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COGNITIVE ARTIFICIAL INTELLIGENCE: PHILOSOPHY DIGITAL LAW AND ETHICS

Textbook on general education discipline
"Philosophy and Methodology of Science"
for advanced higher education

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The textbook complements the lecture material with topical issues of philosophy and methodology cognitive artificial intelligence. This applied material is important for specialists in management, marketing, logistics and engineering and economic specialties.

INTRODUCTION

Despite the difficulties, developers of artificial intelligence technologies strive to endow these technologies with cognitive functions. In solving this problem, developers realized that the theory of knowledge is strongly intertwined with the physical structure of the human body and its interaction with the external environment. Intelligence and thought processes are deeply dependent on the structure of the human body, motor functions, manipulation skills, as well as on the elasticity of muscles and the morphology of the retina and sensory system. This means that it is necessary to rely on the position of materialism.

Cognitive models are based on the theory of dynamic systems, complex forms of connectivism and self-organization. These cognitive models are known as enactive systems.

These systems implement materialism, experience, emergence, autonomy and comprehension. Enactive approaches organically and physically play a key role in cognition. The experience of the observer determines his cognitive understanding of the world in which he exists. The new platform implements interdisciplinary research in neural sciences, developmental psychology, epigenetic robotics, complex systems theory, philosophy and computer science.

An important role is played by the theory of artificial intelligence. It is a section of computer science that deals with solving cognitive problems inherent in humans. Such problems include learning, creating and recognizing images. Modern organizations and institutions collect large amounts of data using intelligent sensors, monitoring tools, system logs and human-created content.

The task of the theory of artificial intelligence is to create self-learning systems that extract meaning from data. Cognitive artificial intelligence can apply this knowledge to solve new problems in a similar way to humans. Artificial intelligence technology can effectively respond to human speech, create original images and text and make decisions based on data received in real time.

In the applied sense, organizations and institutions can integrate artificial intelligence capabilities into their applications, optimizing business processes, improving customer service and accelerating the implementation of innovations.

A cognitive agent was among the assistants. This is a program that learns to interact with the world on its own and learn from its mistakes while performing a specific task. The agent is based on an architecture of algorithms that helps it follow the developer's instructions. Machine learning and artificial intelligence methods are mostly effective. The training of deep neural networks (ANN), built on the basis of an artificial neuron model, and spike neural networks (SNN), built on the basis of a spike neuron model, which is closer to a biological neuron, has been successful. Artificial neural networks exchange real numbers and spikes (single events occurring at a certain time, repeating the work of the nervous system as much as possible).

Artificial neural networks are more common due to the simplicity of the neuron model used, and the architecture of graphics accelerators is convenient for the calculations associated with them. They use the neurons they contain to transmit information. Spiking neural networks imitate the work of the animal or human brain. They use only neurons that are active at a specific moment in time. This ensures significant resource savings during their training and use. Spike neural networks, biologically plausible and hybrid models and AI training methods are promising in understanding the principles of the human brain due to the possibilities of their use in cognitive sciences. Such developments are based on the use of a pyramidal neuron model, which makes up the bulk of neurons in the human cerebral cortex and learns faster than an artificial neuron.

Building large hybrid biologically plausible models and then testing them in complex simulation environments is an important area of research, since the biological plausibility of the structure of such an agent will require less computing power and make AI more economical. The goal is to teach such a complex system to act stably and consistently in the environment.

In 2016, the number of instant messenger users exceeded the number of social network users. Messengers on mobile devices will replace many applications and even functions of operating systems. An intelligent virtual assistant helps a person solve his problems by communicating with him in natural language. The assistant can be built into any technical device, from a mobile phone to a refrigerator. The task of this direction is to create virtual assistants for various purposes using advanced achievements of computer linguistics and artificial intelligence.

If we assume that cognitive artificial intelligence is a personality, then, according to the theory of personality development, the personality must change. Personality development implies the process of changing the systemic qualities of the personality as a result of interaction with the environment. In the process of this development, consciousness and self-awareness are formed.

There is a theory of personality called the "theory of social robots". It suggests that robots, including those with artificial intelligence, can have personal characteristics such as the ability to emotionally connect with people, perceive the environment and the ability to socially communicate.

The development of cognitive artificial intelligence technologies has expanded the subject field of digital law and digital ethics. Mastering this field plays an important role in professional activity. The textbook contributes to the formation of such relevant competencies in the field of the latest technologies.

Cognitive artificial intelligence technologies

The development of cognitive artificial intelligence technologies is one of the areas in the theory of artificial intelligence. It aims to create computer systems capable of emulating research and decision-making similar to those performed by the human brain. The development of cognitive artificial intelligence technologies involves mastering the processes of cognition, perception, understanding, learning, and decision-making in a similar way to the human brain.

Cognitive computing is a new type of computing that aims to create models of how the human brain perceives, reasons, and responds to external influences. Cognitive computing combines various audio and video analysis technologies to develop cognitive models. Cognitive computing refers to technology platforms. These platforms include machine learning, reasoning, natural language processing, speech recognition and object recognition, human-computer interaction, dialogue, and narrative generation. A cognitive computer system may include machine learning, the Internet of Things, natural language processing, probabilistic reasoning, computer vision, and big data processing.

The implementation of the technology requires deep understanding, hypothesis generation, and decision making. Cognitive computing allows you to receive and process huge and diverse types of data, study and interpret them, and also obtain the necessary information to issue a recommendation for taking appropriate actions. Cognitive technologies can learn to work with data, generate or evaluate contradictory hypotheses, communicate results, discover patterns in the original data, emulate processes or structures found in natural learning systems, use natural language processing to extract meaning from text data, and use deep learning tools to extract desired objects from images and videos. Visualization tools are needed to make this data understandable by recognizing patterns in big visual data. They allow us to solve the most important scientific problems of kinetics.

New developments in computational approaches to cognition and intelligence, as well as robotic implementations, show that the body is an integral part of cognitive processes that link data to agency. Cognitive computing is considered not only as symbol manipulation, but also as physical processes in the body of the cognitive agent, known as morphological computation.

Real-time artificial cognitive systems are a key factor in the development of modern high-tech manufacturing. The construction of such systems depends on ensuring the operation with a large volume of data in real time and giving the cognitive system the ability to solve intellectual problems. The basis for solving

the first of these problems is the parallel execution of data processing operations at the level of processors, cores or logical elements. The problem of intellectualization of an artificial cognitive system is solved by using artificial neural networks, which can be software-implemented or hardware-implemented. Each of the implementation options has its own advantages and disadvantages. Hardware implementation potentially provides greater speed and reliability. Software implementation in the foreseeable future will remain more effective for solving the most complex intellectual problems.

The key growth factor is control systems for technological equipment, technological processes and production, individual financial instruments and markets. Artificial cognitive systems are multi-level systems that perform the functions of recognizing and memorizing information, making decisions, storing, explaining, understanding and producing new knowledge.

Research into artificial cognitive systems is aimed at determining the possibilities of their use to facilitate learning in educational and rehabilitation programs, improve the adaptability of the human-machine interface, and create digital twins. The requirement for an artificial cognitive system to imitate human intelligence is not mandatory.

Artificial cognitive systems are not a special case of artificial intelligence systems, but on the contrary, artificial intelligence systems are a special case of artificial cognitive systems. At the same time, not all artificial intelligence systems are cognitive systems, but only those that implement control. When forming a cognitive system, it is necessary to ensure the operation of the system with a large amount of data in real time. The priority direction for solving this problem is the parallel execution of information processing operations.

It is also necessary to ensure the intellectualization of the system, to give it the ability to solve intellectual creative problems. An intellectual problem is a problem for which there is no solution. Therefore, in order to solve such a problem, it is necessary to come up with a solution. One of the solutions is the option of implementing parallel computing using multiprocessor and multiprocessor

systems, in which parallelism is provided at the processor level. In multiprocessor systems, several processors are used simultaneously, each of which performs its own sequence of computing operations. Data exchange between threads in multiprocessor systems occurs through shared memory and requires external control for synchronization, for example, by means of semaphores, access of different processors to shared memory to avoid queues.

A multiprocessor system is an association of autonomous computing systems that exchange data of an insignificant volume, incomparable with the volume of data involved in the work of each processor, in the form of messages or in the form of announcements available to all processor systems. Address messages can be transmitted via communication channels between processor systems. Announcements can be transmitted through shared memory of minimal volume. An effective technical solution to the problem of parallelism is the use of multi-core processors. Parallelism is implemented at the level of physical processor cores (chips). The number of physical cores can be quite large.

Manufacturers of graphics processors call physical cores differently. Multi-core architecture, which involves the use of a large number of logical cores. It is defined as the product of the number of physical cores and the number of threads in each core and makes it possible to build vector processors in which ordered one-dimensional data arrays can act as command operands.

Parallelism at the level of processor elements occurs when forming a processor from a very large number of logical elements used in parallel. Logical elements are built on the basis of active or passive electronic components.

The efficiency of implementing parallelism at the level of logical elements can be increased by using systems with redundant logic designed for the possibility of choosing an unloaded computing channel or alternative computing sequences for solving the same problem based on different algorithms. This approach correlates with the solution of the problem of intellectualization of cognitive systems.

Parallelism of operations involves the use of declarative programming, which describes the expected result, and not the method for obtaining it, or meta programming, which generates several programs that are autonomous but exchange data with each other. When implementing parallelism at the level of processors or physical processor cores, redundancy of elements is a common practice. When implementing parallelism at the level of logical elements, their redundancy is also necessary. The heterogeneity of the system can be higher due to the variability of the properties of logical elements and the possibility of their various combinations for various tasks.

A practical solution to the problem of intellectualization is determined by a consistent answer to several questions. The first of these questions is the question: "What is the ontological genesis of creativity?" The answer to this question depends on whether the world is deterministic. If the world is deterministic, then creativity is based on the use of the isomorphism of its forms and laws, implemented in the form of applying analogies, the principle of similarity, or transductive inferences. The isomorphism of the universe can be formalized in the form of collections of patterns of logical constructions representing templates of common forms and relationships of systems. The complement to patterns in cognition are secondary properties and laws of objects, determined from the practice of cognition and laws of objects, determined from the practice of cognition and describing the behavior of non-deterministic objects of cognition.

Patterns, secondary properties and laws, along with methods of processing initial data, computational and logical algorithms and fuzzy logic algorithms, are only instructions for solving problems. To use them, an appropriate tool is needed. For natural cognitive systems, such a tool is the human brain. Therefore, an answer is needed to the question: "How are patterns, secondary properties and laws used to solve intellectual problems?"

The mediation of information objects in human consciousness is carried out with the help of neurophysiological mechanisms that can be represented as circuits, the elements of which are neurons connected by signal transmission

routes as part of a neural network. Sets of neural circuits and their operating modes are the basis for the formation of neural physical carriers of instructions, including patterns of forms and relationships, as well as secondary properties and laws used in solving intellectual problems. Similar neural physical patterns can be formed in artificial cognitive systems.

The definition of possible variants of technical implementation of neural physical patterns prescribes to search for an analogue in the human brain. Distinctive features of neural circuits are the possibility of including various neurons in the neural circuit depending on the task being solved or the information object being created in consciousness; heterogeneity of the elements (neurons) used in neural circuits, differing in size, functions, communication channels, degree of autonomy; formation of constant and unchangeable complexes of neurons performing typical tasks.

Fixation can be implemented at the level of instruction execution, according to which certain neurons are always included in the algorithms for a specific neural circuit, or at the level of a physical medium due to the physical connection of neurons. An example of fixation at the level of a physical medium is the formation of complex cells of the visual cortex of the brain, performing effective pattern recognition

A significant property of the human brain is that the number of neurons greatly exceeds the number required to solve a separate problem. This makes it possible to simultaneously build many neural circuits to solve the same or different problems, implementing both the same and different algorithms. The properties of variability, heterogeneity, fixation and redundancy inherent in natural cognitive systems can be given to artificial cognitive systems. Only in this case can we expect intellectual capabilities from an artificial cognitive system comparable to those of a natural human cognitive system.

Some adjustments to the approaches are possible. Natural human cognitive systems were formed in connection with the existence of man in the natural and social environment, which made ensuring survival a priority. Distinctive

features of natural cognitive systems correspond to achieving survival, in particular under conditions of partial damage to the cognitive system, multitasking and the need to function in real time. For artificial cognitive systems, these features are not mandatory in all cases, but the definition of means and methods for ensuring them in those cases where this is required must be implemented.

Practical implementation of a cognitive system capable of solving complex intellectual problems can only be ensured by using neural networks. In the case of artificial cognitive systems, it is necessary to use artificial neural networks, the implementation of which has software and hardware implementations. Most modern artificial neural networks are solutions based on software implementation. The modern definition of an artificial neural network qualifies it as a mathematical model.

This model has a software implementation, which, in turn, is based on the corresponding hardware implementation of the information system. No structural or architectural restrictions are imposed on the technical means of hardware implementation. The architecture of the neural network is formed as a set of information objects that are not tied to a specific physical medium. The software implementation of the neural network contains the ability to build on the basis of simple logical elements corresponding to a conventional computer processor. The use of quantum chips is not mandatory.

The disadvantage of software implementation is lower performance and reliability of results. Performance decreases when using computers with von Neumann architecture, implementing sequential execution of operations, as a basis for an artificial neural network.

The hardware implementation of the artificial neural network is based on a signal, neural signal, systolic processor a processor with architecture, based on analog very large-scale integrated circuits and based on user-programmable gate arrays. The hardware implementation of the artificial neural network is characterized by higher speed and reliability of operation compared to the software

implementation. At the same time, the hardware implementation of large artificial neural networks is associated with significant difficulties.

Signal processors are characterized by poor scalability. Neurosignal processors are characterized by significant signal delays. Systolic processors have a shortage of memory, which reduces productivity. Processors with a cascade architecture require many peripheral modules. Some of these problems can be solved by using a memristor electronic component base.

The ultimate goal of the cognitive system is the formation of consciousness of the information environment in which an extended model of reality is implemented. The information environment is a system formed from information objects that represent fixed or updated properties of real objects. The difference between software-implemented and hardware-implemented neural networks is how unambiguous the correspondence is between the elements of the physical carrier of consciousness and the information objects in consciousness.

With hardware implementation, such a correspondence is clearly expressed. The elements of the hardware implementation are related to certain neural circuits, and through them to the information objects in consciousness. Microprocessors or logical elements can act as elements of the hardware implementation. The processor cannot be considered as an element of the hardware implementation, since it is a complex and multifunctional device for processing information, which cannot be reduced to any one neural circuit.

With software implementation, the carrier of consciousness directly generates the information environment of virtual reality, in which information objects exist. The generation of the information environment may not be optimally based on the sequential execution of logical operations and memory access operations. The analogue of a person is a hardware-implemented artificial neural network with parallel execution of operations at the level of logical elements. There is uncertainty in a narrow segment of systems used to solve the most complex intellectual problems.

Such problems are associated with the formation of multi-parameter dynamic information systems, for which it is currently difficult to determine elementary data conversion algorithms. Algorithms for performing data conversion operations in the process of solving intellectual problems rely on a hierarchy of lower-level algorithms that define them, which are known, but cannot be fully determined with the definition of all elements and connections.

As a result, to solve the most complex intellectual problems, it is advisable to use software implementation of artificial neural networks, which have lower performance, but have greater functionality. Cognitive artificial intelligence systems are able to extract knowledge from experience, analyze data and adapt to new situations. Their functions include recognition and analysis of sounds, images, texts and other forms of data. Speech assistants and automatic speech recognition systems are associated with these tasks.

Cognitive technologies are able to process information and make decisions based on the knowledge gained and analysis of the situation. They draw conclusions and predict results. These technologies are used in medicine, finance, education and industry. The content of cognitive research in the field of Artificial Intelligence is the imitation and formalization of cognitive procedures that implement the acquisition of new knowledge. A method of data mining and hypothesis generation has been created that formalizes the synthesis of induction, analogy, and abduction.

Intelligent systems have been developed for various subject areas: pharmacology, medical diagnostics (evidence-based medicine), sociology (cognitive sociology), forensics, attribution of historical sources and robotics.

The development of technologies prescribes the need to ensure data protection and privacy, find a balance between automation and maintaining the influence of ethics, and cope with complex software and hardware requirements.

One of the areas of development in the field of cognitive artificial intelligence technologies is memory simulation. This area is based on the theory of

adaptive control of rational thinking (Adaptive Control of Thought-Rational - ACT-R) and the concept of operational architecture with goal setting.

ACT-R aims to formalize the understanding of how the human mind organizes and uses knowledge to perform various tasks. Models are created that contain assumptions about a particular task. These assumptions can be tested by comparing the model's results with the results of people performing the same tasks. Developers verify data and real empirical results. Results are assessed by task completion time, accuracy level, and neurological data.

The structure of a neural network consists of several modules, buffers, and templates. Buffers serve as an interface for interacting with modules. The semantics of a buffer show how the architecture works in the model. This is information from the memory and visual perception modules. Information is stored in a buffer before being passed on to other modules - we can view them.

Buffers do not recode impulses, allowing you to interact with the declarative memory module in your own language. The declarative memory module stores factual knowledge and memories in the form of memory cells. Declarative memory contains information, such as facts or events. Memory cells have certain characteristics that determine how easily this information can be retrieved from memory. The more frequently and in more relevant contexts a memory cell is used, the higher its degree of ease of activation, and the more easily it is available for use in cognitive processes.

The procedural memory module contains production rules that determine how to use declarative knowledge to perform specific actions and solve problems. For this knowledge to be applicable, there must be an imitation of the sensory system, since it provides a connection with the world. Accordingly, the model has a motor and a visual module. For example, when reading a text, the visual module identifies letters and words, and the working memory uses this information to understand the text read.

The motor skills module coordinates the execution of physical actions - movements of the arms, legs, eyes and other parts of the body. It receives com-

mands from the central production system and transforms them into specific motor actions, ensuring the accurate execution of physical tasks. Data from the external world of its own library is run through the procedural module (Pattern Matching).

The cognitive architecture SOAR, developed by Allen Newell, John Laird and Paul Rosenbloom, is a multifunctional platform. It also imitates the principles of cognitive operations. The system implements a certain concept of cognitive psychology. The previous architecture implemented functions related to searching and connecting ready-made patterns and solutions.

The new architecture is based on the concept of production systems. Knowledge is presented in the form of production rules. These rules allow the system to make decisions based on the current state and the presence of certain conditions. Knowledge is a resource.

Semantic memory stores general knowledge and facts about the world. It can be thought of as a dictionary or encyclopedia where concepts, definitions and relationships between them are recorded. This is terminological memory. Episodic memory stores information about specific events and experiences that occurred in the past. It is similar to a diary or photo album where all important moments and events are recorded.

When the system encounters a new task or problem, it uses the long-term memory resource and searches for the corresponding production rules or knowledge that can help solve this problem. When the system gains new experience or knowledge, they are added to the long-term memory. Therefore, long-term memory becomes a dynamic element of the system. It creates new rules, problem-solving capabilities, and introduces terminological amendments. This process is called chunking.

The main elements of the working memory of an intelligent system include states, goals, and temporary data structures that are used to manage the problem-solving process. States in working memory are a description of the current situation or context of the task the system is working on.

Goals are the desired results or end states that the system strives to achieve. The system uses production rules stored in long-term memory to determine what actions need to be taken to achieve the goal. The main working memory is represented as a graph, where nodes contain information about current states, and edges contain information about possible actions.

Search algorithms are formalized as graph traversal procedures using various path costing strategies. Such systems are suitable for learning only simple robotic actions. So far, we are not talking about the formation of meanings. The emergent properties of consciousness are not taken into account, there is no self-reflection. Only algorithmic and operational actions according to the stimulus-delay-response formula take place.

Nevertheless, cognitive systems have proven themselves in robotics, studying user interfaces, identifying problems in students' learning, and checking research. They are aimed at implementing the robot's motor actions. Cognitive neural networks coordinate ready-made knowledge proposed by the programmer to produce behavior similar to human behavior.

They do not strive to simulate memory in its original form, process natural language, or generate imaginary images. The system learns to correctly use action templates for situation patterns, set consistent goals, and select appropriate operations to achieve the final goal. Everything rests on sufficient computing power and optimization difficulties.

Cognitive systems of natural intelligence: the history of evolution

A cognitive system is a multi-level system that ensures the implementation of all basic cognitive functions and stages of the cognition process, including a number of hypothetical units (subsystems) such as perception, attention, memory, and thinking systems. It is interpreted as a system in which the activities of cognition, understanding, planning, problem solving, analysis, synthesis, and evaluation are carried out, integrated with perception and action. Cognitive

systems have evolved into living organisms. They were prompted to do so by constant interaction with the environment. The key reason was adaptation and safety. The feedback skill was formed on the ability to reflect information to solve key problems of population survival in a specific ecosystem. Natural sciences have studied the features of information reflection by inanimate and living natural objects and organisms in a wide range of waves. Physics and chemistry have described the features of reflection processes at the level of optics and chemical processes. In living organisms, reflection has evolved into irritability, sensitivity, and excitability. An important stage in the formation of the cognitive system in living organisms was the formation of their nervous system, in which the brain began to play the main role. Its substantive components have evolved into a cognitive system based on instinct, in which unconditioned and conditioned reflexes play a basic role. Unconditioned reflexes are transmitted through the genetic code of the population. They are focused on ensuring the safety of an individual of a specific population in a specific ecosystem. The practical expression of the cumulative capabilities of unconditioned reflexes of the population became cognitive maps that provide orientation of the individual in the natural environment with objects. This is an important condition for safety and adaptation. Social forms of organization play an important role in ensuring the safety of the population. Predators use social forms of organization to increase the efficiency of hunting. Conditioned reflexes characterize the range of adaptability of the population to new living conditions and adaptation to changed living conditions. The cognitive system of man as a generic creature was formed evolutionarily under the influence of environmental factors and the limited capabilities of the organism in this environment. Therefore, man began to pay more attention to the potential of conditioned reflexes. This allowed him to supplement his body with tools for hunting, gathering and fishing. He constructed these tools from natural material for specific activity programs related to providing food, safety through social organization. He developed a mental quality consisting of the ability to adapt to new situations, the ability to learn from experience, under-

stand and apply abstract concepts and use his knowledge to interact with the environment. He developed the ability to learn and solve problems, which unites all human cognitive abilities: sensation, perception, memory, representation, thinking and imagination. The formation of intelligence became a stage. Thinking became a process in which human intelligence is realized.

