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ARTIFICIAL INTELLIGENCE, ITS STRUCTURE AND APPLICATION

Abstract*: this article is devoted to the presentation of the most advanced developments in high technology. The issue of the development of artificial intelligence and the capabilities that scientists have developed in this area today. At this stage in the development of science and technology, there is a tough struggle for the possibilities of replacing the role of man and in his highest achievement of reason with artificial intelligence. The rapid growth of information technology contributes to the solution of this extremely important task, which is being solved by leading scientists and engineers. We will give examples of the use of artificial intelligence in modern life and the horizons that open before humanity in the framework of improving neural connections.*

Keywords*: artificial intelligence, neural networks, optimization.*

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ИСКУССТВЕННЫЙ ИНТЕЛЛЕКТ, ЕГО СТРОЕНИЕ И ПРИМЕНЕНИЕ

***Аннотация**: статья посвящена изучению самой продвинутой разработки в сфере высоких технологий – искусственному интеллекту и его потенциалу, раскрытому в настоящее время. На сегодняшней стадии развития науки и технологии существует небольшая вероятность замены некоторых ролей человека искусственным интеллектом. Стремительный рост информационных технологий способствует решению чрезвычайно важных задач, которые изучаются ведущими учеными и инженерами. Авторами приведены примеры использования искусственного интеллекта в современной жизни, а также горизонты, которые открываются перед человечеством в рамках улучшения нейронных сетей.*

***Ключевые слова**: искусственный интеллект, нейронные сети, оптимизация.*

Introduction.

Artificial intelligence is a self-learning computer system designed to solve problems of a high class of complexity. It is capable of solving managerial and computational problems, and is designed to control particularly complex objects and systems (spacecraft, nuclear power plants, etc.). Artificial intelligence was borrowed from living nature, which over billions of years has created the most unique product of its activity, the brain.

Intelligence as the highest product of the evolution of living nature.

Intelligence or mind is the ability of our thinking to collect information from the outside world, weed out everything that is not relevant, analyze and make a conclusion, adequately assess the external situation and skillfully respond to it, learn, memorize the information received, gain new experience and the ability to predict development consisting of the ability to be aware of new situations, due to the acquired knowledge, be able to correctly predict the development of events and skillfully manage the human

environment. Intelligence is the highest achievement of nature, created over billions of years of evolution of living matter on our planet. Many living beings possess intelligence to one degree or another, but human intelligence is the most developed, thanks to the cerebral hemispheres. In nature, intelligence depends on the neural connections of the brain of a living being. So in the human brain there are more than 86 billion nerve cells (neurons), each of which has tens of thousands of connections through its dendroid processes with other brain cells, forming a kind of dense network called neural connections. In the human brain, there are billions of billions of neural connections, the task of which is reduced to the perception of the external world through the senses: sight, hearing, taste, smell, touch. All information from the outside enters the brain through coded electrical impulses that are processed in specific parts of the brain. Information is reproduced in different areas of the cerebral cortex, analyzed, memorized, and based on innate instincts and learning, a response is given to external stimulation. An important factor in the intelligence of a living organism is the memorization of the information received. In humans, memory is formed by the neural connections of several parts of the brain, the large cerebral cortex, the large cerebellar cortex, and the limbic system. Neural connections in the temporal lobes of the brain play an important role in the formation of memory. Memory function depends on the state of neural connections and neurotransmitters that provide communication between nerve cells. The main neural connections that provide memory are concentrated in the hippocampus. The brain works on the principle of an electronic computer, in order to store current information, it uses RAM to store information for a long time, the brain resembles a hard disk. Human memory can be divided into three conventional parts. The first direct memory, which is practically not stored in memory and is eliminated so as not to overload the hard disk due to the insignificance of the incoming information. Short-term memory is stored in the cerebral cortex for a relatively short time, and long-term memory is in the hippocampus, where it remains for many years. The principle of memory formation consists of three main stages. The first is storing information, the second is storing and the third is the stage of reproducing information. When people receive information, it flows from one nerve cell to another. These processes occur in

the cerebral cortex, these nerve impulses lead to the creation of neural connections. Along these paths, further paths extracts, in fact, remembers the information received. Forgetting is important to avoid overwhelming your brain's hard drive. All unnecessary information is eliminated and neural connections created for a short time are destroyed, freeing up opportunities for more important messages. Information from one neuron to another goes in the form of an electrical impulse and is transmitted to another nerve cell at a junction called a synapse. An electrical charge is transferred from one neuron to another due to the action of neurotransmitters, the action of which is the memorization of neural connections. The memory capacity of the human brain is colossal and incomparable with the capabilities of any of the most modern super computers, it is about a million gigabytes. Recent research by leading neuroscientists suggests that a person's memory can store a quadrillion bytes of information. Given that the size of ordinary random access memory of an average computer is no more than eight gigabytes. And the human brain can store a million gigabytes. Many scientists became interested in the achievements of biologists and decided to transfer the principles of our brain to the language of mathematical algorithms, taking the electrical impulses of a nerve cell as a sequence of numbers «0» and «1». The use of such calculations made it possible in the middle of the 20th century to create the world's first electronic computers.

