networks with creative properties is available in the latest works of researchers in transhumanism [4, 19]. The issue of creativity, touched upon by the publications of experts on AI neural networks, is the choice of direction, subject, and result of imitation or creation in neural networks of a supernatural phenomenon of human activity. The most important conclusion is that the study of the creative abilities of AI neural networks is the central problem of scientific research about AI [23].

The creative process marks the production of a product that is different from the previous ones [30]. In this perspective, a person is the exclusive owner of the conscious ability to create. At the same time, another participant in the creative process is the natural environment, which for many centuries has been demonstrating the most impressive results of genuine creativity, which has been noted as "creative evolution" [10]. Nevertheless, when discussing the models of the creative process, the prominent place in them is occupied by a person with his ability to think and create. The constant appeal to thinking and awareness of such an action encourages us to think about the need for a conscious property of the creative process. In this case, the creative process must have targeted and rational settings.

4 Results and Discussion

A creative subject can use objects with unknown and new components, choose environmental options, and adapt external conditions to special needs [20]. The most important feature of the creative process is the ability to operate with unique knowledge as a result of applying executive components and

knowledge acquisition components to new information. The intellect reveals itself through various types of activity, primarily including operations for selecting, reserving, and managing data and creating new information products. Anthropogenesis led to the formation of consciousness as a comfortable and fast system for working with information coming to a person, the ultimate goal of which is to control such a complex organic environment as the human one. Are modern neural networks capable of such activity? The developments of recent years in the field of AI have been associated with the creation of analogs of the logical activities of the human intellect, the most notable of which was manifested in solving puzzles and other games. But such neural networks could have been more effective at work and in solving everyday and scientific problems, which are mostly dynamic [8].

For example, the transformation of text between several languages is an original task for which creative methods are used in the case of a person. However, the language systems of people do not have a formal basis, and speech constructions operate outside of any regulations. This means that the automation of language transformation implies the deliberate introduction of traditional elements into a flexible language structure or an appeal to an appropriate structure that can work with such a natural system – an AI neural network. So, for such operational linguistic situations, neural networks should be used, along with linguistics and its derivatives, syntax, and semantics, the subject of a particular linguistic culture, and methods characteristic of its content, with the solution of their corresponding tasks. And the most advanced neural networks are still significantly inferior to humans in all similar situations and functions.

The first stage of the creative process, discovery, is based on a knowledge base that determines the effectiveness of the innovative operations of the process [14]. Although this first stage episode is defined as the critical starting point of the creative process, modern AI neural networks begin to meet substantial obstacles even at it. The most crucial goal of neural networks is to teach AI non-standard behavior and similar solutions in emergencies specified in an indefinite way, which, in turn, dictates that neural networks must have goals set to achieve [28]. For this reason, such AI neural networks should be considered successful, based on which their specialist developers attempted to form an information system of thinking and reasoning. However, only the complete introduction of such a volume of knowledge into the neural network base that would allow AI to reason and make a decision is an incredible effort so far. As it turned out, most people allow atomicity in their conclusions more often than it seems since they need more verbal and other tools to represent their knowledge fully.

The formation of one or another system of people's world outlook, on which the prism of the worldview is built, stems from both emotions and the rationalism of personal properties [4]. Each person has a considerable base of specific knowledge. We have accumulated all this knowledge since birth, exploring and trying everything in our path. In this way, it became known that snow turns into water at a warm temperature. In the same way, we will become aware of even more things that modern artificial intelligence structures still need to become familiar with [5]. Currently, even the most productive and powerful computing center, consisting of a combination of servers and neural networks, needs such resources. So far, the intellectual abilities of the above system allow for solving only problems that are characteristic of the average person's early development stage.

Scientific progress and technological innovations are still on the way to achieving an AI structure that can reason and compete with humans. Today's most striking example of a sufficiently developed AI neural network is the ConceptNet semantic neural network [6]. The network structure is built from nodes, with its layers and conceptual content connected by small natural language phrases or sign relationships between them. They can be any phenomena necessary for computers to search for information successfully, give answers to people and identify their intentions. ConceptNet is a massive congregation of

information bases with about 300,000 concepts that describe many interactions and relationships among objects [6], such as: "A enters B," "B separates from A," etc. Despite the enormous amount of evidence available to neural networks and their successful application in tests, they can still not cope with tasks that require a proven empirical basis and rational human judgment.

Composition is an important stage in the creative process [18]. The consequence of the creative process is the creation of a new object or the identification of non-obvious connections between phenomena and processes. Most human creative activity products are easily defined as newly formed combinations of previously produced products and conclusions [22]. This view allows us to interpret the creation of models in the structure of the AI neural network as a technique designed to help discover new combinations on the plane of reality. They have every chance to appear both from the structure of each previous element and their general concentration due to the impulsiveness of their changes. This gives reason to designate the main strategic principles of the compositional stage, which complement many others:

- A. A combination of opposite properties in one element [26];
- B. Addition of an existing element with a completely new, previously unknown property [7];
- C. Mixing elements that differ in appearance [25];
- D. The disposition of a known element in an unknown environment [21];
- E. The disposition of an unknown element in a known environment [17].