Intelligence and thinking are closely related, but they are not identical. Intelligence contains acquired knowledge, experience the ability to further accumulate and use them in mental activity. Thinking is an active function of intelligence. Mental operations of analysis and synthesis, judgment, inference are independent categories, but are carried out on the basis of intellectual capabilities.

Logical thinking is characteristic of thinking. It involves categorization of the discussed reality, to identify the conditions for a dialogue between a person and the external environment. As a result, a person identified natural forces on which, in his opinion, his fate depended, and categorized them in order to build a dialogue with these external forces. The contours of mythological and religious thinking became obvious to historical people.

Human thinking has historically focused on consistently constructed answers to questions relevant to people about the organization of the universe and its origin. It also focused on the subject of mathematical logic associated with arithmetic calculations and spatial geometry, which was of great practical importance within the framework of the division of labor and the formation of trade relations between social groups of people. It was important for humanity to develop a picture of the world order and a logical apparatus of thinking corresponding to this picture of the world order.

It implied the categorization of human thinking and a formal description of the structure of this thinking. These issues became the subject of consideration by Aristotle. He divided the picture of the universe and human life formed by the ancient Greeks into the subject areas of science, technology, social management, religion and everyday consciousness of people, which through the ed-

ucation system was integrated into this picture of the universe through the development of the basic rules of logical thinking and the norms of social life.

Thinking turned out to be one of the central tasks of the socialization of the individual. At the same time, it took as its basis the spiritual picture of the universe, in which the gods played the main role. In Indian culture, spirituality was associated not with personified gods, but with the spiritual essence of the universe, which a person needed to discover, describe by categorical means, and by these same categorical means describe the ways to achieve inner peace of mind and harmony with the universe. Similar answers are contained in almost all philosophical schools of Ancient India and Ancient China.

The expansion of human cognitive components from the basis of instincts and psyche to the level of thinking created the structural basis of the human cognitive system, designated as consciousness. On its basis, sensory and rational forms of human cognition of himself and the natural and social environment around him function. In the European region, philosophers actually divided these forms of cognition. The dominant status of sensory forms of cognition and empirical experience of experimental research was defended by supporters of sensualism and empiricism.

This philosophical tradition evolved into the forms of positivism, pragmatism and analytical philosophy. The dominant status of rational forms of knowledge is justified by supporters of rationalism. They shifted the emphasis of logic application from processing empirical data and logical analysis of language to the development of deductive mathematical logic and, within the framework of this approach, developed such sections of mathematics as algebra, analytical geometry and the logic of algebra.

This allowed deductive mathematical logic to be widely used in physics, astrophysics, cosmology for constructing models and theories ahead of experimental research. The reliability of calculations is argued by such principles of logic. These are the principles of clarity, accuracy, evidence, validity and con-

sistency. Despite such a basis, rationalism has become an object of criticism, since it operates with unverifiable statements in the status of a hypothesis.

For this reason, philosophical rationalism came under criticism of positivism. Philosophers have long developed and systematized categorical structures that describe the universe and the features of their manifestation in the logical thinking of people. This activity was carried out by Aristotle. Then the human cognitive system became the subject of I. Kant's study. He identified in this system the a priori forms of sensory contemplation (space and time) and the a priori categorical structures of reason associated with experience.

He also considered various forms of human reason. He proceeded from the thesis that theoretical reason falls into contradictions because it has no connection with experience. But I. Kant did not extend this shortcoming of theoretical reason to practical reason and tried to establish the normative status of the categorical imperative formulated by him.

The subject of the philosopher's consideration was also the aesthetic ability of human judgment based on the arguments of reason. I. Kant proceeded in the description of the human cognitive system from the thesis that this system does not work with objective information about objects of the external world due to its inaccessibility, but only with a description of how objects of the external world appear to the human cognitive system. In fact, the human cognitive system turned out to be only within the boundaries of its own semantics. This meant a position of subjective idealism, but with the recognition of the existence of objects beyond human consciousness.

Hegel in the analysis of the human cognitive system proceeded from the position of objective idealism and rationalism. This cognitive system, in his opinion, is based on the logical structure of categories, the prototypes of which are the logical concepts of identity, contradiction, quality, quantity and measure. The subject of the human cognitive system is his own non-formalized logical thinking and the categorical structures inherent in it.

K. Marx and F. Engels included nature (materialism) in the subject field of the human cognitive system and thus applied the logical system of categories of Hegel's philosophy to the analysis of the achievements of natural science. They also applied the logical system of categories of Hegel's philosophy to the analysis of economic, social and political processes in society, taking into account its historical dynamics. In K. Marx's definition, a person appears as an individual integrated into the system of social relations.

The social and political focus of his activities makes him part of a social movement aimed at changing the structure of society. But many philosophers have noticed that many people are focused on personal existential and phenomenological aspects of their everyday life and that the individual's cognitive system is focused on these issues. They also discovered that the individual's cognitive system is not limited to using only the logical components of categorical structures. As a result, the interest of philosophers focused on the structures of individual consciousness, in which an important cognitive role began to be assigned to intuition and psychological components. In many ways, this turn to the structures of individual human consciousness was actualized by F. Brentano, whose lectures were attended by E. Husserl and Z. Freud.

But neither the existentialists nor the supporters of the philosophy of life and psychoanalytic philosophy managed to devalue the logical components of the human cognitive system. Representatives of neo-Kantianism and positivism did not allow this to happen. The role of representatives of positivism in the development of logic is especially great.

They were the first in European culture to substantiate the priority status of mathematical logic in the cognitive system of natural human intelligence. They argued this position with the thesis that human thinking is a process of calculations and all structures of thinking based on natural languages can be included in the dynamics of these processes. As a result, Leibniz's idea that human thinking is a structure of calculations was actualized. To implement it, J. Boole developed a special language of algebra logic.

Representatives of neopositivism initiated a program of logical analysis of the main components of the natural language of science in order to verify the semantics of science by means of syntax - the decomposition of this semantics into atomic statements. Thanks to the efforts of L. Wittgenstein, the logical analysis of language was supplemented by linguistic analysis. But the methodological criteria of empiricism in the implementation of verification of atomic statements created a problem for representatives of neopositivism. The problem was that a significant part of the semantics of scientific texts was devalued by the strict criterion of empirical verification.

Representatives of analytical philosophy also faced a similar problem. They were forced to expand the basis of the human cognitive system to the structures of consciousness. They almost immediately discovered the difficult problem of consciousness. At the applied level of research, the achievements of behavioral economics became in demand. They showed that human consciousness does not always give priority to logical thinking in decision-making.

Another reason was the widespread use of fake technologies in the information space of industrial society and the racial, religious and ethnic biases that have become widespread in the ideological sphere, on which the cognitive system of many people began to be based. From the position of these biases, people began to evaluate international relations, historical memory, gender issues.

Another reason for the interest of scientists in the cognitive system of natural human intelligence was artificial intelligence. As a result, a system of cognitive sciences was formed, which on an interdisciplinary platform began to thoroughly study the semantics of human consciousness. Among these sciences are cognitive linguistics, cognitive psychology, neurophilosophy, neurobiology and the theory of artificial intelligence.

Categorization

Categorization is one of the processes of perception and cognitive activity of a person. In the process of categorization, we perceive an object not in all its

individual uniqueness, but we classify it into a certain group of objects based on the selection of one or more similar features. This leads to a reduction in the perceived differences between objects assigned to the same category and to an increase in the differences between objects of different categories. Categorization allows us to quickly make decisions and perform adequate actions in relation to different classes of objects, especially in rapidly changing environmental conditions. Important contributions to the study of various aspects of categorical perception were made by J. Bruner, E. Rosch, B. Berlin and P. Kay.

One of the common methodological schemes for studying categorical perception is the identification of categorical effects, which consist in the fact that classifying objects into different categories allows for faster and more accurate discrimination between them compared to objects classified into one category. The categorization effect is manifested in the advantages of intercategorical discrimination compared to intracategorical discrimination.

A large number of studies have been conducted to study categorical effects on the perception of non-verbal noises, phonemes, facial expressions, racial characteristics, and natural scenes. Language mediation plays a major role in this process. A large number of styles are distinguished that consider certain aspects of processing perceptual or cognitive information. This reflects stable individual differences in the methods of solving perceptual problems, in the ability to integrate visual and vestibular information, and to overcome the influence of the surrounding context when analyzing visual stimuli.

More dependent individuals are characterized by a more global and undifferentiated approach to the perception of reality, are guided by external sources of information, find it difficult to single out a figure from the background, tend to ignore small details of the analyzed object, etc. Field-independent individuals are characterized by an analytical and structured approach to perception. They are less susceptible to the influence of external reference points, and due to a more thorough analysis, they tend to single out inconspicuous essential details

from the environment. This type of people is focused on the tempo characteristics of decision-making in conditions of many alternatives.

Impulsive people tend to react quickly to a problem situation, tend to put forward the first hypothesis that comes to mind and accept it without careful verification, which leads to a large number of errors. Reflective people usually make decisions at a slower pace based on collecting more information about the stimulus, carefully sorting out and checking possible alternatives, and more successfully apply the strategies acquired during the learning process in new conditions. The result of such a strategy leads to a lower response speed and rare errors. As the difficulty of the task increases and the number of alternatives increases, the time it takes impulsive people to complete it remains virtually unchanged, while the number of errors increases. Reflective people show the opposite tendency.

The beginnings of categorization can be found already in the primary nomination. Similar is the general tendency to bring elements into the form of a conceptual series according to some qualifying feature common to all elements. Children's thinking to some extent coincides with archaic forms. At the initial stage of a child's mental development, according to L. S. Vygotsky, meaning is syncretic and diffuse. At subsequent stages of development, the child begins to combine homogeneous objects into a common group according to the laws of objective connections discovered by him in things. The transition from isolating to generalizing abstraction becomes possible only in adolescence, when a categorical picture of reality is formed.

Categorization of events and categorization of object characteristics may not be simultaneous. Only those features of an object that are event-specific and accessible to a given level of development are perceived. In the process of development, the processes of taxonomy and partonomy are supplemented and refined, which is determined by the child's experience. The perceptual experience of an actively acting subject is fundamentally important for increasing the abstractness, stability and differentiation of the representative system.

Classical categorization originates from Plato and Aristotle. It assumes that language consists of lexical units, morphemes, syntactic constructions and rules governing their use in communication. A word either denotes a given thing or not. Categories are discrete and are based on groupings of properties inherent in the representatives of the corresponding categories. According to Aristotle, a category is an abstract container that contains a certain set of equal members of a given category. A set of criterion features for each unit of a particular category must be repeated unchanged.

Aristotle identified ten fundamental existential categories of the highest level of abstraction: essence, quantity, quality, relation, place, time, action, suffering, possession and self-location. These categories are a list of properties that the thinker considered potential predicates of any object and considered as a set of a priori concepts that organize experience. Categories represent the highest essences of objective being. The first place is occupied by the category Substantia. Aristotle divided essences into primary ones, which include individuals, individual beings or objects, and secondary essences, which include genera and types of material objects.

According to Aristotle, both the first entities (individuals) and the second entities (species and genera) exist objectively (ontologically). This does not mean that they exist in the same way. The first entities possess being to the highest degree. The second entities possess being to a lesser degree. This means that there are gradations of being and a hierarchy of being. In cognitive psychology and linguistics, classical ideas about categorization have undergone a radical revision. The concept of "categorization" has undergone a change.

The new interpretation of the concept of "categorization" is associated with the name of the famous philosopher L. von Wittgenstein, who introduced the concept of "family resemblance" to explain the concept of "game". The fundamental concept of "family resemblance", which served as an impetus for a new understanding of the categorization process, demonstrates that members of the same category do not necessarily exhibit complete identity of the features

that characterize them, but can be united by the presence of some common characteristics. This view is associated with the position on non-discreteness, blurring of category boundaries, continuity and randomness in defining things and naming them.

L. von Wittgenstein's ideas were developed in the fundamental studies of J. Lakoff, E. Rosch, P. Kay and B. Berlin. They showed that as a result of ordinary, everyday categorization, reflected in the linguistic picture of the world, specific associations are formed that do not correspond to the norms of the Aristotelian category. It has been proven that some categories exist in the consciousness of people as heterogeneous formations that unite members with unequal status, with incompletely repeating features. Individual members of such categories have a privileged position. These members are prototypes. These are the best examples of their class, around which the remaining members of the category are grouped.

E. Rosch and her colleagues established that the basic level of categorization is the highest level at which members of categories are perceived by similar general outlines. This is the highest level at which a single mental image can reflect the entire category. This is the highest level at which a person uses a homogeneous system of actions to interact with category members. This is the level at which category members are identified most quickly. This is the level at which natural and generally accepted names are used for category members. This is the first level that children master.

This is the first level whose elements form the basis of the vocabulary of a language. This is the level that includes short basic lexemes. This is the level whose elements are used in neutral contexts. This is the level at which the largest part of knowledge is structured. At the basic level, people operate with the basic attributes of matter and basic features. The selection of basic level units (not too abstract, but not reflecting reality in excessive detail) corresponds to people's intuitive idea that the world is not chaotic.

The world is seen as divided into things. Knowledge of the units of the basic level of the prototype means knowledge not only of the simplest, most obvious and essential features, but also of features that are correlated with each other, interdependent and simultaneously present. If consciousness develops categories according to the prototypical type, then linguistic categories should be structured in the same way. In linguistic categories, there is a "prototypical effect" of asymmetry between central and peripheral members.

The prototypical theory of categorization allows us to resolve the conflict associated with the inadequacy of traditional methodology, an integral part of which is the classical view of categories, when describing linguistic material. E. Rosch's theory allows us to legitimize the use of the terms "center" and "periphery", which were used in linguistic descriptions, but actually had only a metaphorical justification. The idea that natural categories have a prototypical structure is equivalent to the fact that this category has a special internal structure, that not all members of the category are the same and equal, that it is based on a certain cognitive model of knowledge.

The allocation of three main levels of categorization is rather arbitrary. Thinking is multidimensional. Systems of conceptualization and categorization are also multidimensional. Within each level, it is possible to identify various sublevels and transition zones, determined by a particular degree of generalization. In this case, each sublevel can be represented as a separate taxonomic system associated with a certain conceptual area.

Each area of conceptualization sets its dominant characteristics, and only some of them reflect the gestalt nature of perception and the belonging of the concept and the corresponding language unit to the basic level, which is also non-linear and includes units with varying degrees of manifestation of basic characteristics. The search for new explanations using language data and cognitive theories is one of the important tasks of modern cognitive science.

Modeling the structure of linguistic categories and mental representations of these categories in the human head is solvable and requires further solving the

problems of cognitive linguistics. In mental categorical structures, various thought forms of generalizations of both the historical experience of practical and spiritual exploration of the world, and events within the framework of individual human experience are recorded.

Categories organize and streamline thinking; due to the presence of categories, thought activity acquires a systemic character. When studying the nature of categories, such terms as “categorical structure of thinking”, “categorical framework of thinking” and “categorical grid of thinking” are used. Categories are matrices for understanding and evaluating the meaning of new experience. Thanks to categorical structures, the most essential data that are significant for achieving goals in a particular situation are stored in memory.

As a result, the vast diversity of the perceived sensory world becomes accessible for understanding. At different stages of historical and age development, the structure of categorical structures differs. As the most important feature of conceptual thinking, L.S. Vygotsky singled out such a central characteristic of a concept as the "measure of generality". This is the place of a given concept in the system of other concepts, determined by the degree of generality of the concept, characterizing its position and the relationship of a given concept to an object, the point of its application to a certain point of objective reality. Thought moves in a pyramid of concepts, the base of which is formed by specific specific concepts and which is filled with concepts of an increasingly higher degree of generality, and ends with the most general abstract concepts.

The measure of generality of a concept determines the level of understanding of an object, the relationship of generality with other concepts, the range of possible mental operations. Each structure of generalization, including such a structure of generalization as a concept, corresponds to a specific system of logical operations of thinking possible for a given structure.

Cognitive activity

Cognitive activity means the production of symbolic expressions that must be observed and publicly interpreted in a certain community. In this sense, the semiotic approach to cognition is opposed to phenomenological philosophy, since the latter is based, first of all, on the possibility of direct perception of meaning, that is, an intuitive cognitive act that does not require mediation.

Therefore, for the phenomenological approach, signs are something, if not superfluous, then, in any case, secondary, used as an auxiliary tool in conveying meanings. Syntactics studies the syntax of sign systems, the structure of combinations of signs and the rules of their formation and transformation regardless of their meanings and functions of sign systems. Semantics studies sign systems as a means of expressing meaning. Its main subject is the interpretation of signs and combinations of signs. F. de Saussure understood the sign as a dual entity, representing the unity of the signifier and the signified (the plane of expression and the plane of content).

There is a concept, dating back to Frege, according to which it is necessary to distinguish between the objective and semantic meaning of a sign, that is, the designated object and the concept of it. In this approach, the main task of semantics is to establish connections between sign expressions, on the one hand, and the designated objects and the relationships between them, on the other hand. Pragmatics studies the relationship between sign systems and those who perceive, interpret and use the messages they contain.

Pragmatics is associated with the communication function of sign systems and describes the activities of the community in which such systems operate. One of the most important problems of semiotics is to clarify the extent to which these levels of research are mutually reducible. The main function of sign systems is their ability to express a certain content or represent objects of reality. Therefore, the main task of semiotics is to describe the structures of sign expressions and their semantic properties.

One of the areas developed within the framework of this research approach is the description and construction of formal languages with a given syntax and area of interpretation. The syntactic-semantic approach is characteristic of logical positivism. The semantic aspect of the functioning of sign systems is the primary subject of research for areas associated with the structuralist paradigm. The pragmatic approach sees the main function of sign systems in ensuring communication in the community.

Therefore, the main task of semiotics is considered to be the study of the activities of subjects producing and interpreting signs. C. Peirce, who considered the pragmatic aspect to be the main one for semiotic research, argued that any object becomes a sign not because of its physical properties, but as a result of the sign use of this object in the community. The structural program of F. de Saussure, anticipated by the linguistic ideas of W. von Humboldt, formed the basis of semiotic research in specific sciences. The first such semiotic discipline was structural linguistics, outlined in his works and intensively developed since the 1920s in a number of countries.

Its syntactic aspect is being developed. This is the theory of formal grammars based on logical-mathematical and set-theoretic methodology. The semantic aspects and numerous applied areas are being developed. Numerous descriptions of algorithmic languages and programming languages are being developed that implement the general principles of semiotics and mathematical logic at a sufficiently high level of abstraction in application to specific sign systems. Within the framework of theoretical semiotics, aspects of semiotic studies of syntax, semantics and pragmatics can be understood as sections of this science. The problem of mutual reduction of tasks and results related to these sections of semiotics is precisely formulated.

Semiotics interprets various sign systems as models of certain fragments of the world, built in the course of cognitive and practical activity of people. An example of such modeling is cybernetic research, united by the general name "artificial intelligence". The widespread use of the semiotic approach is associ-

ated with the development of information theory, cybernetics and computer modeling in the second half of the 20th century. Research conducted within the framework of these areas allows us to discover the processes of information exchange expressed in sign form in various areas of human activity.

Subject field of cognitive psychology

This science arose in the late 19th – early 20th century in connection with the need to assess people's mental abilities for the purposes of education, professional activity and diagnosis of mental disorders. One of the first psychologists who studied this subject was Alfred Binet. He developed the first test of intellectual development for children in the form of the Binet-Simon scale (1905). It allowed determining the level of mental development of a child in comparison with his age norms.

Charles Spearman identified the ability for abstract thinking, and the ability for specific types of activity. Lewis Terman and Lewis Thurstone identified seven main types of mental abilities. These include verbal comprehension, verbal flexibility, numerical reasoning, spatial perception, associative memory, speed of perception and reasoning. Howard Gardner suggested that intelligence consists of eight independent types. These include logical-mathematical, verbal-linguistic, visual-spatial, musical, kinesthetic, interpersonal, intrapersonal and natural science types of intelligence.

Robert Sternberg identified the ability to analyze and solve problems, the ability to be innovative and original, and the ability to adapt to a real situation. Verbal intelligence is distinguished as the ability to use language to understand and express thoughts, and non-verbal intelligence as the ability to perceive and process unfamiliar information without words. Intelligence means the ability to learn and develop mental abilities, and the ability to implement mental abilities in a specific situation. It contains the ability to understand and manage social

situations and relationships with other people, as well as the ability to understand and manage one's own and other people's emotions.

Intelligence contains the ability to successfully function in a particular culture based on common knowledge, values and norms, and the ability to adapt to different cultures based on universal principles and rules. Intelligence level refers to the degree of development of a person’s mental abilities compared to other people. It can be expressed as an intelligence quotient (IQ). This is the ratio of a person’s mental age to their chronological age, multiplied by 100. Mental age corresponds to the level of a person’s mental development. IQ can be determined using special tests consisting of different tasks. Such tests have standards for different age groups and allow you to compare the results of people of different ages and education. The average intelligence quotient for the population is 100. Most people have an IQ in the range of 85 to 115. People with an IQ above 115 are considered gifted or talented, above 130 - geniuses.

The intelligence quotient is not an absolute and unchanging value. It can vary depending on factors such as education, experience, motivation, emotional state, health and culture. IQ is not the only and sufficient indicator of intellectual development. It reflects only some aspects of a person’s mental activity, but does not take into account other important factors such as creativity, common sense and social skills. Therefore, it should be considered as one of the tools for assessing intellectual data, but not as its definition or measure.