The history of the creation of artificial intelligence.

Artificial intelligence as a science began to develop in the mid 40s of the twentieth century. As a new direction in scientific thought, artificial intelligence was formed on the basis of philosophical teachings, the prevailing concepts of human nature and his ability to understand the world. The development of physiology gave, and a powerful impetus to the study of the human brain. A new science, neurophysiology, appeared, which, together with psychology, gave a theoretical understanding of the activity of the human brain and thinking. With the rapid development of the economy at the turn of the nineteenth and twentieth centuries, there was an urgent need to optimize the ever-increasing calculations, which needed to somehow be systematized and subordinated to uniform requirements. With the study of neurophysiology, scientists came to the

conclusion that the human brain perceives the world around us not as a picture, sounds, smell and touch, but in electrical impulses that are successfully converted in the cerebral cortex into a clear perception of the surrounding world. In this case, electrical impulses do not act chaotically, but according to the principle of formalized actions, in a certain algorithmic sequence. This is how a new direction of computational mathematics was born – the theory of algorithms, on the basis of which the first electronic computers appeared, the prototypes of modern computers.

Electronic computers, created on the principle of algorithmic actions, in the speed of calculations began to surpass the capabilities of the human brain. Such accomplishments set new tasks for scientists, to determine the boundaries of the achievements of computers in relation to humans and the gradual replacement of human activities by machines. A struggle began to increase the speed of computer data processing. In the middle of the twentieth century, one of the first creators of computer technology, the English mathematician and engineer Alan Turing, published his famous article «Can a Machine Think?" In a popular scientific journal. In it, the scientist proposed a test, which was named the author. The Turing test is a model for comparing computer and human capabilities. The article caused a great resonance in the scientific community, pushed humanity to new horizons for the development of computing technology and contributed to the start of the development of artificial intelligence.

In Russia, the first steps in the creation of artificial intelligence were taken by the Russian scientist Semyon Nikolaevich Korsakov. He studied human capabilities and, in order to facilitate human mental labor, for the first time in our country proposed devices that could expand human capabilities. In his article «Intelligent Machines», Korsakov described the principles of operation of mechanical devices invented by him that could facilitate the work of people in intellectual activity.

In the Soviet Union, the leading scientists of our country were engaged in this topic. The history of the development of artificial intelligence in the USSR and Russia. Collegiate counselor Semyon Nikolaevich Korsakov (1787–1853) set the task of enhancing the capabilities of the mind through the development of scientific methods and

devices, echoing the modern concept of artificial intelligence as an amplifier of natural intelligence.

In the work of his machines, our scientist was the first in the world to use perforated cards, which served as a prototype for a database.

In the USSR, the development of artificial intelligence began in the early sixties, after the head of our country, N.S. Khrushchev paid an official visit to the United States and got acquainted with the achievements of America. A particular acceleration of work in this area began during the «Kosygin reforms», when the economy of the USSR was growing at an unprecedented rate. Soviet scientists V. Pushkin and D. Pospelov, V. Turchin made a great contribution to the development of this direction.

Comparison of the human mind with artificial intelligence.

The question is often asked who can solve this or that problem with the human brain or a modern computer faster and better? This question became especially acute when developers in the late eighties of the last century created a computer chess program Deep Blue. In the first stages, she lost to a person. But the rapid development of computer technology in the nineties, the increase in processor power and data processing speed led to the fact that in 1997 the computer beat the world champion Garry Kasparov, which gave a new impetus to the development of artificial intelligence. Neuroscientists played a special role here, helping mathematicians and programmers to better understand the principles of the structure and operation of the human brain and the role of neural connections in it. Many scientists believed that the computer has entered an era when it begins to defeat humans on an intellectual level and that the era of humans is coming to an end. However, this is a premature opinion that nature has spent billions of years of evolutionary development on the creation of the human brain, carefully selecting the most effective form of intelligence. The computer has a rather small history of creation and is programmed to solve certain problems in a strict algorithm of actions from one sequence to another by the method of step-by-step work, according to how programmers write the code, leading a stream of sequential instructions. For such a flow, accuracy in performing each step is very important, because with the continuation of the sequence of actions at each stage of the computer's

calculations, errors will begin to occur, and they will accumulate, leading to serious errors. The human brain may be inferior to a computer in processing basic data, but machines will have to learn for a long time the plasticity of the brain and the super-complexity of its neural connections. So in the human brain, electrical impulses travel through axons. From one neuron to another, by means of a huge number of synapses and dendrins, which use chemicals in the form of neurotransmitters in the process of transmitting encoded electrical signals, and thereby filter information passing in a wide stream through neurons. The speed of a modern computer reaches up to 10 billion operations per second, while a neuron accumulates only a thousand signals during this time. Therefore, an electronic machine can outstrip the human brain in processing information in a narrow direction by a million times. However, humans have one hundred billion neural connections, and the length of neurons in the cerebral cortex alone is more than half a million kilometers. In the brain, electrical signals have a deep, multifaceted distribution, simultaneously capturing many parts of the cerebral cortex, its limbic part and the ancient brain, which provides multifunctionality of the brain and a wide impact, which in a small part is not available to a computer. Replacing the human mind in the near future with an artificial one is a very difficult and problematic task. Nevertheless, scientists continue to work on improving computers, creating more and more complex neural connections, which are gradually improved, and provide a person to expand the capabilities of his mind using artificial intelligence. For example, modern computers, thanks to the latest developments of scientists, use several processors simultaneously, ensure the parallelism of different areas of work, which contributes to machine learning and the development of artificial intelligence.