The clearest example of the result of such a combinational creation is modern musical compositions. There are two branches here. The first is the production of musical arrangements for the artist to perform. For example, the most progressive neural network structure that creates such products is no worse than any master of music, the system of Aiva Technologies [15]. Artificial Intelligence Virtual Artist is based on highly complex learning algorithms using reinforcement techniques. Such algorithms allow massive amounts of information to be fed to computers, enabling them to make decisions about any other information. Such information passes through the neural networks of the program, which appear as algorithms that process information and are similar to the human brain. Such networks enable companies like Google, for example, to analyze myriads of graphic images with a broad interpretation that is exceptionally human-like. Aiva Technologies writes and produces scores for movies, video games, movie trailers, or commercials. Sometimes, AI neural network acts like a 24/7 composer, never running out of inspiration and always doing what is asked. Customers that visit the company set out goals for AI, and it runs several iterations until the notes satisfy the customers' objectives. Those same clients then play the composed compositions with live or virtual musical instruments in a studio.

Another characteristic example is the production of compositions of modern electronic genres with their subsequent performance with the exclusive participation of electronic equipment [13]. This aspect is the engineering environment responsible for synthesizing music sounds using digital signals. Today, such compositions, born due to the connection between software and digital instruments, are divided into a certain number of new genre directions that differ from each other in combined styles (indie rock, pop rock, etc.). Today, such a product of neural networks is a daily developing and popular product for many people, the success of which is complemented by the vigorous activity of robotics, which radically changes the musical plane [15].

Remembering the skeptical forecast regarding the lack of creativity in the machine due to the probable lack of effectiveness of the process [16], today, it was found every reason to correct this opinion unwittingly (Figure 1).



Figure 1 – AI-generated work, “Théâtre D’opéra Spatial,” took first place in the digital category at the Colorado State Fair via Jason Allen, *The New York Times*

AI is not intended to create innovative inventions since its main task is the consistent and unconditional execution of algorithms people develop in the form of program code [21]. This should also include the provisions of the term “innovation” to any productive product, skirting the attention of the subject of such a product. With the constant filtering of products by issues, we run the risk of running into an expansion of the concept of “new” – on the one hand, the results of human activity that are familiar to us will be located, and on the other, the products of the action of AI neural networks. The same applies to the correlation of “innovations” – this will have to be done separately on both sides. Thus, we will traditionally follow the logic and common sense, allowing creative competition between people and neural networks to occur. Of course, this will be a competition for the status of the strongest and the only one in the best traditions of social Darwinism. The victory can be used by any of the parties in case of their success.

5 Conclusion

Often, the practical side of studying the problem of the creative process of neural networks gravitates towards the desire to displace a person from the position of the sole right to own creativity, emphasizing the growing role of AI systems in this regard. Such an approach to considering the problem is based on the understanding of creativity as a mechanical process of selecting various elements to create an object that is new in composition. At the same time, the development of humanity in the direction of merging with artificial info-, techno-, bio-, and cognitive systems can have two main scenarios regarding creativity: regression of a person's natural ability for creativity and its reduction to a highly developed ability to model new compositions from existing elements or, as a result of a technological breakthrough, the successful endowment of AI systems with the potential to create unique, previously non-existing features.

Access to advanced information tools for all operations has modified human capabilities in many ways but has largely abolished sensationalism. The annual growth in the abilities of computing technology and gadgets has increased the logical and computational properties of people's thinking. Still, it has reduced many areas of the universal human knowledge base that were previously useful. For example, the average student of the initial modules of the mechanics and physics direction no longer has a formula for finding the root in the square, does not have derivatives of various cosines in memory, and the most depressing thing is sometimes unfamiliar with the correct definition of these same cosines. This makes one doubt the proportional rise of the properties of the subject's thinking in other areas.

The optimal scenario for the interaction of people and neural networks would be to see productive and beneficial creative cooperation between the parties, where the ongoing creative development would give its results for the benefit of humanity. The creative process is only complete with a new object in the

form of a result. In this position, AI neural networks, like humans, produce new products. Once again, there is a solid need to recognize the existence of a stable space of reality for creative competition between people and AI neural networks. The creative process itself stems from two stages in the form of discovery and composition. Today, neural networks cannot compete with people at the discovery stage since they still need a sure semantic base for this, which any person always has to conclude. And at the composition stage, AI neural networks use established algorithms for building a new object from complex combinations. The best and most promising position for people today is to maintain the pace of their progress, considering the improvement of technology.

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