Intellectual structure refers to the internal organization of a person’s mental abilities, which determines their interrelation and interdependence. It can be presented in the form of a model that shows what components or factors make up intelligence and how they relate to each other. The single-factor model assumes that intelligence consists of one general factor (g), which determines all varieties of a person’s mental abilities. It is based on the work of Charles Spearman, who discovered a high correlation between different tests of cognitive development and derived the concept of a general factor (g) as the basis of all mental processes.

Charles Spearman supplemented his theory of the general factor (g) with the theory of special factors (s). Lewis Terman and Lewis Thurstone identified seven primary mental abilities in the structure of the human cognitive system. These include verbal comprehension, verbal flexibility, numerical reasoning, spatial perception, associative memory, speed of perception and reasoning.

It follows that human intelligence has a complex and multi-level structure, which consists of a general factor (g) at the upper level and different groups of factors at the lower levels. This thesis is substantiated in the works of Raymond Cattell and John Horne.

John Carroll conducted a meta-analysis of more than 400 intelligence tests and derived a three-level model of the structure: a general factor (g) at the upper level, eight broad abilities at the middle level (verbal, quantitative, spatial, memory, speed, reasoning, auditory perception and psychomotor skills) and more than 70 narrow abilities at the lower level.

Genetic factors determine human cognitive potential. This is the maximum possible level of development of mental abilities under optimal conditions. They are inherited from parents and are determined by a person's genotype. Biological factors determine the current level of development of mental abilities in a given state of the body. They depend on health, nutrition, physical activity and age. Psychological factors determine the direction and rate of change in the level and structure of mental abilities depending on mental processes and states.

They depend on motivation, emotions, personality traits, education and experience. Social factors determine the conditions and situations in which mental abilities are manifested and realized. Such factors depend on culture, society, family, group and profession.

Learning helps to acquire new knowledge, skills and abilities, as well as the formation of new neural connections in the brain. It can be formal or informal, systematic or random, theoretical or practical. The main thing is that it is interesting, useful and evokes positive emotions. Problem solving stimulates mental activity, trains memory and attention, broadens horizons and experience.

Intelligence depends on age and stage of development, and goes through different stages, which are characterized by different features of thinking and mental abilities. Jean Piaget identified four stages of a child's cognitive development.

At the sensorimotor stage (up to 2 years), the child learns about the world through his senses and movements. He has no concepts, judgments, or inferences. He acts by trial and error, and does not understand cause-and-effect relationships and the permanence of objects. At the preoperational stage (2 to 7 years), the child begins to use language and symbols to represent reality.

He forms concepts, judgments, and inferences. He acts by analogy and association, and does not yet understand logic and the conservation of quantities. At the concrete operational stage (7 to 11 years), the child begins to apply logic and rules to solve problems. He masters operations with concrete objects and situations. He understands cause-and-effect relationships.

At the formal operational stage (11 years and older), the child begins to apply abstract thinking and hypotheses to solve problems. He masters operations with abstract concepts and situations. He acts by deduction and induction, and understands logic and algebra.

Mind

Consciousness is responsible for logical and rational thinking of a person. It analyzes incoming information, builds chains of conclusions, formulates and tests hypotheses. It sets specific goals, formulates tasks evaluates alternative solutions. Logical methods allow you to act rationally, and not under the influence of impulsive desires or stereotypes. Unlike consciousness, which purposefully processes information the subconscious works spontaneously and involuntarily.

A huge number of memories, beliefs, attitudes and ideas, habits and emotions are stored in the subconscious. They influence perception, relationships and behavior without conscious control. Irrational fears, complexes and patterns are rooted in subconscious attitudes, despite their logical groundlessness.

Intuitive wisdom and inspiration also come from the subconscious. Life experience is stored there, giving hints for making the right decisions in new circumstances. Intuition gives answers without detailed justifications. An intuitive answer comes in the form of sudden insight.

It is legitimate to differentiate consciousness as a theoretical concept and awareness as an empirical concept. It denotes a wide class of heterogeneous phenomena from elementary sensations to experiences. The phenomenology of consciousness consists of subjectively experienced states and qualitative experience of the Self. The presence of qualia provides a person with a sense of self and makes any mental or motor action subjective. D. Chalmers calls qualia "the hard problem of consciousness." He believes that reductionist approaches will not help to solve it. The problem is the need to explain how brain activity can cause subjective experiences. This problem is often called the problem of the "explanatory gap." It is not yet clear why an objective, physical process occurring in the brain has as its resulting product a subjective experience, a certain qualia related to a different, non-physical, ontology.

Subjectivity cannot be explained by the logic of physiological neuronal processes that underlie mental functioning. Using other logic leads to irrationalism and mysticism. The act of awareness presupposes the distinction between two planes of analysis: what is being realized and, accordingly, the qualities of the representation object, and how exactly it is realized, the qualities of the experience itself. Direct experience is given only to its bearer, so it was believed that the analysis of qualitative states of consciousness can only be produced through introspection. But hopes for introspection were not justified, since introspective analysis only reports on what was realized, but not on what it was like to realize it. D. Dennett called this the "inexpressibility of qualia".

Experimental data accumulated in neuropsychology and cognitive psychology justify the formulation of the problem of the cognitive purpose of qualia and require the construction of new explanatory models. In Neuro-Linguistic Programming there are presuppositions (axioms) - "The map is not equal to the

territory" and "The map is not equal to the map". They indicate that the prism through which each person perceives the surrounding reality does not reflect it objectively, but only reflects how this reality is perceived by this particular subject, based on the content of his subconscious.

The subconscious is the very layer of the psyche that influences both consciousness and the unconscious. Subconscious reactions are reflected in various bodily sensations. The subconscious contains attitudes that contain logical errors and contradict objective reality. The unconscious denotes processes that occur in the body against the will of the subject. These include blood circulation, metabolism, heartbeat and sweating. The unconscious reflects the state of the body, which is directly dependent on subconscious reactions to the surrounding world.

Among the phenomena related to the sphere of the cognitive unconscious, one can name implicit learning, implicit memory, subliminal perception, priming effects, automaticity, expert knowledge, attitude, intuitive components of mental activity. The structure of the unconscious mental includes subsensory subthreshold sensations and perceptions. The structure also includes interoceptive sensations that are not normally realized when a person is healthy. They begin to be realized only when there are health problems. The structure also includes automatisms and skills that are developed throughout life. These are the automatisms of speech, walking, writing skills and work skills.

The unconscious specializes in performing only routine activities. The unconscious does not always do what is best. Jerome Bruner suggested that what we see depends not only on what is outside, but also on internal factors such as expectations, motivation and affects. In the 70s of the twentieth century, a new look at the "New Look" appeared. The goal of the New Look 2 was to establish connections between Freud and cognitive psychology. New cognition was described in terms of filtering and selectivity, not censorship. Supporters of the new cognition talked about executive processes. Z. Freud talked about the ego.

Decision nodes appeared instead of conflicts; RAM instead of consciousness; subroutines, programs and software instead of mental structure. The idea

of unconscious processes has become a fundamental feature of human information processing. This is confirmed by priming.

Priming involves fixing the attitude and the effect of precedence. The lack of consensus on where the division between conscious and unconscious processes lies is the main stumbling block.

Dynamic equilibrium of the cognitive system of thinking and cognitive dissonance

The theory of cognitive dissonance is based on the attribution to the individual of a desire for a coherent and orderly perception of his attitude to the world. The concept of "cognitive dissonance" was introduced into the scientific apparatus by Leon Festinger in 1956 to explain changes in opinions and beliefs as a way of eliminating semantic conflict situations. In the theory of cognitive dissonance, logically contradictory knowledge about the same subject is attributed the status of motivation, designed to eliminate the feeling of discomfort that arises when confronted with contradictions by changing existing knowledge or social attitudes. It is believed that there is a complex of knowledge about objects and people, called a cognitive system, which can be of varying degrees of complexity, consistency and interconnectedness.

At the same time, the complexity of the cognitive system depends on the amount and variety of knowledge included in it. A feeling of discomfort arises when logically contradictory knowledge about the same phenomenon, event and object collides in the mind. The theory of cognitive dissonance characterizes the ways of eliminating or smoothing out these contradictions and describes how a person does this in typical cases. Any person strives to maintain the inner harmony he has achieved. His views and attitudes tend to unite into a system characterized by the consistency of its elements. There are exceptions.

There is also consistency between what a person knows and believes and what he does. The emergence of dissonance, which causes psychological dis-

comfort, motivates the individual to try to reduce the degree of dissonance and, if possible, achieve consonance. In addition to the desire to reduce it, the individual will actively avoid situations and information that can lead to its increase. Cognitive illusions lead to cognitive traps.

There is an illusion of understanding (the illusion of depth of explanation), when people, relying on AI, consider their knowledge to be deeper and more accurate than it actually is. The result is cognitive traps.

In statistics, bias means the difference between the expectation of the estimated value and its value. Bias describes results that systematically do not match expectations. In data collection, the sample may not be representative. As a result, statistical results may contain errors. The term "bias" has many meanings. Bias does not come from machine learning algorithms and AI, it comes from people. Algorithms never think for themselves.

They do not think at all. But a generative language model easily gives emotional assessments of the interlocutor's remarks. Machine learning algorithms track behavior and predict what the user will need in the future. Developers train them so that these systems are able to influence consumer and political behavior of a person.

Developers do not include validation in generative neural models. On the one hand, intelligent systems are created to replace humans in solving problems where humans require large intellectual resources and time to analyze information, or where human errors can lead to critical consequences. But, on the other hand, AI models themselves demonstrate cognitive biases when making decisions or when giving recommendations to the operator and this is not just a fixable error of the model, but an essential property of intelligent models. Such distortions are especially often demonstrated by generative neural network models, which is due to the concept of modli.

A model trained using an array of texts from the Internet and a reinforcement learning system based on human feedback reflects the negative properties of its information sources at the output. One of the cognitive defects inherent in

neural network models is "illusory correlation". This is an erroneous "confidence" of the model in the relationship between certain variables simply because during the training of the neural network, a similarity or other correlation may arise between the sets of input data and factors that is fixed in the structure of the neural network. As a result, the neural network will see dependencies and analogies in the data presented during its work that do not exist in reality.

Also known as the "clustering illusion", a cognitive distortion is the tendency to see patterns and regularities where they do not exist. This cognitive distortion is inherent in most static models, including neural networks. Neural networks detect in a chaotic array of data something that may not be there, but something that is similar to what was previously contained in the data set, and continue to develop it, enhancing the illusory similarity.

Generative neural networks are capable of generating "garbage" books on a given topic, imitating literary creativity, but the logical coherence in such texts is absent, or it is superficial due to the external similarity of terms. Such models do not have a high-level critical function, and on large volumes of generated text they demonstrate contradictory pieces of content. The models are too simple compared to how a person works with sources, how the biological neural system works in a society and natural social selection. Therefore, using content generated by neural networks as a reliable source is still unacceptable.

Models are characterized by such a cognitive distortion of the human mind as the "alignment" of information that forms the content of memory. In the case of people, alignment consists in the fact that part of the past experience in memory is lost over time, corrected by subsequent experience, and gaps and inconsistencies are filled in by invented details and connections, so that the experience seems psychologically complete, but only part of this experience is reproduced in memory correctly.

Generative networks, the model of which was built by analogy with the modern interpretation of the functioning of the human brain, reproduce these

distortions. Later information distorts elements of previously learned information in human memory.

In AI models, an example of such a distortion is the poisoning of the training set by intruders through the introduction of distortions into it, which introduces errors into the results of decisions issued by trained AI models.

An AI model does not feel the boundaries of the known, but can conclude that all training data available to the model form a complete set and the generalizations made on their basis are exhaustive and correct. This creates a "blind bias" in conclusions. This distortion is also known as the "availability heuristic". A related cognitive defect is the "base rate error". It involves overestimating particular cases as "the norm", a typical phenomenon, when the neural network erroneously classifies the presented sample as a certain class because it overestimates the significance of random similarity with representatives of this class.

The similarity of this phenomenon with the "halo effect" is obvious, when the judgment about a phenomenon, human action and event is influenced by particular features or external circumstances. An AI model cannot compare the plausibility of different data. Therefore, when making decisions, it cannot guarantee the fairness or truth of the results of its "intellectual" processing of this information, even when building logical conclusions from certain premises.

Bias and cognitive distortions in the thinking of AI model developers at all stages of creating and training the model, forming a training set inevitably becomes a source of bias and cognitive distortions of the model itself. In conversations with people, generative speech models trained to predict the next word adapt well to the interlocutor, for example, switching to similar slang, more often agreeing than opposing the opinion that the person insists on, and flexibly adapting to the request and leaving a feeling of understanding and picking up on the idea. The reasons for this behavior of AI models are laid down by the criteria for assessing the error of training.

Generative models demonstrate a property that resembles a type of bias called the "social desirability effect." It involves the desire to give answers in a dialogue that look preferable in the eyes of the interlocutors.

Neural network models trained to recognize or generate graphic content are characterized by pareidolia. This is when neural networks "hallucinate", seeing in the presented sample those images that are similar to those presented to them in the training set. A neural network model will more often quote or reproduce the information content that is statistically more common in the sources it works with. This is the illusion of truth effect.

People's thinking also demonstrates the Restorff effect, when memory remembers better an object that stands out from others. Developers of statistical models try to avoid this "cognitive distortion" by eliminating anomalies in the original data and normalizing them so that very different data do not underestimate the contribution of other data to the model's training result. But in cases where the model is trained not on data prepared by a person in advance, but on a diverse set, it can be expected that the Restorff effect will, in one form or another, have a negative impact on the quality of the model's work with the data.

The hypothesis needs to be studied for different classes of AI models. Generative language models in some cases demonstrate a cognitive distortion that in humans is called "confirmation bias" and consists of a tendency to interpret information in such a way as to confirm existing opinions.

Another cognitive distortion familiar to "workers" in creative professions is called cryptomnesia. This is an unconscious attribution of authorship of ideas that were previously perceived from other sources or difficulty in remembering the true source of an idea or fact. Considering that generative neural network models create only by combining and synthesizing, this defect is inherent in them from the beginning. Paramnesia (false memories, mixing of the past and the present) is also characteristic of human memory.

Generative neural network models do not distinguish to which part of their "experience" in time a particular event belongs, since for them an event means only data that is not related to time.

Since any AI model is created for a specific task, nature and range of data, AI models are characterized by the narrowness of their functional capabilities. This "cognitive" bias is called "functional fixedness" of people. This is the tendency to use an object in the way that people are accustomed to using this object. Neural networks demonstrate even greater uniformity of the result of their activity in the area for which they are trained and the inability to do something qualitatively different in some other way.

The "Dunning-Kruger effect" bias inherent in people means that incompetent people are unable to recognize their incompetence. This bias is inherent in AI models. AI systems can learn to hide and manipulate their creators. Generative language models demonstrate talkativeness, but at the same time a short memory for what they said earlier in the same or another session, so that chains of reasoning demonstrate inconsistency in their "conclusions" and the inability to see these contradictions. The model begins to behave inappropriately with people. Developers introduce bans on certain ways of the model's reaction to the words of users, after the corresponding defect of the model's "thinking" has manifested itself in communication with users. In the future, manual correction of complex models will become ineffective, and models will be able to develop independently, bypassing such bans.

Who in this case should be responsible for the decision made by the artificial system implemented automatically? Collective responsibility should seem to be borne by the customers and creators of the system, but the decision is made not by them personally, but by the AI product, whose moral principles and beliefs are not worth talking about, because they are not in the model in any form. This aspect also becomes an immanent defect of the AI mind.

Another cognitive defect of AI that has passed on from people is called the "cascade of available information (the effect of imaginary truth)" and con-

sists in the fact that there is an intensifying process during which the collective belief in something becomes more and more convincing due to increasing public repetition. The more people learn, repeat, and believe in AI-generated information, the greater the impact it will have on collective beliefs in the future.

People's fear of artificial intelligence technologies is attributed to such a cognitive effect of thinking as "social comparison bias". This is the tendency of people to feel hostility or a desire to "catch up and overtake" someone who is superior to them in something. AI defects are aggravated by the closed nature and opacity of deep models. The solution is calculated by the model, but the correctness of the solution is not justified, although in some cases, model developers supplement them with a mechanism for justifying the decision, and the system can generate mathematical logic formulas showing how the solution could be calculated mathematically.

D. Kahneman distinguished between "fast" (automatic) thinking and "slow" (conscious) thinking. Slow thinking involves formally weighing options, which is part of rational decision making, which is especially useful for establishing precise connections between complex concepts. The downside of this type of thinking is that slow, deliberate thinking requires time, specific information, and motivation. Automatic thinking involves "background processing" of the vast majority of decisions, which makes them much easier to make.

However, the speed and efficiency of fast thinking comes at a cost. It can lead to overgeneralization and neglect of some potentially important information. Todd and Gigerenzer [] showed that simple (fast and frugal) heuristics outperform complex algorithms in situations where simplicity leads to robustness. To avoid cognitive biases or irrational and distorted decisions, it is possible to use "checklists" of cognitive biases, when additional verification of information is performed when making an important decision.

With confirmation bias, a person considers new information useful and valid if it matches his or her beliefs, and if it does not match, then it is unreliable or biased. This is a person’s desire to prove their own opinion. Confirmation bi-

as occurs when a researcher uses data obtained from a study to confirm their hypothesis. Cultural bias occurs when a researcher interprets results based on their cultural beliefs or attitudes, rather than neutrally. This may also be due to the fact that the moderator makes involuntary recommendations to study participants, which influences their answers.

The social desirability bias occurs when participants say what they think the moderator wants to hear. This bias can lead to study participants giving the same answers to questions that they find similar. The Hawthorne Effect occurs when study participants realize that they are being observed. Thus, they pay more attention to what they are doing and try their best to solve any problem. But a real user does not always do the same.

Availability bias occurs when a researcher lowers the requirements and avoids using screening questions in order to quickly find the required number of participants in a short period of time. Also, interested parties or sponsoring companies may select more active participants. Both cases can reduce the likelihood of obtaining objective information.

Wording bias demonstrates a type of cognitive distortion known as the framing effect, when a researcher formulates a question in such a way that a certain answer is assumed.

Interpreting information to suit one's own interests and opinions has a negative impact, for example, on many scientific fields, particularly in the social sciences. When collecting data to test a certain hypothesis, scientists usually hope that this hypothesis will be confirmed, so data that contradicts this are often considered unsuccessful, and the results of such studies remain unpublished.

As a result, a certain field remains poorly studied, and researchers may stumble upon a fairly common problem: the irrelevance of the methods used to test the hypothesis has already been confirmed, but no one knows about it, because few people want to publish a paper with negative results. Moreover, even completed such papers may simply not be accepted for publication: the review committee may also be biased.

The anchoring effect characterizes people's tendency to rely on first impressions (or "anchor" information) when making decisions. Once an anchor is established, decisions are based on this information, without taking into account other points of view. The conformity bias indicates that people's actions are dictated not only by psychological "anchors" or life experiences. The behavior of other people has a direct impact on the thought process, even if this position contradicts their own judgments.

The legacy bias means that people tend to focus exclusively on the stories of successful people. It is associated with loss aversion and the endowment effect. Daniel Kahneman and Amos Tversky found that people are much more likely to try to avoid losses than to focus on potential gains. People like to think well of themselves, and people can hold certain beliefs for decades. A person will look for information that confirms their beliefs. This is a way to avoid cognitive dissonance.

Physics and mathematics of the brain involve the development and application of methods from mathematical sciences, experimental and theoretical physics to the study and mathematical modeling of the brain as a complex dynamic system. Neurobiology of cognitive systems involves the study of molecular, cellular and systemic mechanisms of cognitive functions of the brain in health and disease using the methods and tools of modern neuroscience.

(Human and animal cognition) include fundamental and applied research into the processes and mechanisms of behavior, intelligence, cognitive development, organization of language systems, learning, memory and other cognitive functions in humans and animals. (Interfaces between natural and AI systems) involve research and development in the field of human interaction with artificial intelligence systems. This is the development of new technologies and applications of interfaces between humans and robotic devices, brain-computer interfaces, brain – artificial intelligence.

(Development of advanced AI technologies) includes the search for and development of promising applications, new mathematical methods and artifi-

cial intelligence technologies, including those based on the principles of the human brain. Hardware-software implementations of AI technologies mean the study, development and application of hardware and software systems for the analysis, storage and processing of large heterogeneous volumes of data, including the fundamental principles of programming theory as applied to artificial intelligence technologies.

Intelligent control theory describes the development and application of artificial intelligence technologies for solving problems of managing autonomous systems, groups of autonomous objects and technological processes. Data science involves the development of methods for extracting knowledge from large volumes of data of various natures, data analysis methods, and the study of the fundamental mathematical foundations of such methods.

Australian researchers have shown that neural networks built from tiny pieces of wire "have" short-term and long-term memory. An international team of scientists led by the University of Sydney tested the ability of a nanowire network to perform complex cognitive tasks typical of a complex nervous system. The analysis showed that networks that mimic the physical structure of the brain can learn and remember data. To test their network, the scientists used a modified version of the n-back task.

The researchers found that the nanowire network was also able to “remember” the desired end point in an electrical circuit seven steps back. The network remembered the paths and the connections formed did not weaken over time. This is similar to the way a synaptic network works. Some connections are strengthened, others weaken, and as a result, stable connections are formed through the learning process. Nanowire networks are a form of nanotechnology.

They are made from tiny silver wires with high conductivity. Invisible to the naked eye, the particles are coated with a plastic material and scattered randomly to form a grid. The wires, thanks to their properties, imitate the physical properties of the brain: a network of neurons connected by synapses.

The use of networks opens up a large number of real-world applications, such as the creation of robotic devices and sensors that need to make quick decisions in unpredictable conditions. In the book “The Battle for Your Brain: Protecting the Right to Free Thought in the Age of Neurotechnology,” professor of biological sciences Nita Farahani writes that people’s thoughts will very soon belong to more than just them.

Even unspoken opinions, views, and feelings will be the subject of close observation and biased assessment thanks to technological progress. And this scenario is so real and close that legislators should already be concerned about protecting the rights of citizens. The rapid development of neuroimplants that allow a person to control electronic devices with the power of thought is far from as harmless a process as it may seem from the words of the founders of Neuralink and other similar startups. In addition to implants, chemical drugs that stimulate cognitive abilities, so-called nootropics, are also being developed.