Spheres of application of artificial intelligence.

Scientific and technological progress does not stand still and the introduction of AI is closely related to this. We face this every day. For example, when we see an advertisement, we are most likely to like it, because artificial intelligence, using certain algorithms, analyzes what we like best. In addition, AI can be applied in many areas of human life. Education. Many schools have computer science orientation courses that go into AI in detail, and universities use data technology. Some programs monitor

student behavior, grade tests, and track attendance or activity in class. In business and trade. In the next few years, there will be new apps that work with digital assistants like Siri to make shopping easier. AI helps you make a lot of money. For example, Amazon, which analyzes consumer behavior and improves customer acquisition algorithms. Artificial intelligence is taking an increasing place in the manufacturing sector. According to a survey by marketing agency McKinsey, conducted among 1,300 top managers of the largest enterprises, 20% of plants and factories are already using AI. The ability of AI is used to monitor the work of an employee, thereby his salary will directly depend on his achievements or successes. In the banking sector. Reliable and fast data processing is very important, which is why AI is so in demand in the banking sector. Every year more and more banks are giving more and more of their work to artificial intelligence. They say that in a few decades, AI will make most of the decisions on its own. By transport. Also, artificial intelligence is used in the transport industry. It monitors the condition of roads, detects objects in the wrong places, monitors violations, helps people move faster. In logistics. AI capabilities allow companies to more efficiently predict demand and minimize production costs, choose the best amount of vehicles to transport cargo. In the state. Management. AI allows you to track violators, monitor the flow of the state budget, store and transfer information, and monitor social networks. In the judicial system. Developments in the field of artificial intelligence will help to globally change the judicial system and make it more independent. So in China, artificial intelligence began to be used in the judicial system. Machine intelligence analyzes data without experiencing emotion like a human. It collects and processes information faster than humans. It can also predict wrongdoing based on the database. In sports. Artificial intelligence is very popular in sports, as different coaches or sports teams analyze the personal data of players, also taking into account different factors in the selection. By analyzing the technique of the game or the physical ability of a person, the program is capable of greatly value to the athlete.

In healthcare medicine. Medicine is rapidly evolving thanks to artificial intelligence, as it helps diagnose diseases, do research when developing drugs or creating

health insurance. There are also many applications and devices that make life in medicine easier for people.

In the development of culture. Artificial intelligence helps people realize their cultural visions. Gradually, the role of the artist is being reassessed as uniqueness in creative work, artificial intelligence offers many new methods of perceiving the environment on the canvas, but it also leaves many new questions for people. Painting. Initially, it was believed that art is a purely human matter, but in our time we see the opposite. In 2018, Christie's, one of the world's most recognized auction houses, sold the first AI painting for nearly half a million dollars. When creating this painting, AI processed more than fifteen thousand portraits through neural networks and specially created algorithms.As a result of using various methods of creating paintings, using paints and halftones and strokes, a unique portrait was created using the experience of many artists. In musical culture. Programmers have created many advanced music programs using artificial intelligence to write new music. Artificial intelligence finds application in many areas of human life, imitating mental tasks. The photo. AI now has a lot of functionality in creating photos, but soon it will improve more, since the neural network recognizes the smallest changes in faces when modeling in a photo editor. This function is used by Apple, face id allows you to protect your phone from intruders.

The main problems of AI:

It is clear that the possibilities of artificial intelligence at this stage of development are not unlimited. Let's list the main difficulties:

1. Disinformation significantly affects the end result.

2. There is no definite multitasking, since all programs in our world are tuned to a specific task, this is a disadvantage compared to humans.

3. Intelligent machines are not autonomous. To ensure their «life» requires a whole team of specialists, as well as large resources.

Conclusion.

Computers today can replace humans in many areas of activity. With the rapid development of technology, they have the opportunity to do a lot of things that were previously only available to humans: recognize tests and reproduce them, compete with

a person in chess, check grammar and spelling, speak, recognize faces, dictate, beat a person in intellectual shows and so on. The time will come when quantum computers will be created, which will be fundamentally more powerful by several orders of magnitude than modern ones. They will accelerate the creation of neural networks, their training, which will contribute to the development of AI, but it is important to remember that AI is a more useful resource for humanity, it is important to foresee in advance all the shortcomings that hinder the development of this industry.

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