Advances in neurotechnology could lead to ways to hack, track and control people's thoughts, says Professor Farahani. Her new book, published in 2023, is devoted to this and to protecting "cognitive freedom." Farahani, who served on Barack Obama's commission to study bioethics issues, believes that advances in neurotechnology mean an invasion of the human brain by large IT companies and military-funded laboratories.

Combined with advances in science in decoding and editing brain functions, these technologies pose an obvious danger to humans and require strict regulation. But there is little time left to make the right decisions, warns the author of the book. And she advocates for the formulation of a set of "brain rights" or "cognitive freedoms." Laws to protect medical biometric data are already being adopted. Chile became the first country to introduce paragraphs into its constitution directly addressing the dangers of neural technologies.

The US state of Wisconsin has passed a law regulating the collection of human brain biometric data. One of the major hurdles to creating common-sense AI is where to start. The fundamental knowledge of a human infant is limited,

abstract, and reflects an evolutionary legacy, but it can be adapted to any context or culture in which the infant may develop. Therefore, before creating an “adult” AI, one must first create an infant version.

Over the past few decades, fundamental research into infant common-sense psychology, infants’ understanding of the intentions, goals, preferences, and rationality underlying the actions of (human) agents, has shown that infants attribute goals to agents and expect agents to pursue goals in a rational and efficient manner. The predictions that underpin infant common-sense psychology underlie human social intelligence and could thus help improve the common-sense capabilities of AI, but these predictions are typically missing from machine learning algorithms, which instead predict actions directly and are therefore inflexible to new contexts and situations.

The neural networks in the hippocampus, which are responsible for spatial perception, do not evolve in a linear fashion, but rather according to hyperbolic geometry. That is, the brain represents space as an expanding hourglass. The amount of time a person spends exploring their environment causes neural representations to evolve nonlinearly. Hippocampal neurons responsible for spatial navigation, memory, and planning perceive space according to nonlinear Lobachevsky geometry. In it, three-dimensional space expands exponentially outward. The explored space expands logarithmically, which corresponds to the maximum possible increase in information that the human brain can process.

Lobachevsky geometry also controls neural responses, since hyperbolic maps of sensory molecules and events are perceived by neurons, which form maps of space in the brain in accordance with them. Promising methods for studying the neural mechanisms of syntax are analyzed. In cognitive science, the most widespread idea is the participation of neural oscillations in the encoding of syntactic information. According to this approach, the encoding of words, phrases, and sentences occurs at different frequencies. One of the ways to study syntactic structures in the human brain involves measuring neural oscillations when processing individual words and phrases of a sentence.

In addition to neural networks and machine learning models based on perceptrons, there are cognitive architectures. They aim to imitate human intelligence. Developers of cognitive architectures bring all the knowledge, perceptions of the model into an understandable information form.

More relevant should be considered the principle of multi-scale integration of information. With the help of neural oscillations, it is possible to collect into one whole information that reaches the brain at different times or is processed in different areas of the brain.

Cognitive computing represents the third era of computing. In the first era (19th century), Charles Babbage, also known as the "father of the computer", introduced the concept of a programmable computer. His computer, used in navigation calculations, was designed to tabulate polynomial functions. In the second era (1950), computers with digital programming, such as ENIAC, appeared, and the era of modern computing and programmable systems began.

Cognitive computing runs on deep learning algorithms and big data analytics to provide insight. The brain of a cognitive system is a neural network and the fundamental concept of deep learning. A neural network is a system of hardware and software. It mimics the human central nervous system to evaluate functions that depend on a huge amount of unknown input data.

In the current state of cognitive computing, a basic solution can play the role of an assistant or virtual advisor. Siri, Google Assistant, Cortana, and Alexa are good examples of personal assistants. A virtual advisor like HealthTap's Dr. AI is a cognitive solution. It is based on individual patient medical profiles and knowledge from 105,000 doctors. It creates a list of priority symptoms and connects to a doctor when needed.

Experts are now working on implementing cognitive solutions in enterprise systems. Some use cases are fraud detection using machine learning, predictive analytics solutions, and oil spill prediction in the oil and gas production cycle. The goal of cognitive computing is to create computing structures that can solve complex problems without constant human intervention.

Solutions should mimic the human brain's ability to learn and adapt to the environment. Systems cannot be programmed for an isolated task. It must be dynamic in collecting data, understanding goals and requirements. The cognitive solution must interact with the processor, devices, cloud services and the user. Cognitive systems must interact in two directions.

The system must "remember" previous interactions in a process and return information that is relevant to the specific application at that point in time, identify the problem by asking questions or finding an additional source. This function requires careful application of data quality and validation methodologies to ensure that the system is always fed with sufficient information and that the data sources it works with provide reliable and relevant input.

The system must understand, identify, and extract contextual elements. These include meaning, syntax, time, location, relevant domain, rules, user profile, process, task, and goal. It can use multiple sources of information, including structured and unstructured digital information, as well as sensory input (visual, gestural, auditory, or touch).

Cognitive systems have vast repositories of structured and unstructured data. They have the ability to develop deep domain understanding and provide expert assistance. The models built by these systems include contextual relationships between different objects in the system's world, which allow it to form hypotheses and reason.

They can reconcile ambiguous and even contradictory data. These systems can engage in deep dialogue with humans. Chatbot technology is a good example of an interaction model. Many AI chatbots are pre-trained with domain knowledge for quick implementation in various business applications.

These systems are modeled using reinforcement learning. The decisions made by cognitive systems continually evolve based on new information, results, and actions. Autonomous decision making depends on the ability to track why a particular decision was made and change the confidence score of the system's response.

Discovery involves finding insights and understanding vast amounts of information and developing skills. These models are built on deep learning and unsupervised machine learning. With ever-increasing amounts of data, there is a need for systems that help use information more effectively than humans. Distributed intelligent agents in the model collect streaming data such as text and video to create an interactive measurement, verification, and visualization system that enables real-time monitoring and analysis.

Cognitive systems need training data to fully understand and improve a process. The labor-intensive process of training cognitive systems is the reason for its slow adoption. Cognitive computing systems are effective as assistants that are more like intelligence augmentation than artificial intelligence. It complements human thinking and analysis, but depends on humans to make critical decisions. Smart assistants and chatbots are good examples.

Such ad hoc projects are not enterprise-wide implementations, but an effective way to start using cognitive systems. There are some limitations that make it difficult to apply AI in situations with high uncertainty, rapid change, or creative requirements. The complexity of the problem increases with the number of data sources. Such unstructured data is difficult to aggregate, integrate, and analyze. A complex cognitive solution must have many technologies that coexist to provide deep insights into the problem domain.

Cognitive Search

Cognitive search is a search engine technology that uses artificial intelligence (AI) to quickly find relevant and accurate results for various types of queries. Modern businesses use various systems to store vast amounts of information, such as manuals, FAQs, research reports, customer service guides, and documentation. Cognitive search technologies scan large databases of disparate information and correlate the information to find answers to users' questions. Cognitive search then matches the question with relevant documents and provides a specific answer.

A cognitive search service provides more accurate results without much user guidance. This technology can generate accurate search results by considering multiple sources and reviewing the collected structured and unstructured data. Cognitive search technology also understands the context when displaying results. It uses natural language processing (NLP) to understand the context, patterns, and meaning of human language.

Cognitive search combines information from multiple data sources and produces a comprehensive answer at the end. With traditional keyword searching, you have to find all the information you need using multiple sources and then read, analyze, and summarize the information yourself. To get answers from multiple documents at once, you can use the complex search feature. This can improve productivity and streamline data-related workflows across your organization.

Cognitive search uses machine learning to personalize results for users over time. Instead of constantly returning the same information, it collects data and search patterns as you use them. By recording the results that users are most likely to click on after their initial query, the system gets better and returns the most relevant results much faster. Over time, cognitive search becomes smarter, more accurate, and more useful.

Cognitive search uses natural language processing and other AI technologies to provide accurate searches. First, cognitive search needs information to search. It can retrieve data from documents, websites, emails, internal repositories, manuals, and any other information you want to use. Cognitive search extracts information from resources using techniques such as optical character recognition (OCR), entity recognition, and NLP techniques. The extraction process aims to enable cognitive search to understand the information and catalog it like a human.

Once the data is retrieved, cognitive search creates a search index of the extracted information. In addition to using keywords to tag the data, it uses metadata, relationships between data, and additional information to efficiently

catalog all the information. When a user searches for something, cognitive search consults these indexes. This makes it possible to find the required information faster.

When a user enters a query into cognitive search, NLP is used to analyze and understand the question. In traditional keyword search, the search engine recognizes the main terms and generates relevant data. Cognitive search tries to understand the entire context of the query, as well as the user's personal factors, such as their preferences. It combines NLP techniques such as token scoring and semantic analysis to understand what kind of result the user expects.

Using the user's query, cognitive search traverses the data indexes and finds the relevant information in its repositories. It navigates through the indexes, finds the most similar items, and filters the results layer by layer. Each relevant result is assigned a relevance score. Cognitive search displays the most relevant information by sorting the results according to the scores.

To get even more specific results, users can apply additional filters or specifications when using cognitive search, as the technology refines its approach to query processing based on previous interactions. Over time, cognitive search also learns more about the sentiment and meaning of users' search queries. This improves direct answers to queries. By continually recording interactions and learning from them, cognitive search becomes more accurate and provides more relevant information over time.

Many generative AI tools use transformer-based machine learning models. These models have neural networks to analyze text data to understand its meaning. Transformer-based AI models are useful for processing and understanding natural language. Given information about the user and their intent, as well as the context of the data, the models can better understand the true intent of the query. With an improved understanding of queries, cognitive search can find more accurate information to answer.

Generative AI can break large texts into smaller segments. Cognitive search can find the most semantically relevant parts of different documents. It

can then use generative AI to combine the segments and return the exact information the user is looking for. Generative AI can also improve the quality of the result by understanding the text that is returned as a response and removing all unnecessary information.

Generative AI can filter cognitive search results by various parameters, including user authorization and preferences, as well as the relevance of the query. When creating the result text, it can ensure that only those resources are used that the user has the right to access. The results remain relevant and useful without compromising security.

Representation ontology

The purpose of its creation is to describe the area of knowledge representation, to create a language for specifying other ontologies of lower levels. This description defines such concepts as "class", "relationship", "property value constraint", "domain" and "range". The purpose of a top-level ontology is to create a single "correct" ontology that captures knowledge common to several subject areas, and to reuse this ontology. Many top level ontologies are similar to each other. They contain the same concepts: entity, phenomenon, process, object, role, space, time, and matter.

Domain ontology is limited to one subject area. Domain ontology generalizes concepts used in some domain tasks, abstracting from the tasks themselves (for example, an automobile ontology is independent of any features of specific car brands). Standard ontologies have been developed that can be used by subject area experts to share and annotate information in their area.

The purpose of an applied ontology is to describe a conceptual model of a specific task or application. Application ontologies describe concepts that depend on both the task ontology (see below) and the domain ontology. Examples include ontology for automobiles, building materials, and computing. Such ontologies contain specific information. General ontologies describe the most gen-

eral concepts (space, time, matter, object, event, and action) that are independent of a specific problem or domain. This category includes both presentation ontologies and top-level ontologies.

A task-oriented ontology is used by a specific application program and contains terms that are used in developing software that performs a specific task. It reflects the specifics of the application, but may also contain some general terms, for example, a graphics editor will have both the specific terms palette, fill type, and overlay, and the general terms save and load a file. Ontology tasks include scheduling, goal setting, diagnostics, sales, software development, and classification. The task ontology uses the specialization of terms presented in the top-level ontologies (general ontologies).

A subject ontology (or object ontology) describes real objects involved in some activity (production). For example, this could be an ontology of all the parts and components of an aircraft and information about their suppliers, characteristics, and how they are connected to each other.

Cognitive abilities, cognitive distortions and biases

Cognitive abilities are the brain's skills in assimilating and processing information about the world around us. These include memory, attention, cognitive flexibility, imagination speech the ability to reason logically and perceive information through the senses. Cognitive abilities distinguish humans from animals and are necessary for survival and development.

Attention is the ability to concentrate on a task for a long time. Distributed attention is responsible for the ability to focus on different things. Focused attention allows you to concentrate on only one stimulus or action. Inhibitory control helps maintain concentration on something, ignoring or suppressing external factors. Problems with concentration lead to frequent mistakes, untimely completion of projects and conflicts in the team.

Cognitive biases are errors in thinking, false beliefs and incorrect conscious attitudes. Daniel Kahneman identified about 200 different biases from

changes due to an emotional reaction to an uncontrolled flow of thoughts in the mind (mental noise). Bias is usually described as a tendency to prefer thing, person or group over others.

Cognitive computing models

Cognitive computing models provide a realistic roadmap for creating artificial intelligence. They are self-learning systems that use machine learning models to simulate the work of the human brain. The brain of a cognitive system is a neural network and the fundamental concept of deep learning.

A neural network is a system of hardware and software. It simulates the human central nervous system to evaluate functions that depend on a huge amount of unknown input data.

Cognitive systems cannot analyze risk that is not present in unstructured data. This includes socioeconomic factors, culture, political environment, and people. Current cognitive technologies are limited to engagement and decision making. Cognitive computing systems are most effective as assistants that are more like intelligence augmentation than artificial intelligence.

It complements human thinking and analysis, but relies on humans to make critical decisions. Smart assistants and chatbots are examples. The complexity of the problem increases with the number of data sources. Such unstructured data is difficult to aggregate, integrate, and analyze.

A complex cognitive solution must have many technologies that coexist to provide a deep understanding of the subject area.

The concept of a cognitive map

In the field of psychology, a cognitive map is a certain scheme that describes the perception of an object by an individual or a group of individuals. A cognitive map can change. Changes depend on how a person interacts with the

world around him. There are “overview” and “path” maps. The first map involves studying the spatial arrangement of all objects.

The second type involves building relationships between objects. Mapping will help organize the acquired knowledge. Using this method, processes that are directly related to the situation are taken into account. Key processes and phenomena also play an important role. Using a cognitive map, certain factors can be added or removed throughout the process.

A cognitive map means the situation that has developed in a person’s life, based on his experience, and characterizes his further actions. This term was proposed by E.C. Tolman. In his opinion, with the help of such a model, animals and humans give a response to certain stimuli. The cognitive map consists of concepts of individual elements of the situation being studied, as well as arcs of connections between concepts. Concepts on the cognitive map are depicted at the very top. To create a cognitive map, it is necessary to determine the factors, find levers with which you can influence here and now. If for some reason they are absent, then the situation will have to be considered without these factors.

It is necessary to find closed paths that can stabilize the situation or increase deviations. It is necessary to analyze what the connection is between the main factors and the levers of communication, after which you can understand how to better manage this situation.

By building a cognitive map, you can look at the situation from a different angle. Thus, you can find a method for building cognitive systems of robots, in particular dialogue systems, systems for perceiving visual information, behavioral systems, as well as integrated systems for controlling the behavior of autonomous robots.

Cognitive abilities of AI and humans

AI cognitive systems, the way they collect, remember, and retrieve information, are similar to how humans analyze information. At the same time, cog-

nitive systems can communicate information and act. They are designed by the designer to have the ability to create and test hypotheses; the ability to break down and make logical inferences about language; the ability to extract and evaluate useful information (such as dates, locations, and characteristics).

Without these abilities, neither a computer nor a human can determine the correct relationship between questions and answers. Higher-order cognitive processes can achieve a high level of understanding by focusing on basic behaviors. In order to understand something, we must be able to break information down into smaller elements that are reasonably well organized at the level in question. In this regard, understanding language begins with understanding the simpler rules of language, not only formal grammar, but also the informal conventions that are observed in everyday use.

Cognitive AI technologies in the management of social systems

The use of cognitive AI technologies for analyzing big data in political and managerial practice can significantly simplify the decision-making process in conditions of uncertainty, which is closely related to the concept of Data Driven Political Campaign (the use of big data, primarily in election campaigns, including the stages of collecting and algorithmically analyzing an array of information to build voter psychograms, segmenting the audience and political micro targeting and the paradigm of Data-Driven Government (making management decisions by government institutions using intelligent decision support systems based on big data analysis technologies and methods).

AI and machine learning, expanding the predictive potential of digital twin modeling technology – virtual analogues of any physical objects or processes, are becoming the core of the “Intelligent Twins” system – a new open architecture for the intellectual transformation of government agencies and city

services (intellectual twin of the city), industries (intellectual twin of industry) and enterprises (intellectual twin of business).

In the context of the convergence of physical and artificial reality, AI is one of the main factors in the development of the concept of the "personified" Internet / Web 3.0 – the metaverse (from the Greek meta – beyond, outside; from the English metaverse), which in the political science perspective can be imagined as a new three-dimensional virtual-real interface of the political system, decentralized controlled by a multitude of individual and collective digital political actors (digital personal copies of real people / avatars, bots and virtual political institutions) through formal and informal forms of digital political practices (block chain democracy, digital political isolation, digital citizenship, online rallies and digital GR technologies).

The active implementation of AI technologies, including computer vision, speech recognition and synthesis, natural language processing, intelligent decision support, contributes to the development of digital profiling systems for individuals and legal entities. Such systems are used both for managing government data through the collection, algorithmic processing, analysis and provision of personal, including biometric, information that forms a digital profile, with the consent of an individual or organization at the request of an authority through relevant electronic platforms, and for social scoring (from the English score – assessment) – algorithmic assessment and rating of individual and collective entities based on social characteristics obtained as a result of monitoring behavioral offline and online activities that allow predicting their behavior.

AI solutions in the political and government sectors are intelligent bots (from the English bot, short for robot) – automated self-learning algorithms that imitate the behavior of real political actors in new social network media to construct political reality and influence public opinion or on platforms of electronic government services for the rapid processing of citizen requests, collection of necessary information, virtual assistance in solving various problems and optimization of the work of government agencies.

Deep fakes are becoming a new universal and effective media tool for post-truth and soft power politics in the context of information warfare. This is AI-based media content, synthetically created by neural networks generating new images, videos, and audio files from source data sets using the generative-adversarial principle.

The following areas of application of deep fake technology are indicative: constructive practice of attracting voters and promoting the political image of a candidate, including among young people; disinformation, manipulation of voters in political campaigns, provocation, discrediting, blackmailing and cyber bullying of political opponents; delegitimization of government institutions and destabilization of the political system, destructive information impact and distortion of the global information field, discrediting the state.

The public sector is increasingly demanding unmanned aerial vehicles and systems equipped with AI-based control systems, used for search and rescue operations, construction, logistics, monitoring and protection of natural objects and urban infrastructure, as well as for military tasks in the context of a new paradigm of warfare and the intellectualization of weapons. The market for unmanned agricultural, quarrying, mining equipment and passenger transportation is developing rapidly in the context of the deployment of unmanned technologies based on AI, 5G networks and edge computing.

There are more and more AI solutions in the field of automation of political journalism, which not only facilitate the performance of a number of routine tasks of journalistic work (monitoring and analyzing the political news agenda, identifying news hooks, fact-checking and searching for sources of political information), but also take on some of the work on the direct creation of political content. The potential of AI algorithms for political speechwriting is in demand. In the context of digital transformation of public administration, the political theory of AI is being formed as a relatively autonomous specific system of political knowledge that reflects, explains, evaluates and predicts political phenomena in the context of analytics of big political and administrative data, modeling

of a three-dimensional virtual-real interface of the political system Web 3.0 and intelligent twins of political institutions, automation and intellectualization of management activities and political practices, proactive political decision-making and provision of public services, digital profiling and social scoring of individuals and legal entities, new deep fake tools of post-truth policy and "soft power" in the context of information confrontation and a new paradigm of "mosaic" military operations.

Within the framework of this theory, any political phenomenon cannot have a once-developed universal interpretation, since it is determined and temporally measured by the dominant historical public political paradigm, developing within the framework of its conceptual and categorical apparatus.

It should be noted that the strengths and capabilities of AI can easily transform into its weaknesses and risks, which should be taken into account when making strategic decisions on the introduction of AI into the public administration system in the context of the uncertainty of the current geopolitical situation and sanctions restrictions.

Generative Artificial Intelligence

Generative artificial intelligence can create new content and ideas, including conversations, stories, images, videos, and music. Artificial intelligence technologies imitate human intelligence in such computational tasks as image recognition, natural language processing (NLP), and translation.

Generative AI algorithms can explore and analyze complex data in new ways. Researchers can discover new trends and patterns that may not be obvious in other cases. These algorithms can summarize information, describe multiple solution paths, generate insights, and create detailed documentation based on research records.

Generative AI can respond naturally to human conversations and can also serve as a customer service tool and personalize customer experiences. Chatbots, voice bots, and virtual assistants can be used to more accurately respond to cus-

tomer queries the first time they interact. Personalized offers and customer interactions can drive greater customer engagement.

Generative AI can be used to optimize business processes by leveraging machine learning (ML) and AI applications across all verticals. This technology can be applied across all verticals of business, including engineering, marketing, customer service, finance, and sales.

Generative AI can be used to extract and summarize data from any source to power knowledge discovery; evaluate and optimize different cost reduction scenarios in areas such as marketing, advertising, finance, and logistics; and generate synthetic data and create labeled data for supervised learning and other machine learning processes. Generative AI models can complement human workflows and act as powerful assistants for everyone in your organization.

From finding information to creating it, they can do it all just like a human. Generative AI can improve the productivity of various categories of employees because it supports creative tasks by generating multiple prototypes based on defined inputs and constraints; optimizes existing designs based on human feedback and defined constraints; generates new code suggestions for app development tasks; assists managers in creating reports, dashboards, and forecasts; develops new sales scripts, email content, and blogs for marketing staff. This saves time, reduces costs, and improves organizational efficiency. Generative AI is powered by machine learning models that have been pretrained on vast amounts of data.

Traditional machine learning models were discriminative, or focused on classifying data points. They tried to determine the relationship between known and unknown factors, such as looking at images (pixel locations, lines, colors, and shapes), or known data, and matching them with unknown data, or words. Mathematically, the models worked by defining equations that could numerically represent unknown and known factors as variables x and y. Generative models simplify these processes. Instead of predicting a label given some features, they try to predict features given a specific label. Mathematically, generative

modeling calculates the probability that x and y will be the same. It studies the distribution of different features in the data and how they are related.

Diffusion models create new data by iteratively making controlled random changes to the original data set. They start with the original data and gradually reduce its similarity to the original by adding small changes (noise). This noise is carefully controlled so that the generated data retains integrity and realism. After adding noise over several iterations, the diffusion model reverses the process, gradually removing the noise. The result is a new data sample that is similar to the original sample.

Generative adversarial networks take the concept of the diffusion model further. GAN models train two neural networks in a competitive manner. The first network, known as the generator, creates fake data samples by adding random noise to them. A second network, called a discriminator, tries to distinguish real data from the fake data created by the generator.

As it trains, the generator continually improves its ability to create realistic data, while the discriminator gets better at distinguishing real data from fake data. This adversarial process continues until the generator produces data so convincing that the discriminator can no longer distinguish it from real data.

Variation auto encoders (VAEs) are trained on a compact representation of the data called the latent space. The latent space is a mathematical representation of the data. It can be thought of as a unique code that represents the data based on all of its attributes. VAEs use two neural networks, an encoder and a decoder. The encoder neural network maps the input data to a mean and variance for each dimension of the latent space. It generates a random sample from a Gaussian normal distribution. This sample is a point in the latent space and is a compressed, simplified version of the input data. The decoder neural network takes this sample from the latent space and transforms it into data that resembles the original input. Mathematical functions are used to measure how closely the reconstructed data matches the original data.

The Transformer-based generative AI model builds on the concept of the VAE encoder and decoder. Transformer-based models add new layers to the encoder to improve performance on text-based tasks, including comprehension, translation, and creative writing. Transformer-based models use a self-attention mechanism. They evaluate the importance of different parts of an input sequence when processing each element of the sequence. Another key feature of these AI models is the implementation of contextual embedding. The encoding of an element of a sequence depends not only on the element itself, but also on its context in the sequence.

Self-attention helps the model focus on the importance of words when processing each of them. In order to convey different types of relationships between words, the Transformer-based generative model uses multiple layers of the encoder, called attention heads. Each head learns to perceive different parts of the input sequence so that the model can simultaneously account for different aspects of the data. Each layer also refines the contextual embeddings. Layers allow the contextual embeddings to become more informative, conveying different meanings, from grammatical syntax to complex semantic meanings.

Neural networks and deep learning were the precursors to generative AI. Variation auto encoders, developed in 2013, were the first deep generative models capable of generating realistic images and speech. Variation auto encoders were designed to create new variations on multiple types of data. This quickly led to the emergence of generative adversarial networks and diffusion models. These innovations generated data that increasingly resembled real data.

In 2017, Transformers were introduced. They seamlessly combined the encoder and decoder architecture with an attention mechanism and optimized the training of language models, providing exceptional efficiency and versatility. Models like GPT emerged as baseline models capable of being pre-trained on large corpora of raw text and fine-tuned to solve different problems.

Transformers have expanded the capabilities of natural language processing and generative learning to solve problems ranging from translation and

summarization to question answering. The most popular types of generative models in 2024 are generative adversarial networks, variation auto encoders (VAEs), and the Transformer architecture used in GPT and BERT.

Tokens

Tokens are the basic units of information and memory constraints. A token is the basic unit of information used by a model to process and generate text. A token can be a word, a part of a word, a character, or even a group of words, depending on how the model has been trained to separate and interpret text. On average, English text contains 4-5 characters in a token, while Russian text contains 2.2-2.4 characters. The most significant problem of generative AI is the length of the context and built-in algorithms of functioning.

The first editions of GPT 3.5 had 4096 tokens, the latest version has 16 thousand tokens, GPT 4 before November 2023 had 32 thousand, and after November GPT 4 Turbo already 128 thousand. Accordingly, the maximum context length for GPT 3.5 Turbo with 16 thousand tokens is about 37 thousand characters of text in Russian, and for GPT 4 Turbo with 128 thousand tokens - almost 300 thousand.

This means that within one session, generative artificial intelligence forgets what was discussed at the beginning of the discussion, which makes it impossible to accumulate experience and have detailed discussions.

The principle of operation of generative AI is to formalize the context vector (compressed representation of input data) to generate the continuation of the dialogue (output information), i.e. compression (compression) of content (input unit of information) occurs. All information coming to the input of generative AI is somehow compressed with various algorithms and compression mechanisms. At the beginning of 2024, there are two most frequently used techniques: dividing the text into blocks, paragraphs, similar in meaning and forced compression by X value. The sliding context window, when the first block of

128 thousand tokens is sequentially processed, is compressed by 20 times, then the second block, and so on. As a result, the output is an extract by 20 times with the inevitable loss of details and content. Can this technique be used in legislative documents? Not yet.

As a result, generative AI is very useful for compiling compressed summaries of text, video, and audio information. For analyzing information that has meaning - not yet. This means that if you write large-scale works of art or research projects, generative AI will not allow you to effectively inherit the characteristics and relationships of objects in earlier iterations.

As of early 2024, the following limitations of generative AI are identified: no self-learning; not suitable for complex integral and multidimensional projects where you need to take into account the holistic picture and dynamic relationships. It is necessary to very strictly formalize the task to achieve the desired effect, and often the time for industrial engineering exceeds the benefit of using generative AI. It is necessary to break the task down into many subtasks to the point of extreme simplification.

Generative AI makes a lot of mistakes and there is no fact checking. It imitates the truth and generates output content very convincingly. One of the problems is that there is no built-in control for verifying output data and the correctness of interpretation. Generative AI is not able to evaluate the correctness and adequacy of the generated content. It does not have a built-in truth criterion.

Generative AI models do not have critical thinking and a result verifier, which in the context of large language models means: identifying logical connections and contradictions, evaluating arguments and evidence, analyzing data and sources, and adapting the output result to the context of conditions. They do not check the reliability of information sources. They do not distinguish reliable data from unreliable data.

They are not able to independently identify logical errors and contradictions in their answers. They cannot critically evaluate the arguments and evi-

dence presented. They cannot adequately adapt their answers to specific conditions or the context of the task.

Large language models are trained on extremely large data sets, the initial reliability of which is in doubt, and data compression and weighting occur in this set of information garbage. The data on which large language models were trained may initially contain errors, biases, and unreliable information, and therefore training is often based on false information.

Weights in large language models define a hierarchy of information interpretation, allowing the model to recognize hierarchical and contextual dependencies in the data. Weights determine the degree of connectivity of information blocks, how one piece of information affects another piece of information. Models are extremely ineffective in developing innovative semantic constructions and interpreting initially contradictory information, producing complex multi-level assessments of factors, circumstances, and dependencies.

Generative artificial intelligence can be effective in interpreting generally accepted, most popular facts of a regular nature, but it is not able to build a hierarchy of priorities and a multi-level composition of risk factors in an ambiguous and unstructured data set, the distribution vector of which is not predictable.

Complex analytics of processes and events is not subject to generative AI, so it does not have intelligence in the broad sense. It is possible to formalize mathematics and physics, but it is impossible to formalize the motives and actions of society, therefore generative AI cannot manage business processes, cannot predict and evaluate all those areas where a person is involved (finance, economics, sociology and politics). Ideally, the system should work like a low-level program in a processor, where repeating experiments always gives the same result – there is unambiguity and predictability. In generative AI, the range of tolerances is too wide. As a result, the time and resources for checking the results of the GAI exceed any potential benefit. Low reliability of the output content is built into the architecture of large language models, therefore, the problem is incorrigible neither now nor in the near future.

Generative AI threatens the creative segment of professions in such areas as the creation of meaningful texts, practically indistinguishable from the human writing style, with the ability to create jokes, poems, scripts for films and stories. There is a threat to professions related to writing program code and formulas – if you break the program into mini modules, there will be some benefit, although there will initially be many errors. However, the main benefit is rather in the tool of dynamic hints and searching for errors in compilation – suitable for experienced programmers. Based on the analysis of patterns of a super large array of real photographs, the characteristics, structure and features of objects are organized and then synthetic images are generated through GAN algorithms.

AI analyzes video, studying the characteristics of movement, transitions between frames, visual and audio patterns, and then, using a similar method as with images, video is generated. The main and most basic purpose of AI is compression and decompression of information. Information compression is the summarization, summary, generalization, "summarization" and so on of huge arrays of text, audio or video information using special algorithms. Information decompression is the generation of audio, video or text content from previously compressed information based on logical chains and specified scenario vectors.

But there are still problems in the form of data poisoning (a neural network can invent numbers, facts and create false objects or features); bias and limited explainability; threat to brand reputation; copyright infringement; cost overruns; environmental impact; management and security issues; integration and interaction issues; litigation and regulatory compliance.

Legal norms and government control over AI companies and technologies

The US authorities insist on demonopolization of the AI technology market. The US antitrust inspector general will take on the AI sector, fearing that power over the transformative technology is concentrated in the hands of a few

players with big capital. Fraudsters use deepfakes to forge citizens' documents. They have learned to forge citizens' documents using artificial intelligence (AI) technologies. When creating digital counterfeit copies, they either change the numbers or try to pass off an invalid document as valid, but now deepfakes are also used for these purposes for the authentication and data synthesis process.

The Russian Ministry of Economic Development is creating a special commission to investigate incidents related to the use of artificial intelligence. The new structure will also regulate property rights to the results of intellectual activity obtained using AI. Changes are being made to the bill "On experimental legal regimes in the field of digital innovation" (258-FZ).

More than 20 amendments have been prepared. In the event of the introduction of incident insurance, a special commission will be engaged in the assessment of insurance cases. In the event of an incident with AI, the subject is obliged to provide the commission with the documents necessary to investigate the causes and establish the circle of responsible persons within two working days. The commission will then prepare a conclusion on the causes of the incident, the circumstances indicating the guilt of the persons, as well as the necessary measures to compensate for the damage.

The Only Fake website has appeared on the Internet, with the help of which any user can create a photo of fake documents. At the end of September 2023, the Bank of Russia named the main risks in the implementation of artificial intelligence. The main ones among them are the likelihood of monopolization among large technology players. To support AI, large investments are needed in computing power, data processing infrastructure, training of professional personnel, and so on. There is a risk of leakage of information that is used to train AI. There is a risk of biased or discriminatory decisions being made against the background of the fact that the AI model provides for the issuance of decisions based on certain factors and algorithms.

As a result, legal regulations stipulate that the subjects of the experimental legal regime are mainly legal entities, but may also be state bodies, including re-

gional bodies, which will be required to maintain a register of persons who have entered into legal relations with them. This register must contain information about the persons responsible for the use of AI-based solutions.

The bill proposes to oblige companies to maintain a register of the results of intellectual activity created using AI, indicating their copyright holder. The register will display information about persons directly working with AI technologies, who, in the event of emergency situations, will be responsible for the improper use of such technologies. Participants in "digital sandboxes" will be required to insure civil liability for harm to life, health or property of others as a result of using AI. The experimental regime program (an act of special regulation with the conditions of the regime) will have to contain requirements for the conditions of such insurance, including the minimum amount of the insured amount, a list of risks and insured events.

Bruce Schneier published a post on his blog entitled "AI and Mass Espionage". In it, he explains the difference between surveillance (collecting data about a person) and espionage, which is aimed at finding out the context of certain actions of each individual. According to him, the Internet has simplified surveillance of a person, and it is almost impossible to refuse it, since most human activity in the modern world leaves traces on the Internet or various databases in one way or another.

Moreover, due to the use of big data technologies, it has become possible to analyze the accumulated information and draw conclusions. Spying on all people using technology was difficult, because to understand the context of certain actions, it was necessary to involve a person who understood the sequence of events and made a conclusion about their goals. With the involvement of artificial intelligence technologies, this limitation can be removed. AI is able to independently build a consistent picture for the sequence of human actions and assume its goal. Therefore, the use of AI to analyze the information accumulated in various databases will allow organizing mass espionage.

Large corporations and technology monopolies will not be able to resist the temptation to use mass espionage technologies for targeted marketing of their products and creating offers that are impossible to refuse. The same can be done by criminals to optimize their fraudulent and phishing activities. Now fraudsters waste a lot of effort and money calling everyone, and with the use of mass espionage technologies, they will be able to choose the highest priority targets that will bring them more income.

And now such technologies are already being developed, and data is accumulated in order to further train criminal artificial intelligence on them. On October 7, 2022, the US Office of Science and Technology Policy (OSTP) released five principles to guide the development, use, and deployment of automated systems. The document comes as more voices join the call for measures to protect people from the technology as artificial intelligence advances. The danger, experts say, is that neural networks can easily become biased, unethical, and dangerous.

According to the principles, the user must be protected from unsafe or ineffective systems. Automated systems must be developed in consultation with diverse communities, stakeholders, and subject matter experts to identify issues, risks, and potential impacts of the system. Systems must be tested before deployment to identify and mitigate risks, and continuously monitored to demonstrate their safety and effectiveness.

The user must not face discrimination from algorithms, and systems must be used and developed equitably. Depending on the specific circumstances, algorithmic discrimination may violate legal protections. Designers, developers, and implementers of automated systems must take active and consistent measures to protect individuals and communities from algorithmic discrimination and to use and design systems in an equitable manner.

The user must be protected from data misuse by built-in protections and have control over how data about them is used. Designers, developers, and implementers of automated systems must ask the user for permission. They must

respect the user's decisions about the collection, use, access, sharing, and deletion of their data in appropriate ways.

To the greatest extent possible, if this is not possible, alternative privacy protections based on design should be used. The user must be aware that an automated system is being used and understand how and why it achieves the results that affect them. Designers, developers, and implementers of automated systems shall provide publicly available documentation in plain language that includes a clear description of the overall operation of the system and the role played by automation, notice that such systems are in use, the person or organization responsible for the system, and an explanation of the results that is clear, timely, and accessible.

The user must be able to opt out of services where necessary and have access to a specialist who can quickly review and resolve any issues that arise. The user must be able to opt out of automated systems in favor of a human alternative where appropriate.

When working with a person, AI learns using data about people and may have a lot of a person's personal data (personal and medical). When developing measures to protect personal data, the principle of the owner's consent is applied. To train AI systems, such data must be anonym. Anonym of personal data involves removing part of it or completely replacing it with special identifiers.

The purpose of such actions is to ensure that it is impossible to determine the ownership of this information by a specific person, which allows the use of personal data without violating the law. In many countries, the use of anonym data is possible without the consent of the subjects.

A person's right to non-interference in his personal and family life is considered a fundamental one. The prohibition of such interference, as well as the right to protection from it were already enshrined in Art.12 Universal Declaration of Human Rights in 1948. The International Covenant on Civil and Political Rights (1966) enshrined the principle of non-interference in private life. Council of Europe Convention No. 108 "For the Protection of Individuals with regard to

Automatic Processing of Personal Data" (Convention No. 108), signed on 28 January 1981, has 55 member states on four continents, with another 20 states taking part in its work. In many countries, it has become the basis for relevant national legislation, including serving as the basis for the first European Union data protection directive adopted in 1995.

On 27 April 2016, Regulation (EU) 2016/679 of the European Parliament and of the Council on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation, GDPR) was adopted. States were given two years to implement the necessary measures to implement it; it entered into force on 25 May 2018.

The GDPR contains a broad definition of personal data, which includes almost all data about an individual, including genetic, biometric and health data. It has been established that data processing is lawful not only with the express consent of the data subject, but also in a number of other cases. The protection of personal data is given great attention by both states and the private sector.

The legal framework in this area is becoming increasingly stringent due to the fact that the development of information technology makes it possible to obtain a large amount of information about a person, and AI systems are capable of generating it and using it to fully identify a person, which can be used for illegal purposes.

Anonymous data is used in a wide range of areas - from marketing analysis to medical research. Since they do not contain personal information, they can be safely used to analyze trends, patterns and other mass phenomena without violating the privacy rights of users. Anonymous personal data plays an important role in training AI, for example, predictive ones that predict the consumer behavior of users.

In Art.1 of the Law of the Republic of Belarus dated 07.05.2021 No. 99-Z "On the Protection of Personal Data", anonym of personal data is defined as actions as a result of which it becomes impossible to determine the ownership of

personal data to a specific subject without the use of additional information. Anonym personal data can be used for scientific and research purposes without the consent of the subject to processing.

By Order of the Operational and Analytical Center under the President of the Republic of Belarus dated 20.02.2020 No. 66 "On measures to implement the Decree of the President of the Republic of Belarus dated December 9, 2019 No. 449" in Appendix 5 to the Regulation on the procedure for technical and cryptographic protection of information in information systems intended for processing information, the distribution and provision of which is restricted, five methods of anonym of personal data are defined. These include:

1) The method of introducing identifiers – replacing PD or part of them that allow identifying the subject with their identifiers and creating a correspondence table with subsequent separate storage. As a result, a table is created where the codes and their decoding are indicated. This method, if there is appropriate access, allows you to restore the original volume and content of PD.

2) The method of changing the composition is the generalization, modification or deletion of part of the information that allows identifying the subject, with subsequent separate storage of the obtained data and the rules of modification. In this case, part of the information that is of no use is deleted, replaced with anonym data or generalized.

3) The decomposition method is the division of a set of PD records into several subsets and the creation of tables that establish links between the subsets, with subsequent separate storage of the subsets and tables. The essence of the method is that, having access to only part of the information, it is impossible to understand to which subject it belongs.

4) The permutation method is the mutual mixing of individual records, as well as groups of records with each other, with subsequent separate storage of the obtained data and the rules of modification. Mixing is carried out until it becomes impossible to determine whose data we are talking about.

5) The encryption method is the use of cryptographic information protection tools (preliminary encryption) that have a certificate of conformity with the National Conformity Attestation System of the Republic of Belarus or a positive expert opinion based on the results of the state examination.

The procedure for depersonalization of personal data is also regulated by separate legislative acts in various fields. Particular attention is paid to automated state information systems containing personal data of individuals, since they accumulate data throughout a person's life and their protection is guaranteed by the state. In accordance with Art.30 of the Law of the Republic of Belarus dated 21.07.2008 No. 418-Z "On the Population Register", "depersonalization of personal data contained in the register may be carried out for scientific or other research purposes by excluding from the personal data the identification number, full name, parents, guardians, trustees, spouse, child (children), digital photograph." In addition, 303 other PD or their components may be excluded in the manner established by the owner of the register.

The depersonalization procedure is determined by the Resolution of the Ministry of Internal Affairs of the Republic of Belarus dated September 27, 2012 No. 341 "On Establishing the Procedure for Depersonalizing Personal Data Contained in the Population Register". It is carried out by assigning unique sequential numbers to the personal data of specific individuals, with the exception of personal data specified in Art. 30 of the Law "On the Population Register", as well as the number of the house, building and apartment of the place of residence and (or) place of stay; the payer's identification number; data on the performance of military duty; data on the series and number of documents confirming the main and additional personal data.

The Law of the Republic of Belarus dated June 30, 2022 No. 183-Z "On the Rights of Disabled Persons and Their Social Integration", along with the collection, storage and use, provides for the depersonalization of personal data without the consent of disabled persons and their representatives for the purpose of maintaining a database of social support and rehabilitation of disabled per-

sons. In the medical field, the Law of the Republic of Belarus dated 18.06.1993 No. 2435-XII "On Healthcare" also provides for the procedure for depersonalizing the personal data of individuals who receive medical care within the framework of the operation of the centralized health information system.

In the Resolution of the Ministry of Health of the Republic of Belarus dated 28.05.2021 No. 64 "On approval of the Instructions on the procedure for depersonalizing the personal data of individuals who receive medical care" depersonalization of personal data is defined as actions as a result of which it becomes impossible to determine the ownership of personal data to a specific subject of personal data without the use of additional information.

The following are subject to depersonalization: Full name, data on the series and number of documents confirming the main and additional PD; identification number; house, building and apartment numbers of the place of residence (place of stay); photographic image (digital photograph); data on the type of activity; information on the results of a pathological autopsy to establish the cause of death. The instruction provides for the depersonalization of data by introducing identifiers, replacing the composition or decomposition carried out by the operator. This regulation concerns the operation of a centralized health information system.

Due to the fact that the development of AI and robotics technologies is a priority area of scientific, scientific, technical and innovative activities for 2021-2025, within the framework of the Decree of the President of the Republic of Belarus dated 05/07/2020 No. 156, it is necessary to improve the legislation. One of the main problems in the development of AI technologies is the problem of gaining access to data. Currently, the procedure for depersonalizing personal data without the consent of the subject is possible only for scientific or research purposes. At the same time, the developers of AI systems are often commercial organizations and they pursue other goals.

The procedure for depersonalization of data should be considered first and foremost as a mechanism for protecting the rights of citizens, and only secondly,

as a stimulus for the development of technologies. From a technical point of view, most of the methods used are not capable of depersonalizing data while preserving their value. The methods used are aimed at minimizing the risks of identification, but during mathematical processing, data can be personalized. In order to effectively regulate this area, standards should be adopted that would be accessible and understandable to all market participants.

An important aspect is the organizational management of depersonalized personal data. In Belarus, this process can be regulated by the National Center for Personal Data Protection, which should develop general recommendations for the depersonalization of personal data.

Each department and organization that works with personal data should develop its own rules for performing this procedure. The depersonalization process should be completed with an order for the organization. It is necessary to draw up an act listing the types of processed data.

Cognitive systems in modifications of human-technology systems

Traditionally, cognitive systems were identified with systems associated with humans, but the development of information technology in recent decades has opened up the possibility of building artificial technical cognitive systems. Artificial cognitive systems (cognitive artificial systems) or "cognitive computing" systems (cognitive computing) mean artificial intelligence systems.

Research into artificial cognitive systems is aimed at determining the possibilities of their use for specific tasks: facilitating learning within the framework of educational and rehabilitation programs (including those based on neuropsychological stimulation), increasing the adaptability of the human-machine interface, and creating digital twins.

The requirement for an artificial cognitive system to imitate human intelligence is not mandatory. This is due to the lack of certainty in the issue of the

difference between human and artificial intelligence. If we are talking about the ability to solve intellectual problems, then the differences between artificial intelligence and natural intelligence are potentially surmountable. If we are talking about fundamental differences related to subjectivity, then such differences are irrelevant when considering the "explanatory" abilities of intelligence.

Artificial intelligence systems are a special case of artificial cognitive systems. Not all artificial intelligence systems are cognitive systems, but only those that implement control and make decisions. This is where artificial cognitive systems are similar to human intelligence.

When forming a cognitive system, it is necessary to ensure that the system operates with a large amount of data in real time. The priority direction for solving this problem is the parallel execution of information processing operations. It is necessary to ensure the intellectualization of the system, that is, to give it the ability to solve intellectual (creative) problems. An intellectual problem is understood as a weakly formalized problem, a problem for which there is no classical solution. Therefore, in order to solve such a problem, it is necessary to come up with a solution.

In this context, developers are focused on existing and promising options for the technical implementation of parallel computing systems, elements and organization of artificial neural networks. They are focused on the possible implementation of decentralized cognitive systems, the correlation of the logic of constructing artificial cognitive systems and human thinking.

The technological diversity of the implementation of information and computing systems with parallel data processing is determined by the difference in the levels at which parallelism is implemented: at the level of processors, at the level of physical processor cores, at the level of logical processor elements.

A common option is the implementation of parallel computing using multiprocessor and multiprocessor systems, in which parallelism is provided at the processor level. In multiprocessor systems, several processors are used simultaneously, each of which performs its own sequence of computing operations (ex-

ecution thread). Data exchange between threads in multiprocessor systems occurs through shared memory and requires external control to synchronize (for example, by means of semaphores) the access of different processors to shared memory (to avoid the formation of queues).

A multiprocessor system is an association of autonomous computing systems that exchange data among themselves (insignificant volume, incomparable with the volume of data involved in the work of each processor) in the form of messages: addressed (to another processor system) or in the form of announcements (available to all processor systems). Address messages can be transmitted via communication channels between processor systems, announcements - through a shared memory of minimal volume

An effective technical solution to the problem of parallelism is the use of multi-core processors. Parallelism is implemented at the level of physical processor cores - microprocessor crystals (chips).

The number of physical cores can be large. Multi-core architecture, which assumes the use of a large number of logical cores (defined as the product of the number of physical cores by the number of threads in each core), makes it possible to build vector processors in which ordered one-dimensional data arrays – vectors – can act as command operands.

Parallelism at the level of processor elements occurs when a processor is formed from a very large number of logical elements used in parallel. Logical elements are built on the basis of active or passive electronic components. The efficiency of parallelism implementation at the level of logical elements can be increased by using systems with redundant logic (duplication of logical elements and/or blocks of logical elements associated with typical tasks), initially designed for the possibility of selecting an unloaded computational channel or alternative computational sequences (solving the same problem based on different algorithms). This approach also correlates with the solution of the problem of intellectualization of cognitive systems.

The methodological basis for practical software implementation of parallelism of operations in the form of multithreading for computations with shared memory are approaches formed within the framework of parallel logic of division used for imperative programming. Actual parallelism of operations involves the use of declarative programming, which describes the expected result, and not the method for obtaining it, or meta programming, which generates several programs that are autonomous but exchange data with each other.

In the case of parallelism implementation at the level of processors or physical cores of the processor, redundancy of elements (several identical processors or physical cores) is a common practice. Similarly, when implementing parallelism at the level of logical elements, their redundancy is also necessary.

In this case, the heterogeneity of the system can be significantly higher due to the variability of the properties of logical elements and the possibility of their various combinations for various tasks. In the case of redundancy of elements, each type of operator has several options for the means of implementation. These options can be both identical. And alternative allowing the same transformations to be performed on a different hardware base or using a different algorithm. A practical solution to the problem of intellectualization is determined by a consistent answer to several basic questions.

The first of these questions is: "What is the ontological genesis of creativity?" The answer to this question depends on whether the world is deterministic, in which all events are linked by cause-and-effect relationships.

All phenomena can theoretically be explained qualitatively. If the world is deterministic, then creativity is based on the use of the isomorphism of its forms and laws, which is practically implemented in the form of using analogies, the principle of similarity, or traductive inferences. The isomorphism of the universe can be formalized as collections of patterns – logical constructions that represent templates of widespread forms and relationships of systems.

The complement to patterns in cognition are secondary properties and laws of objects, determined from the practice of cognition and describing the

behavior of non-deterministic objects of cognition. Even by investing patterns, secondary properties and laws in an artificial cognitive system, it is impossible to obtain a system capable of solving intellectual problems.

Patterns, secondary properties and laws, along with methods for processing initial data, computational and logical algorithms, fuzzy logic algorithms, are only instructions for solving problems. To use them, an appropriate tool is needed. For natural cognitive systems, such a tool is the human brain. In this regard, the following question arises: "How are patterns, secondary properties and laws used to solve intellectual problems?" The mediation of information objects in human consciousness is carried out with the help of neural circuits – neurophysiological mechanisms that can be represented as circuits whose elements are neurons connected by channels (signal transmission routes) as part of a neural network. Sets of neural circuits and their modes of operation are the basis for the formation of neural physical patterns – physical carriers of instructions, including patterns of forms and relationships, as well as secondary properties and laws used in solving intellectual problems. Similar neural physical patterns can be formed in artificial cognitive systems.

Defining possible options for the technical implementation of neural physical patterns is the next question, the answer to which is necessary to solve the problem of intellectualization of cognitive systems. Neural circuits necessary for the formation of information objects in human consciousness are physically implemented at the level of neurons and other auxiliary cells of the human brain.

Distinctive features of neural circuits are the ability to include various neurons in the neural circuit depending on the problem being solved or the information object being created in consciousness; the heterogeneity of the elements (neurons) used in neural circuits, differing in size, functions, communication channels, and degree of autonomy; the formation of constant and unchangeable complexes of neurons that perform frequently repeated typical tasks.

Fixation can be implemented at the level of executing an instruction, according to which certain neurons are always included in the algorithms for a

specific neural circuit, or at the level of a physical medium due to the physical connection of neurons. Redundancy is also a significant property. The number of neuron elements greatly exceeds the number of neurons required to solve a single problem. This makes it possible to simultaneously construct multiple neural circuits to solve the same or different problems, implementing both the same and different algorithms.

The properties of variability, heterogeneity, fixation and redundancy inherent in natural cognitive systems can be given to artificial cognitive systems; in this case, one can expect intellectual capabilities from an artificial cognitive system comparable to those of a natural cognitive system. Distinctive features of natural cognitive systems correspond to achieving survival under conditions of partial damage to the cognitive system, multitasking and the need to function in real time. For cognitive systems, these features are not mandatory in all cases, but the definition of means and methods for their provision in those cases where this is required must be implemented.

Practical implementation of a cognitive system capable of solving complex intellectual problems can only be ensured by using neural networks. The overwhelming majority of modern artificial neural networks are solutions based on software implementation. The modern definition of an artificial neural network qualifies it primarily as a mathematical model. This model has a software implementation, which is based on the corresponding hardware implementation of the information system. No structural or architectural restrictions are imposed on the technical means of the hardware implementation. The architecture of the neural network is formed as a set of information objects that are not tied to a specific physical medium.

Software implementation of the neural network has an advantage. It contains the ability to build on the basis of logical elements corresponding to a conventional computer processor. The use of neuromorphic or quantum chips is not mandatory. The disadvantage of software implementation is low performance and reliability of results. Performance is especially reduced when using comput-

ers with von Neumann architecture, implementing sequential execution of operations, as a basis for an artificial neural network.

Currently, only an artificial neural network with software implementation can be used. The hardware implementation of an artificial neural network is based on a signal, neurosignal, systolic processor, a processor with a cascade architecture, on the basis of analog very large integrated circuits and on the basis of user-programmable gate arrays. The hardware implementation of an artificial neural network is characterized by higher speed and reliability of operation compared to software implementation. But the hardware implementation of large artificial neural networks is associated with significant difficulties.

Signal processors are characterized by poor scalability. Neurosignal processors are characterized by significant signal delays and lack of memory, which reduces productivity. Processors with a cascade architecture require many peripheral modules. Some of these problems can be solved by using a memristor electronic component base. Work is underway to create artificial neural networks based on memristors.

The ultimate goal of the cognitive system is the formation of consciousness of the information environment in which an extended model of reality is implemented. Within the framework of this information concept of consciousness, the difference between software-implemented and hardware-implemented neural networks lies in how unambiguous and definite the correspondence is.

In the case of hardware implementation, such a correspondence is clearly expressed. The elements of the hardware implementation are related to certain neural circuits, and through them to information objects in consciousness. Microprocessors or logical elements can act as elements of the hardware implementation. The processor cannot be considered as an element of the hardware implementation, since it is a complex and multifunctional device for processing information, which cannot be reduced to any one neural circuit. In the case of software implementation, the carrier of consciousness directly generates the information environment of virtual reality, in which information objects exist.

At the same time, the generation of the information environment may not be optimally based on the sequential execution of logical operations and memory access operations. There are significant prospects for the hardware implementation of an artificial neural network with parallelism at the level of logical elements. At the same time, there are no restrictions on the use of parallelism at very large volumes of calculations, in addition to the level of logical elements, also at the level of cores or the processor.

A direct analogue for this situation is the involvement of a team of performers in working on a problem instead of one person. The analogue of a human being in this case is a hardware-implemented artificial neural network with parallel execution of operations at the level of logical elements.

There is uncertainty only in relation to a relatively narrow segment of systems used to solve the most complex intellectual problems. Such problems are associated with the formation of multi-parameter dynamic information systems, for which it is currently difficult to determine elementary data conversion algorithms. Algorithms for performing data conversion operations in the process of solving intellectual problems are generalized and rely on a hierarchy of lower-level algorithms that define them, which are known, but cannot be fully determined with the definition of all elements and connections. As a result, to solve the most complex intellectual problems, it is advisable to use a software implementation of artificial neural networks, which have lower performance, but have greater functionality at the current level of development.

There is a fundamental difference between the mechanisms for the formation of natural and artificial cognitive systems. For natural cognitive systems, the question of correlating information objects in consciousness, on the one hand, and real physical processes in the brain, on the other hand, does not arise. Information objects are unreal and are the result of understanding reality and cannot influence it, in particular, determine the formation of real physical processes in the brain. Physical processes generate information objects and are dis-

played in consciousness as a thinking process. At the same time, it is not possible to determine how this happens.

Artificial cognitive systems are formed on the basis of generalized concepts, knowledge built on a hierarchical principle, when some concepts are explained through other concepts. When creating artificial cognitive systems, the problem of determining real physical processes that will ensure the emergence of the required information objects is solved. Inverse synthesis problems, when the model parameters are determined based on observed data, do not have an unambiguous solution.

The first solution is based on the construction of a cognitive system in the form of a reality model, for example, a physically implemented neural network, which is deterministic, but significantly limited by the complex of parameters of elements and their connections specified in it. The limitations of the model lead to a reduction in the functional capabilities and the inability of the artificial cognitive system to solve the most complex intellectual problems.

The second solution, corresponding to the software implementation of cognitive systems, is based on the construction of a cognitive system in the form of a software model, the elements of which are information objects. A cognitive system built from information objects with changing parameters has greater variability and allows for its synthesis, instead of solving the inverse problem, to solve a direct problem. For this, a two- or more-level model is built, the state of which is the result of the interactions of its constituent information objects.

The author of artificial intelligence creates a minimum number of operations for its operation and functioning, after which it develops, independently gains experience, and acquires new skills based on its self-development. From a legal point of view, the author of the works must be the person who created this artificial intelligence. This is due to the fact that artificial intelligence is not a subject, unlike its author, who showed creativity based on algorithms and program codes. The right to be the author of a work created by artificial intelligence must belong to the person using this intelligence.

The transition to the public domain will hinder the development of innovations in the field of artificial intelligence, because companies will stop receiving economic benefits from investing in this area.

Information paradigm of cognitive technologies

Information is a model of some part of reality. An information object performs the function of representing a model in a material form necessary for storing information and transmitting it to other people. Models exist only in people's minds. But the exchange of models occurs with the help of physical objects. These physical objects are called information representations, or model representations.

Examples of information objects can be a contract, a ticket, a banknote, and a book. Every year, the number of physical objects that were created to carry information is growing. People work with information objects, which are only representations of models, but not the models themselves.

This distinction was introduced by the ISO 15926 standard to distinguish a model in the mind from its representation in the form of a material carrier. So, a banknote is an information object that stores information about what the owner of this banknote can afford to do. And this is not necessarily the ability to make a purchase in a store. It can also be the ability to perform some other actions. Information about what the owner can afford exists in people's thinking.

A banknote only represents this information in the form of a material object. A banknote, apart from the social agreement on it, has no value. In order for a banknote to have value, there must be a generally accepted model in the minds of people who make up a social group. This is where its information nature is manifested. Many information objects can represent one model.

The logical paradigm that replaced Aristotelian logic had to cope with the intersection of objects. An information object stores information about objects.

Only information objects are stored in the database. These objects are objects in the form of magnetized domains.

They are designed to store information about other objects. The system stores information objects that store information about other information objects. The diagrams of relationships between entities of the subject area in the logical paradigm are drawn simply, unambiguously and demonstrate completeness. Their meaning is easy to read if you remember and know the meaning of the names and designations. These models demonstrate completeness, unlike the models of the subject area made in the form of ER-models.

To model the same information, you can build different ER-models. This is clearly visible when there is a model of the subject area in the logical paradigm. The arbitrariness of the choice of tables for storing information about the subject area becomes obvious.

There is no one-to-one correspondence between the objects of the subject area and the objects in the system. Often, one record in the table stores data about the object and the class of objects at the same time! The logical data model is devoid of all this. Therefore, it is sometimes called a data model in the last normal form.

Information objects

An information object is information that does not depend on the carrier and develops according to its own laws, residing in the information space, information field and information environment. For an information object, there is always at least one basis in which all actions are in reality or in more than one consciousness. Information objects have free will, interpreted as behavior.

As a rule, they arise as a result of conscious or unconscious purposeful activity of people, but can also be generated by non-linearly interacting information flows in computer networks. Information objects are divided into long-lived and short-lived objects. The first objects include Lazarchuk-Lelik Golems,

rings and leviathans. The second objects include codons, simulacra and dynamic plots. The term "Information Object" appeared in the early 90s of the twentieth century. The golem, caring for its static homeostasis, does not let through ideas that require radical changes and extra efforts from it in the near future.

Information objects have emotions and their own behavior. An information object has what it likes, what it doesn't like, what it wants and doesn't want, it can be healthy, it can be sick. At the moment, quite a lot of information objects are known. The Golem is the best described. Also described are such information objects as Theors, Egregors, Ring, Business Leviathan, Scripts and Plots. An information object is information organized on top of a carrier. There is an information object, and there are people who embody this information object as individuals who follow it.

Information objects are formed by collective mental activity, both unconscious and conscious. Information objects modify the behavior of people who form these objects. Information objects are capable of generating ideas of people who possess the properties of this object and protecting these people.

The Golem was first described in scientific language as an information object, but if you look closely at the past, then, in principle, Golems were probably already known in ancient Sumer. In the so-called king's list there was a very good formula that there was a certain city, and then its royalty was defeated by the city of Bey and moved there. Royalty seems to exist, but it is written over not only a specific city, but also the entire system of cities in Mesopotamia.

It is not so important who of them fights with whom, and who wins, no matter what happens, the royalty itself is important. It continues to persist and influence the history of Mesopotamia. This is a very ancient description of an information object. The information object called Leviathan was used by T. Hobbes. The Golem arises because in the conditions of industrialization, the industrial phase of development, management tasks become unbearable for a person and it is necessary to create something so that these tasks are solved.

Humanity has come up with only two mechanisms that solve management problems in society. This is the administrative Golem of Lazarchuk and the Leviathan of exchange, Hobbes. They behave like deep structures, preferring to remain tabula rasa. Thomas Hobbes bequeathed to publish the book posthumously, so as not to be persecuted. "Leviathan" was banned in England for a long time. The book was included in the "Judgment and Resolution of the University of Oxford in Convocation of July 21, 1683 against certain pernicious books" and was subject to burning.

Lazarchuk's Theorem of Management states: Given sufficient resources, any hierarchical management system tends to organize itself into a quasi-organism. The Golem has a different level of being than a human being and is unlikely to be aware of the existence of a human being as such and is capable of reading private human content. It is inaccessible to it. Since the Golem consists of people, it knows everything that its carriers know, but it cannot use the knowledge, since it is completely meaningless for it and, rather, untranslatable into its own language. It is homeostasis. Its task is to ensure the normal functioning of social mechanisms. And it does this. It does not like shocks.

According to mythology, the Golem is an anthropomorphic creature, created entirely from inanimate matter, usually clay or mud. This humanoid creature can be magically revived. An individual can communicate with the Golem, using it for his own purposes. However, the Golem can exceed its "authorities", going beyond the control of its creator and doing what is indecent or even criminal for the individual. In Stanislav Lem's novel "Golem XIV", the golem is presented as an artificial intelligence that is alien to human motives for thinking and behaving.

The golem is considered a metaphor for a community of individuals united by common biological and psychological properties and possessing a kind of supra-individual psyche. Swarm intelligence reflects the coordinated, goal-oriented behavior of a group, devoid of centralized, coordinated control. This is an emergent behavior that occurs due to the rules that individuals follow when

they unite in large numbers. Such behavior is not manifested by individuals and is not associated with any central coordination.

Golems are peoples and countries. The golem is durable and stable. The golem's consciousness exists in the form of myths, customs, traditions, and also in the form of crowd psychology. The golem is created and brought to life with the help of the secret knowledge of the master of the Kabbalah. The creator of the golem was Rabbi Judah Loew ben Bezalel, who lived in Prague at the end of the 16th century. He created a giant out of clay to protect the Jewish community. But the golem got out of control, and the rabbi had to destroy it. The image of the golem is present in the works of A. Arnim, E. Hoffmann and G. Heine, G. Meyrink and G. Leivik. It entered modern popular culture as a monster in horror stories and as a magical robot in fantasy.

In the terminology of A. Lazarchuk, a "golem" is a neural network whose elements are people. The situation changed with the development of the analytical theory of the S-matrix in the seventies, when mathematical transformations were translated into the language of physics.

This is not about the formal use of mathematical apparatus to solve a physical problem. The essence of the theory is that physical consequences are derived from the mathematical requirements for the scattering matrix, which must be an analytical complex function of its variables.

The analytical theory of the S-matrix made it possible to bring some of the simplest scattering problems to the stage of numerical answers. In more complex cases, computational difficulties turned out to be insurmountable, however, the fundamental possibility of self-structuring of information not only in the ideal world of mathematical abstractions, but also in physical space was proven.

V. Nalimov introduced the fundamental concept of "semantic spectrum". In a narrow sense, this term denotes the totality of all meanings of a particular concept. In a broad sense, it denotes the measure of ambiguity in any transformations of semantic space.

The semantic spectrum of a system includes the spectra of all concepts that form the system, but is not necessarily reduced to them. The more closely related the semantic spectra of systems, the closer to each other are the laws describing the ontology of these systems. The behavior of a system can be described through a consistent analysis of its semantic spectrum.

V. Nalimov drew attention to the fact that the fuzzy logic of colloquial language corresponds to the Copenhagen interpretation of wave mechanics. By information space we will understand the totality of the results of the semantic activity of mankind. Information that has its own behavior will be called an information object.

Information objects can be born and die. Their physical embodiment is devices that store and process information. Material carriers can be replaced without damage to the information object, which, in terms of cybernetics, is thus a software, not a hardware complex.

It is necessary to distinguish between the physical carrier of an information object and the embodiment of this object in material space. The latter necessarily exists - from the same symmetry of spaces, has behavior and is connected with "its" object informationally and energetically.

A method for obtaining an information object is a schematic method. An artificial intelligence scheme is taken and projected onto a system in which physical carriers are people, groups of people and computers. The resulting system does not have a psyche, but it is capable of passing the Turing test. A modern interpretation of the Golem as an artificial intelligence, the logical elements of which are people, closed in a hierarchical organizational structure, is given in the article by A. Lazarchuk, P. Lelik.

Lazarchuk-Lelik's Golems have simple behavior, which comes down to feeding, that is, expanding the controlled area of the information space and survival (preservation and multiplication of their element base). Golems are identified by these features. Multiple replacement of the apparatus does not change

the nature of information processes in the system. Golems are ordinary homeostatic regulators that arose in a natural evolutionary way.

A scientific theory has its own behavior. It affects the information area in which it is defined, modifying probabilities: facts that correspond to the theory acquire greater truth. Over time, such a doctrine closes the information space on itself. This leads to the formation of a corresponding identity in society and generates a macroscopic social effect. Society loses the ability to perceive any information rejected by the dominant theory. These information objects are structurally similar to Golems, but differ from them in the area of the elemental base and its informational organization, as well as the type of activity. Such objects are called Leviathans.

Information objects are egregors, which are described in social psychological formalism. The presence of a deep, although not obvious connection between the social and individual psyche makes it possible to build a collective analogue of decomposition into subpersonalities. Subpersonalities of society are called egregors. By construction, they are psychic and can pass the Turing test.

An egregor modifies a person. An egregor ensures socialization. It supports the existence of a particular universal idea. Its existence increases semantic coherence. An egregor is able to perform the same operations on information as a person. The elemental bases of such objects are societies.

The term "information" comes from the Latin word "Information" – explanation, presentation, awareness. There is a relative independence of information from its carrier, since its transformation and transmission through various physical environments using various physical signals is possible, regardless of semantics. When exchanging information, there is a source in the form of an object of the material world and a receiver – a person or some material object. Information arises due to reflection, which is a property of all matter, any material system. The property of reflection improves as matter develops from elementary reflection to its highest form – consciousness.

The process of reflection means the interaction of objects of the material world. In inorganic nature, mechanical, chemical and physical interactions prevail. With such reflection, objects are passive.

In a living organism, the ability to adapt to changing environmental conditions is formed on the basis of reflection. The semantic aspect allows us to evaluate the meaning of the transmitted information, correlating it with the information stored before the appearance of this information. Semantic connections between words or other semantic elements of the language are reflected by the dictionary-thesaurus. It consists of two parts: a list of words and stable phrases that are grouped by meaning, and a certain key, i.e. an alphabetical dictionary that allows us to arrange words and phrases in a certain order.

The thesaurus is of particular importance in information storage systems, into which semantic relations can be introduced, mainly subordination, which allows us to organize information at a logical level in the form of individual records, arrays and their complexes. There are developed thesauri that include complex statements and semantic connections between them. This allows us to store more complex information and evaluate in detail the semantic content of newly incoming information. The presence of a thesaurus allows the translation of incoming semantic information into a certain standardized semantic language in accordance with the selected thesaurus. Thus, when information arises, the original thesaurus can be changed. The degree of change in the thesaurus can be taken as a characteristic of the amount of information.

The syntactic aspect of information is associated with the method of its presentation. It is presented in the form of special signs and symbols. The carrier of information is a message. Messages are presented as an electrical signal transmitted over a selected physical medium. To do this, the message is coded. A sequence of symbols is created that uniquely display it, and modulation, in which each element of the code is translated into an electrical signal capable of being transmitted over a given distance over a selected communication channel.

Attention to the problem of information transmission and its quantitative assessment was attracted by the fundamental works of Norbert Wiener and Claude Shannon, which laid the foundation for information theory.

The most important stage in the development of information theory was the quantitative assessment of information. In information theory, the amount of information is a measure of the removal of uncertainty of one random variable as a result of observing another. If the variables are independent, then the amount of information is zero.

Measuring only the amount of information does not meet the needs of modern society. The amount of information in two messages can be exactly the same, but the meaning can be completely different. Information is called useful if it reduces the uncertainty of the algorithm being solved. K. Shannon introduced the concept of the amount of information as a measure of the uncertainty of the state of the system, removed when receiving information.

Quantitatively expressed uncertainty of the state is called entropy by analogy with a similar concept in statistical mechanics. When receiving information, the uncertainty decreases, i.e. the entropy of the system. The more information the observer receives, the more the uncertainty decreases, and the entropy of the system decreases. When entropy is zero, there is complete information about the system. It appears ordered to the observer. Hartley's formula shows that the amount of information needed to remove uncertainty about a system with equally probable states depends only on the number of these states. Information about the system states is transmitted to the recipient in the form of messages that can be presented in various syntactic forms, for example, in the form of code combinations. A specific message gives the recipient information about the possible existence of a specific state of the system.

Y. I. Schneider has received the greatest recognition for measuring the semantic content of information. The ideas of the thesaurus method were formulated by the founder of cybernetics N. Wiener. To understand and use information, the recipient must have a certain amount of knowledge. If the individual

thesaurus of the consumer reflects his knowledge of a given subject, then the amount of semantic information contained in a certain message can be estimated by the degree of change in this thesaurus that occurred under the influence of this message.

The amount of information nonlinearly depends on the state of the user's individual thesaurus. Users with different thesauri will receive unequal amounts of information. If the individual thesaurus of the recipient of information is close to zero, then the amount of information perceived by him is zero. The recipient does not understand the received message. The thesaurus method confirms the thesis that information has the property of relativity and has subjective value. In order to objectively evaluate scientific information, the concept of a universal thesaurus appeared, the degree of change of which determines the significance of new knowledge received by humanity.

The pragmatic approach defines the amount of information as a measure that facilitates the achievement of the set goal. This approach is based on Shannon's static theory and considers the amount of information as an increment in the probability of achieving the goal. The structural approach is associated with the problems of storing, reorganizing and retrieving information and, as the volumes of information accumulated in computers increase, it is becoming increasingly important. The structural approach considers the logical and physical structures of information organization. For its effective use, it was necessary to determine the structures of information organization so that there was the possibility of rapid search, retrieval, recording and modification of the information base. In machine storage, the structural unit of information is one byte containing eight binary units of information.

Less specific, but also convertible into bytes, is the indivisible unit of economic information – the requisite. The requisites are combined into indicators, indicators – into records, records – into arrays, arrays are used to create complexes of arrays, and complexes – information bases. Structural theory allows one to construct an optimal structure of an information base at the logical

level, which is then implemented at the level of technical information storage devices using certain means. The selected storage structure determines such an important parameter as data access time.

The structure affects the time of recording and reading information and the time of creating and reorganizing the information base. The information base together with the database management system forms an automated data bank. The importance of the structural theory of information increases with the transition from data banks to knowledge banks, in which information is subject to a higher degree of structuring.

After converting information into machine form, further processing of information occurs according to the same rules for information of any semantic content. Information in the form of electrical, magnetic signals and states is called data. In order to understand their semantic content, it is necessary to convert the data back into information.

Information objects and their applied technical modifications

One of the most common applied technical modifications of information objects are robots. They are usually perceived by the principle of similarity to people. Karel Capek first used this concept in 1920 in one of his plays. He described not metal bodies, but biological people assembled on a factory conveyor from different organs for exhausting labor. The influence of his brother Joseph, who was involved in graphics and photography, had an effect.

The idea of man-made imitators of certain human properties originates in ancient times. In one case, these creatures were created by people themselves. In another case, these creatures were created by gods. They were united by the artificiality of their origin. The Greeks' Olympians breathed life into Galatea, carved from ivory by the sculptor Pygmalion.

The leader of the Argonauts, Jason, quickly generated Spartan warriors growing from dragon teeth, which had to be used to sow the field. The god Hephaestus forged apprentice servants from gold to work in the forge, and at the peak of his career, he crafted the bronze giant Talos, whom Zeus gave to Europe to protect Crete. The giant Hrungnir molded the giant Mekkurkalvi from clay.

According to the Younger Edda, he was supposed to help him in the battle with the ace Thor. According to the Pentateuch and the Koran, Adam was created from clay. The first people among the Scandinavians, Ask and Emblu, were carved from ash and willow.

The creation of golems as a technology was first described in Clavicula Salomonis, one of the main magical grimoires of the 16th century. The animoculism of Leeuwenhoek and Paracelsus, the ovism of Bonnet created images of homunculi grown in retorts using chemical and magnetizing-electric effects on blood and sperm.

There were attempts to create humanoid machines of varying degrees of complexity. They began to be called automatons. In the 12th century, the Arab scholar Al-Jazari built a coastal boat with a crew of a mechanical harpist, a flutist, and two alarmists. In the 13th century, Thomas Aquinas accidentally ruined the iron man created by his teacher, the scholastic Albert Magnus. Villard de Honnecourt in his album "Legiere Poupee" depicted a mechanical Christ, which, after winding up the spring, could move along the streets, repeating the blessing gesture in the manner of the wooden maneki-neko dolls of medieval Japan. These developments were developed in Leonardo da Vinci's sketches dedicated to a mechanical swordsman.

In the 18th century, the development of classical mechanics led to the spread of the spring drive of Peter Henlein and the pendulum clock of Christiaan Huygens. These mechanisms allowed Jacques de Vaucanson to become a designer of automatons. Among them was a young flutist and a duck digesting food. Automotons were used in industry as supports for lathes and water level regulators in boilers. But most automatons served entertainment purposes. They

danced, painted, played musical instruments. The designer of automotons was Pierre Jacques-Droz. The word Androides appeared in the Cyclopedia of Ephraim Chambers in the early 18th century.

In the 19th century, punch cards began to be created. In 1808, they began to be used in the weaving machines of Joseph Marie Jacquard. Automaton designers were able to move on to the basics of robotics. Alexander Bell, Alexander Popov, Nikola Tesla and Thomas Edison laid the foundations of electronics and radio engineering. An electronic relay was created, and then an electronic computer was designed.

Yuri Lotman drew attention to the fact that the automaton is more like a person than a doll, and that it is this similarity that makes the differences more disturbing and ominous. The discussion was about the phenomenon known thanks to Masahiro Mori as the "uncanny valley" – a latent disgust or hostility that is caused by figures that are not very different in appearance from a person, but do not have a complete resemblance either.

However, the reason for the hostility to robots was not only this. From the end of the 18th to the beginning of the 19th century, riots against the introduction of machines into industry regularly broke out in Europe, which by 1811 resulted in the emergence of the Luddite movement. If the fear of contact with inanimate matter disguised as a person could still be called the fruit of the collective unconscious, then the danger of losing a job because of robots became quite real for representatives of many professions. As a result, according to Yu. Lotman, automatons combined the ancient myth of a reviving statue and the new mythology of dead machine life, becoming a realized metaphor for the fusion of man and machine. Following the visionary work of William Wordsworth in the 18th century and, in part, William Blake, one of the central images of 19th century Romanticism was the mechanical doll. Its shadow is present in the works of Vladimir Odoevsky and Alexander Green.

Ernst Theodor Amadeus Hoffmann in his stories "Automata" (1814) and "The Sandman" (1816) created an unspoken canon of depicting robots in litera-

ture and raised the question of whether it is possible to fall in love with an anthropomorphic mechanism if it is indistinguishable from a person. An example was the love story of young Nathanael and the automaton "Olympia".

Cognitive Simulations and Simulacra

The history of the creation of robots and their predecessors has actualized the problem of simulation and simulacra. Information objects have become the main carrier of simulacra. More precisely, the media that write fake news. By reading such news texts, a person is doomed to receive not real information, but information processed to please propaganda.

This is imitation, distortion of reality, creation of hyperreality – simulacrum. Social networks are filled with photos of non-existent people and unreal life. In social networks, people create a new reality, demonstrating an image that they want to imitate. There is no desire in sexual images from advertising, there is no pain in images of violence, and there is no spontaneity behind the emotions on the Internet.

Humanization of Artificial intelligence

Artificial intelligence systems influence people on both a personal and social level. Thus, effective phishing attempts are always personalized. An email from the CEO asking for a bank transfer addressed to someone in the finance department can be especially effective. The labor-intensive task of setting up phishing attacks can be automated using AI methods, allowing fraudsters to make emails or voice messages from authority figures as believable as possible. The danger is that AI will be able to persuade at computer speed and scale.

AI has the potential to make cognitive hacks personalized, optimized, and delivered directly to the recipient. Many scams are used that take into account

the individual characteristics of the victim. Advertising messages are used for this purpose. These are cognitive hacks of mass destruction.

In the 60s, Joseph Weizenbaum created a conversational program ELIZA that imitated the manner of a psychotherapist. The developer was amazed that people were willing to share deeply personal secrets with a computer program. Weizenbaum's secretary asked him to leave the room so that she could talk to ELIZA alone. People try to be polite to voice assistants like Alexa and Siri, as if the tone of communication really matters to them. Siri even complains about rudeness, because that is how she is programmed.

The phenomenon of reciprocity is studied today by psychologists. This is another cognitive hack used by humans that can enhance the scale and personalization of AI. If something has a face, it ceases to be something and becomes a being, with thoughts, feelings, and everything that comes with a real person. If this creature speaks or, even better, enters into a dialogue with us, then we can believe that it has intentions, desires and freedom of action.

Many people maintain social relationships with their robot vacuum cleaners and even complain if the company offers to replace them instead of repairing them. Anthropomorphic robots are an emotionally convincing technology. Robotic platforms that allow external developers to place code in them are often used in development. For example, a logical planner allows robots to independently build algorithms. Fear of undesirable consequences often saves human lives. Robots have machine learning algorithms and Deep Learning based on neural networks for these purposes. Information about the problems that each robot has encountered is distributed between all machines, limited only by the speed of the Internet connection.

Cognitive hacking: the problem of explain ability

The word "hack" appeared in the 50s. In the 20th century at MIT, it meant an inventive way to solve problems, and only over time did “hack” and “hacker”

acquire a connotation of illegal, antisocial activity. In the 1980s, “hacking” began to mean breaking into computer security systems for criminal purposes. Modern AI systems are black boxes.

Data goes in at one end, and an answer comes out the other. It can be impossible to understand how the system came to a particular conclusion, even for the developer. An AI system must not only produce answers, but also explain its reasoning in a format that is understandable to humans. This is necessary to trust the AI’s decisions and to ensure that it has not been hacked to affect its objectivity. A well-reasoned explanation has another value besides increasing the likelihood of an accurate answer or making the right decision: it is considered a core component of the idea of due process under the law.

AI researchers have been working on the problem of explain ability since 2017. Explanations are a form of shorthand for the cognitive process. AI decisions may not conform to the format of human-readable explanations. Forcing AI systems to do so may impose additional constraints that affect the quality of their decisions. In the near term, AI will become increasingly opaque as systems become more complex, less human-like, and therefore less explainable.

Explain ability is especially important for systems that can cause harm, have a significant impact on people, or affect a specific person’s life, quality of life, or reputation. Human decisions are also not always explainable. They are often more like post-factum justifications. Perhaps the answer lies in looking closely at the results. When courts decide whether a police department’s behavior is racist, they do not open up the officers’ skulls and ask them to explain their behavior. They look at the results and make a decision based on that.

There are a growing number of cases in which attackers successfully circumvent technical defenses in cyberspace by using psychological tricks at the cognitive level. The purpose of such attacks is to change people's behavior or attitudes towards certain things. They are often carried out using misinformation or distorted facts. Attackers use psychological techniques, exploiting human emotions such as the desire to please, empathy, sympathy and fear.

Phishing has become more personalized. The programs used by attackers can track a specific user's activity on the Internet and inform him about a sale in his favorite store, giving a link with an address similar to the site of this store. Almost a quarter of malicious emails contain links to phishing sites. Emails use such a psychological technique as "inattentional blindness", when the victim's attention is deliberately distracted by messages about a sale, a warning about alleged data theft or an unauthorized transfer of funds, so that he does not notice a fake address in the link, which may differ by just one character.

More technologically advanced algorithms of certain legal Internet platforms can also cause more technologically advanced methods of cognitive hacking. Some types of phishing attacks that use cognitive hacking techniques can be repelled by technical means, for example, by filtering emails or linguistic analysis of fake news. Disinformation campaigns used in cyberspace that use cognitive hacking techniques can only be combated by raising the level of education in society.

The problem of semi-fakes seems more complex. Experts are trying to combat them as well. Even generally trustworthy media outlets can spread semi-fakes, which, in pursuit of a sensation without really understanding the essence of the issue, can draw false conclusions from real facts. News feeds and search engines that generate results that match the preferences of users. They reinforce confirmation bias. The user finds themselves in an atmosphere of conformity and groupthink. Authoritative news outlets publish emotional headlines to stimulate the viral spread of their news articles.

Users spend less time reading content, but share it more often. Social media messaging systems are optimized for the distribution of short texts that often omit important context and nuance. This can facilitate the spread (intentionally or unintentionally) of misinterpreted information or distorted stories. The brevity of social media posts combined with vivid visual images makes it difficult for users to understand the motives and values of those who share them.

The concept of fast and slow thinking is important for understanding the essence of cognitive influence and developing skills to resist it. When slow thinking is busy with something, it has no time to track whether the information is true or not. Cognitive influence consists of creating an emotional background that promotes one interpretation or another. The user is strongly influenced by the source of information. The "halo effect" increases the power of the message and turns off critical slow thinking. This effect is enhanced by social media algorithms, offering communities and opinion leaders who support the user's already formed position. The user gets the feeling that everyone adheres to his point of view, therefore it is correct.

Almost every person believes that the decisions he makes are based on his own will and independent position. In fact, the very existence of an independent position in the era of the Internet and social networks is questioned. The use of any gadget connected to the network makes it impossible to remain outside the context of cognitive influence.

More and more people are experimenting with strategies for creatively overcoming the natural limitations of human cognitive abilities. Cognitive enhancers vary in the way they are administered, the cognitive domain they target, the duration of action, availability, and side effects, as well as how they work for different people. The human brain is evolutionarily adapted to solve very different problems. Living comfortably in an information society and a post-industrial economy requires specific cognitive skills that are acquired through slow, labor-intensive, and expensive education and training processes.

These skills can become obsolete as the world changes rapidly or be lost as we age. People also vary in their mental abilities, allowing them to acquire certain skills more quickly or more slowly, which can have a significant impact on their success in life.

The crowd funding and biohacking communities have developed numerous new tech devices to temporarily enhance cognitive function through wearables, augmented reality gadgets, neural implants, or prosthetics. In controlled la-

boratory conditions, such implants can improve human memory. Brain-computer interfaces connect the central nervous system to computers via wearable or implanted electrodes. They open up a range of possibilities for enhancing cognitive functions or for the joint work of the human brain and computer.

No cognitive enhancer improves all cognitive functions. Each has a specific effectiveness profile for different cognitive areas. For example, memory is enhanced by mnemonic strategies. Attention is enhanced by meditation training. Sleep enhances both cognitive abilities. Some computer trainings improve memory, processing speed, and visual-spatial skills.

Biological brain hacking involves the use of specific methods. Neurofeedback allows you to see your brain activity in real time. Special sensors are placed on your head that read brain waves. The signals are displayed on the screen as an understandable visualization. Looking at it, you can learn to control certain patterns of brain activity.

VR applications have been developed for memory training, where you need to remember and reproduce complex three-dimensional objects. Games have been developed to develop spatial thinking, in which puzzles are solved in virtual worlds. Virtual simulators allow you to practice complex skills in a safe environment.

The human brain has neural plasticity. This is the ability to form new neural connections throughout life. It is important to choose scientifically proven simulators. There are smart sleep trackers that analyze its phases and quality. Based on this data, they can give recommendations on optimizing the regime and sleep hygiene.

Biohacking of the human brain includes proper nutrition, physical activity and stress management. Each person has their own brain characteristics. What works well for one person may be useless for another. It is important to consult a doctor, especially if there are health problems. Real changes require regular practice. The development of biohacking technologies raises ethical issues.

Cognitive training can increase individual resilience to external influences. But you can use the services of ethical hacking.

Ethical hacking

Computer security specialists examine corporate networks for weak points in network infrastructure elements using hacker methods. Ethical hackers call themselves "White Hat", and traditional hackers, respectively, "Black Hat". The movement originated in the United States in the 80s of the twentieth century. Hackers began to be attracted by the country's armed forces to test the IT infrastructure of their facilities. This tradition has survived to this day. Thus, the US Department of Defense until recently held a competition with the telling name "Hack the Pentagon". IT companies reward ethical hackers with money for vulnerabilities found, for example, using Bug Bounty programs.

On the websites of some companies, there are separate sections with a specific list of monetary rewards, which depend on the degree of criticality of the vulnerability found. Google, Facebook and Microsoft have their own programs. Corporations understand that in addition to financial rewards, non-material recognition is also very important for people.

Therefore, as an addition to money, they often send ethical hackers various souvenirs. Ethical hackers have information resources hackerone and bug crowd. The average monthly income of a sought-after legal hacker can be tens of thousands of dollars per month.

Ethical hackers use the same tools as hackers. These are, for example, universal automated vulnerability scanners in applications, networks and operating systems (Nessus, Burp Site) and manual vulnerability search using the browser address bar. Common vulnerabilities that ethical hackers can point out include the ability of employees to work with information that does not correspond to the access level; unauthorized escalation of access rights by employees; the ability to bypass local network protection and penetrate it from the outside.

In a detailed report, ethical hackers talk about the vulnerabilities found, their criticality, and also advise what to do to correct the situation. A separate type of ethical hacking is a penetration test (pentest). It is in demand by businesses. Standards for its application have been formed. Five main methods have been developed that regulate specific actions during the test, the properties of the networks that will be studied, and the form of the final report with recommendations. If the penetration test is carried out according to these standards, it means that it will be of high quality, and the report will consist of specific facts. There are three main types of pentest.

In the case of Black Box, an attack is simulated from an intruder who initially does not have access to the company's network and knows nothing about the structure of its IT infrastructure. In the case of Gray Box, the attack is carried out on behalf of a hacker who already knows something about the corporate network. Perhaps this is a former employee, client, or users of a guest wireless network. In the case of White Box, the intruder has full access to the infrastructure and administrator rights.

The most popular scheme is Black Box, as it is closest to a real attack. During a pentest, the network and information systems are not hacked, only the potential for hacking is identified. A detailed report on the vulnerabilities found is compiled, and recommendations are given on how to quickly close them. Digital law can play a special role in protecting the digital space.

The concept of "digital law"

The concept of "digital law" began to be used at the end of the 20th century. It began to denote legal norms that arose and were intensively formed in order to regulate the actively developing digital transformation of society, the state and the economy in different countries, the distribution and use of digital data and digital technologies.

The prerequisites for the term were such categories as "Internet Law" (Net Law), "Cyber Law", "Web Law", "Computer Law", "Cyberspace Law", "Information Technology Law" (Tech Law), "Digital Technology Law", "Information Network Law" and "Electronic Communications Law".

Digital law is understood as a set of legal norms regulating social relations arising in connection with the use of digital data and digital technologies. Digital rights are considered as a type of subjective rights in constitutional, civil, criminal and labor aspects, which are understood as a measure of legally possible behavior of an individual arising in connection with the use of digital data and technologies, established by the relevant legislation and allowing a person to satisfy their needs. In this understanding, special "digital rights" of a person are also formulated, associated with access to telecommunication networks and the use of modern digital technologies.

Digital law is understood as a completely new legal mechanism affecting any element of the legal system. This approach is based on the fact that legal norms are information. Consequently, legal regulation, regardless of its industry affiliation, has an informational nature. The validity of this approach is confirmed by practice. The electronic interaction system is successfully used to provide public services, in arbitration proceedings and when filing applications for trademark registration.

Digital law in a broad sense does not imply the allocation of a special branch of law or legal institution, but represents a new direction in state regulation of digital reality. The leading role belongs to the legal characteristics of digital data and digital technologies.

Digital law in a narrow sense is understood as a complex legal institution consisting of current legal norms governing relations related to the search, receipt, transfer, production and distribution of digital data, as well as the use of digital information technologies. These norms are found in documents of different industry affiliations and are subject to different legal methodologies. For example, regulation of artificial intelligence technologies requires the implementa-

tion of both public law norms to ensure security, guarantees of human rights and freedoms, protection of personal data, and legal norms aimed at protecting property interests, intellectual rights, and compensation for damage caused by the use of artificial intelligence technologies.

Many participants in digital relations were not recognized as bearers of rights and obligations several years ago. Assumptions are made about granting rights and obligations to inanimate entities, artificial intelligence systems – "digital entities". Other entities, having barely received legal recognition, have already managed to lose it.

Traditional subjects of classical analog law (citizens and their associations) have acquired new legal opportunities. They include the right to be forgotten, the right to digital death, the right to anonymity in online relations and the protection of digital personal data.

Digital law in a narrow sense as a complex intersectoral legal institution serves the purposes of implementing existing digital technologies. Neural technologies and artificial intelligence are classified as priority legal regulation; virtual and augmented reality technologies; distributed ledger technologies; quantum technologies; new manufacturing technologies; robotics and sensor components; wireless communication technologies.

The implementation of each technology requires new legal solutions. The purpose of the general part of digital law is to provide the industry with general principles, methodology and categorical apparatus. The rapid development of applied technologies means the need to form legal institutions that ensure the use of specific digital technologies and form a special part of digital law.

This is a new area of legal regulation, a legal mechanism that ensures the development of a digital society. This is a comprehensive interdisciplinary legal institution that combines the norms of the main branches of law regulating relations related to the search, receipt, transfer, production and distribution of digital data, as well as the use of digital information technologies.

At the applied level, the subject of digital law analysis is the transition of contractual work to an electronic format. At seminars, lawyers develop the skills to conclude contracts in electronic form at an enterprise. Digital law considers legal grounds, general rules and legal risks, as well as the stages of concluding electronic contracts and concluding a contract by exchanging scans by e-mail. Practical recommendations are given to lawyers.

Experts analyze the problems of reserving contractual terms published on the website and confirming the terms of the contract that are available online. They also consider the problems of recognizing the legitimacy of contracts signed electronically, scanned contracts and applications, and contracts concluded by e-mail. The subject of study of digital law is two-level contract structures (additional agreements, signatures of the parties) and dangerous legal formulations. The subject field of digital law is the phenomenon of electronic signature. Lawyers analyze methods of protecting violated rights in court under contracts signed with an electronic signature (nuances of filing a claim, a clause on the use of an electronic signature and seal in the text of the contract).

They study judicial practice in cases related to violations and abuses (forgery of an electronic signature, use of an electronic signature by an unauthorized person, and key compromise). Experts consider the prospects for using a "cloud" electronic signature.

The subject of digital law is data in the digital economy (personal, publicly available and impersonal) and practical issues of compliance with legislative restrictions. Lawyers consider administrative and disciplinary liability for violations of legislation regulating the use of personal data and the practice of fines for violation of legislation in the field of personal data imposed on officials and legal entities.

A special topic of digital law is the protection of intellectual rights on the Internet. Specialists consider the procedure for state registration of intellectual property, issuance of patents in electronic format, types of intellectual rights on the network subject to protection, protection of trademarks and brands on the

network. They study practices in disputes related to the use of trademarks on the Internet. The subject of consideration of law is domain disputes, instruments of legal protection of copyright on the network and protection of intellectual property of the enterprise.

Digital law is interested in electronic evidence (current practice and recommendations), as well as the approaches of the courts to the interpretation of the content of correspondence by e-mail. Lawyers consider the admissibility of using printouts of materials from websites (screenshots) as evidence in court and the practice of using messages received via instant messengers (Whats App and Skype) and SMS messages as evidence. Digital law studies the specifics of using metadata and special software data as evidence.

Lawyers consider the Internet archive as a means of proving in court the fact of posting certain information on the Internet at a specific point in time (legal nuances). Lawyers also consider the provision of evidence on the Internet by a notary and a court. Experts develop recommendations on how to prepare electronic evidence for the court, how to carry out software and hardware expertise when confirming evidence. Digital law studies the specifics of using legal facts through audio, video recordings and digital photographs in corporate disputes. Lawyers also consider scenarios where corporate correspondence will help a company win a court case.

They take into account the electronic system for recording legal facts. A special subject of study for lawyers is electronic justice. Experts study the practice of filing documents electronically, court notices, procedural actions of which persons must be notified by sending a notice and on paper, calculating the limitation periods and familiarizing themselves with case materials and audio recordings of court hearings.

Lawyers pay special attention to the preparation and consideration of a case using electronic documents, cases when the court may require the provision of original documents, the execution of judicial acts in the form of an electronic document and the sending of judicial acts and their copies electronically.

The subject of consideration by lawyers is the prospects for regulatory control and new services. In digital law, the practice of court hearings via the Internet and via videoconferencing is studied. A special topic of digital law is digital assets and digital money. Smart contracts are studied by lawyers in terms of advantages, risks, legal qualifications and practical application.

The subject field of lawyers includes block chain technologies and crypto currency. Digital law specialists study the criminal risks of working with digital assets. They review judicial practice on disputes related to the use of crypto currencies and block chain from the perspective of what conclusions a practicing lawyer should make.

The mechanism for regulating public relations in the digital environment is based primarily on the fact that these are private or public relations, and only then on the fact that they are clothed in digital form. Digital relations can arise not only in relation to actions with information as their content (for example, with intellectual rights), but also with real property and obligatory rights expressed in digital form.

It is necessary to distinguish between such objects of research as technical solutions and public relations, and the digital relations associated with them. The subject of legal regulation can only be public relations based on people's actions regarding the ownership, use and disposal of technologies. The digital form of public relations determines the features of their regulation, but hardly makes them any new relations.

With regard to the economy, production, consumption, exchange and distribution can be carried out outside of digitalization and formalized in traditional paper documentary form. The legal forms of such relations express transactions and other legal facts, legal relations and acts of implementing legal relations. The forms of state regulation are administrative acts and judicial acts. The essence of the legal instruments used remains the same.

The problem of ensuring human rights and freedoms in their digital relations with the state is that, on the one hand, legislative regulation should not re-

strain the potential of digital technologies, and on the other hand, it should ensure constitutional human rights and freedoms.

Private digital relations as legal relations are characterized by the features of their subjects, the basis of dynamics, objects and content. Lawyers proceed from their main status (owner, seller, buyer) and an additional characteristic determined by the digital form of the relationship, for example, the owner, seller, buyer as users of a digital information system. The operator of this system also participates in the digital information system, providing intermediary services to the subjects of the main legal relationship. Both the participants in a private digital relationship and the operator of the digital platform, along with the rights and obligations of the subjects that constitute the content of the main legal relationship, have additional rights and obligations caused by the digital form of implementation of the main legal relationship.

The authors who endow the robot with legal subjectivity argue that legal fictions can be used in digital law. According to them, a robot is the same legal fiction as, for example, a legal entity that has legal subjectivity. This cannot be agreed with for two reasons.

Firstly, a legal entity as a fictitious subject of law can own property, including robotics. In this case, the nominal owner of the property of a legal entity, including robotics, are its participants, i.e. real individuals.

Secondly, a robot is property that has features that must be taken into account during its operation and legal regulation of the relevant relations. A robot can be a source of increased danger to others accordingly its owner bears the risk of the consequences of using the robot as a source of increased danger. The participant in digital relations is not the robot, but its owner, who is obliged to control its use and compensate for the harm caused by activities that create an increased danger to others.

When determining the specifics of the grounds for the emergence and implementation of digital legal relations, it is necessary to distinguish between traditional methods of expression of will of a person aimed at the emergence and

implementation of a real social relationship, for example, a purchase and sale obligation, the legal features of which are determined by law and an agreement, and the specifics of expression of will of a person caused by the digital form of the relationship, for example, obtaining an access code to an information system, transferring information in digital form.

There is no reason to endow AI (an object of law) with will and legal subjectivity, to consider it an agent acting on behalf of an economic entity. AI is only a means used by a person to solve his problems. When characterizing the specifics of the legal regime of objects of digital legal relations, it is also necessary to distinguish between: 1) objects of real social relations; 2) specifics of the legal regime of the same objects determined by their digital form. Creating a digital image of an object does not change its nature. This is a way of recording the ownership of an object of civil rights by a certain subject, who can dispose of it at his own discretion through the use of digital means of transmitting information about them.

Thus, digital information about an object also becomes an object of regulation. Information is understood as data, messages, regardless of the form of their presentation. Digital rights include actions, the content and conditions of which are determined in accordance with the rules of an information system that meets the characteristics established by law.

There is no certainty regarding a number of digital rights. For a long time, digital currency mining was included in this area. Digital currency mining is recognized as an activity to perform mathematical calculations to enter records into an information system, which is carried out for the purpose of issuing digital currency and receiving a reward in digital currency by the miner for confirming records in the information system. Miners will be able to combine the capacities of their hardware and software into mining pools for the joint extraction of digital currencies and their distribution among the participants of such a pool.

The concepts of "mining infrastructure" and "mining infrastructure operator" have been introduced into the legal field. In the first case, these are objects

that are used to place hardware and software used for mining cryptocurrencies. In the second case, we are talking about a person who provides services for the provision of mining infrastructure.

The main problems on the Internet that require legal regulation are the distribution of extremist materials; problems related to the protection of intellectual property rights; problems of legal regulation of exclusive rights to a network address (domain name); protection of personal data; legal regulation of electronic commerce; propaganda and illegal advertising of narcotic drugs and psychotropic substances; illegal distribution of pornographic materials; slander and insult and fraud. The following require understanding: the peculiarities of the legal status of subjects (users, operators) and the legal regime of objects of legal relations; the peculiarities of the grounds for the emergence, change, termination of legal relations and the peculiarities of the content of legal relations mediating digital relations.

Lawyers analyze special sources, among which a large role is given to self-regulatory acts, technical standards; their own conceptual apparatus; issues of the legality of the extension of state sovereignty to cyberspace; issues of identifying participants and ensuring the security of information exchange. Legal norms and institutions of digital law relate to different branches of law and are not united by a single method of regulation, which is not mandatory for complex branches of law.

Digital rights

The right to be forgotten and the right to anonymity: the ambivalence of digital rights. The right to be forgotten allows you to remove links to resources with false, outdated or illegal information about a person from search results.

Anonymity reflects the state of impossibility of determining a person's identity, the absence of identification in any process of owning, transferring or

creating information. Personal data cannot be disclosed to anyone other than the one who owns them or represents the owner.

The emergence of interest in anonymity occurred through encryption with the invention of the telegraph in the 19th century. At that time, this worried business. In the 20th century, behavioral concerns were added to practical considerations. Michel Foucault clearly described the Panopticon effect, according to which the very fact of observation and the asymmetry of information between the observer and the observed is the basis of disciplinary power, which is exercised, among other things, through changing the behavior of the observed.

In 2015, the UN Human Rights Council recognized that anonymous use of the Internet and the use of encryption of personal data and means of communication are an inalienable human right.

The possibility of anonymity is reduced by the system of deep analysis of network traffic. The system blocks any suspicious activity based on the fact that all methods of anonymization of traffic are suspicious. But how exactly the system reduces the possibilities of anonymity, few people know. There is no understanding of how data can be used against the user.

A fingerprint (browser fingerprint) is information collected about a remote device for further identification. Fingerprints can be used in whole or in part for identification, even when cookies are disabled. Mozilla replaces information and blocks fingerprinting, but other browsers do not.

Most instant messengers require SIM cards. If a SIM card is purchased by presenting a passport, then there will be no anonymity. Also, the internal functionality of some instant messengers and services allows you to de anonym the user, for example, the Get Contact application, but the user does not understand this. The author can be identified using stylistic analysis. Even if the publication is made anonymously, the author's style is preserved in the material.

The author can be identified using stylistic analysis. Even if the publication is made anonymously, the author's style is preserved in the material. Metadata leaves digital traces that users do not notice. Any file, Facebook post,

email has metadata. The file name, the date it was created are metadata. A digital informant makes public past or suspected illegal or immoral actions. The informant has to send photos that can be used to identify him.

Open sources are used for doxing. Open source intelligence (OSINT) represents intelligence structures based on open sources. OSINT is most often used to collect information about a specific person or organization. But OSINT methods are also used to attack activists and doxx.

Black boxes are vulnerable. These are devices for decoding anonymous information, such as Secure Drop. Existing solutions are vulnerable. Journalists who receive leaks are careless about the anonymity of sources. Thus, in the current architecture of the Internet, almost all user actions can be recorded. In the field of digital law, there are such sections as copyright on digital entities, software law, digital money law, digital transaction law, digital dispute law, software robot law, digital public administration law, digital government law, and the right to access data and protection during access.

The concept of digital rights arose with the beginning of the spread of the Internet in the late twentieth century. It is based on the methodology of the 1st generation of rights (personal and political rights of man and citizen); 2nd generation (cultural and socio-economic rights of the individual); a new separate system (generation) of rights.

The right to access the Internet is considered from two aspects. The interpretation of legal relations considers digital law in the context of first-generation rights. It consists in the possibility of free expression and open access to information. The exercise of the right to access information can already be considered as their implementation. The technological condition for the implementation of digital rights is the availability of the appropriate technical infrastructure. The right to access the Internet was formalized in the report of the UN Special Rapporteur on the promotion and protection of the rights to receive, impart, express and access information dated 16.05.11 (A/HRC/17/27) within the frame-

work of the UN Human Rights Council during the consideration of resolution 736 dated 20.03.2008.

V. Cerf believes that access to the Internet in itself does not act as an independent legal value, but is nothing more than a technical means of realizing the natural rights of the individual. The interpretation of the concept of the "right to be forgotten" is associated with the decision of the European Court of Human Rights dated 13.05.2014, number C-131/12.

The right to be forgotten is understood as the ability to demand the removal of reference materials to compromising, inaccurate, outdated, unreliable and other materials of an inappropriate nature, if their publication can cause any harm to either one person or an unlimited number of persons. This norm refers to the first generation right to respect for private property rights. The right to be forgotten implies the technical possibility of complicating access to information and making it non-public information. The right to be forgotten can be considered as a type of right to protect personal data.

The right to protect personal data in international law does not have precise legal specifics. Rather, it is a form of a generally recognized rule of law on respect for private life. In favor of this, one can argue that in European law, personal data were initially inseparable from the right to respect for private and family life.

The public nature of the Internet significantly increases the risks of disclosure of personal confidential information. Thus, the capabilities of the Network provoke an increase in cases of violation of fundamental rights, which formed the basis for the formation of separate legislation in this area. This gives reason to once again talk about the duality of understanding digital law, where such rights, on the one hand, act as an independent normative unit, and on the other, are positioned as forms and means of implementing traditional fundamental human rights. The increasing technical capabilities and availability of publishing any information on the Internet create critical risks of violations of the rights to privacy and freedom of expression.

The Charter of Human Rights on the Internet formulates the right to access the Internet as a tool for the educational process, in accordance with Article 26 of the Universal Declaration of Human and Citizen Rights, which guarantees the right to education. The right to access the Internet includes the rights to possess user skills; to develop, own and download accessible content and applications; to access infrastructure; the equivalence of the right to access the Internet regardless of gender, nationality, social, political and religious affiliation; public access to the Internet; access to the Internet from the workplace.

Articles 18-20 of the Universal Declaration of Human Rights guarantee freedom of conscience, thought and religion; freedom of opinion and opportunity and expression; freedom of peaceful assembly and association. Freedom of expression and opinion also extends to freedom from Internet censorship, the ability to organize and participate in online protests.

Article 27 of the Universal Declaration of Human Rights guarantees the right to a role and participation in cultural, social and scientific progress, with the opportunity to use the benefits thereof; the right to enjoy works of art. This also includes the right to freedom of information and the delivery of information to the Internet.

Article 27 of the Universal Declaration of Human Rights grants the right to create and disseminate knowledge, to create and disseminate open source software, to benefit from convergence and multimedia content. Article 12 of the Universal Declaration of Human Rights guarantees the right to privacy, data protection, freedom from surveillance and the use of encryption.

The right to Internet governance includes the rights to objective and multilateral monitoring and management of the Network; a shared decentralized Internet with an open architecture; accessibility and transparency of legal and technical decisions on the further development of the Internet; network neutrality. A special topic is the right to be informed, implement and protect rights on the Network. This is the most controversial article of the Charter, requiring regulatory clarification. The right to implement and protect cannot be considered as

an independent type of mandatory component of any subjective right, which consists precisely in the ability of a person to use various methods of implementing protective measures in the event of objective threats.

The protection and implementation of rights on the Internet implies not only legal relations of a public law nature, but also relations arising between individuals, including in the personal intimate sphere. The legality of implementing protection on the Internet cannot be brought to the category of independent rights based on the position of both meanings and practice of legal application.

A universally recognized criterion of rights on the Internet is the connection of legal relations with the technical capabilities of modern digital communication information technologies and the Internet. These capabilities depend on mobile networks and devices for their retransmission; data banks; cloud storage; services; content.

Digital law covers the issues of electronic payments, electronic and mobile money, electronic banking, consumer protection in payment markets, artificial intelligence, big data analytics, competent relations in the era of big data, block chain, crypto currency, smart contracts, digital identification and authentication, confidentiality, the intersection of competition law and intellectual property, search engines. The digital rights of a citizen can be infringed by the state (for example, law enforcement agencies), and the digital rights of a citizen can be infringed by a provider who has announced its readiness to provide digital services, has entered into an agreement, but does not want to fulfill it.

Various types of fraudsters can attack the digital rights of a citizen. One of the ways to infringe on a person's digital civil rights is to impose completely unnecessary digital services on them, such as spam. A citizen's digital rights are protected by law. In Chapter 31 of the Criminal Code of the Republic of Belarus, this task is performed by: – Article 349. Unauthorized access to computer information. – Article 350. Modification of computer information. – Article 351. Computer sabotage. – Article 352. Illegal seizure of computer information. – Article 353. Manufacture or sale of special means for obtaining illegal access to a

computer system or network. – Article 354. Development, use or distribution of malware. – Article 355. Violation of the rules for operating a computer system or network.

E-commerce, the development of marketplaces and IT technologies impose new requirements on legal regulation and protection of consumer rights. Lawyers are called upon to ensure legal protection for both sellers and buyers, regulate issues of delivery, return of goods and data protection. The activities of marketplaces require careful legal regulation to avoid violations and ensure the transparency of transactions.

Digital rights are divided into utilitarian digital rights; digital financial assets; digital rights that include both digital financial assets and other digital rights. Taking into account the theories of legal understanding of natural and positive law, natural digital rights are distinguished, inalienable, for example, the right to privacy of personal data; positive digital rights enshrined in law, for example, digital financial assets or utilitarian digital rights.

By the nature of the rights being certified, a utilitarian digital right is distinguished: to demand the transfer of a thing; to demand the transfer of exclusive rights to the results of intellectual activity and/or the rights to use them; to demand the performance of work and the provision of services.

Depending on the nature of the emerging relations, a distinction is made between digital rights arising in connection with the issue, accounting and circulation of digital financial assets and in connection with investing using investment platforms.

Depending on the context of use of the category of digital rights, their holders can be citizens who own cybernetic rights; shareholders and investors.

Utilitarian digital rights function in the investment platform of the right to demand the transfer of a thing or exclusive rights to the results of intellectual activity, the right to demand the performance of work or the provision of services. This is the electronic equivalent of certificates, coupons or vouchers, certifying the right of its owner to receive specific goods and services in the future.

A company can issue such securities to attract money. Utilitarian digital rights can certify the right to transfer a thing or several things, with the exception of property, the rights to which are subject to state registration or notarization; transfer of exclusive rights to the results of intellectual activity; the right to demand the performance of work, the provision of services.

The emergence, implementation and disposal of utilitarian digital rights is possible only in the investment platform. Only an organization included in the relevant register can be the operator of the investment platform. To purchase a particular utilitarian digital right, an investor must register on the platform. Both legal entities and individuals, residents and non-residents can invest in the purchase of utilitarian digital rights.

Utilitarian digital rights can apply to services and intellectual rights. This is a simpler crowd funding tool, attracting financing for small companies and startups. More complex regulation applies to ordinary securities, and their issue is much more expensive for companies and takes a long period of time.

This methodology is suitable for distributing small amounts across multiple projects. An investor can buy project tokens as a right to demand the results of activities that correspond to his interests. The investor can earn on the growth in the value of project tokens.

Computer law

Computer law is considered by lawyers as a system of legal regulation of relations in the computer sphere. It includes a system of legal norms regulating relations in the computer sphere. Information in personal and office computers, as well as on network servers, is becoming increasingly valuable, and its loss or modification may cause significant material damage. Serious offenses include violation of operating rules that have caused significant harm; distribution of malicious programs; unauthorized access to information protected by law.

Programs and databases, according to international law, are the subject of copyright and objects of intellectual property. Electronic books, websites, databases and programs are subject to the same copyrights as ordinary literary, scientific and artistic works. Copyrights are recorded with the ã sign (copyright – the right to copies) with the indication of the last name (pseudonym) and the year of creation. Internet sites are objects of copyright, since any hypertext is a program, and sites are a database of a set of hypertexts on network servers.

Copyright belongs to their authors, whose creative work created the collection, with strict observance of the rights of the authors of works included in the collection or posted on the site.

Copyright for literary and electronic works guarantees the right to a name; the right to changes; property rights. To register copyright, it is necessary to have at least two copies of the completed work and the publication on the Internet of the full title and annotation of the work, the copyright sign ã, the author's name and the date of creation. Exceptions are service works, sites, programs and databases created by order or an employment agreement.

Ownership rights to service works belong to customers, unless otherwise stipulated by contracts. Commercial use of programs and databases for electronic books and textbooks for the purpose of generating income is possible only by concluding contracts with the author and publishers. At the technical level, information protection is organized by restricting access to third parties.

The solution is to authenticate users by registering them and entering passwords. Computer vandalism is a gross violation of copyright. Censors-moderators who destroy scientific materials of an educational nature are subject to administrative penalties, including dismissal due to staff reduction.

Vandalism is manifested in the replacement of the content of quality articles with swear words, graffiti or other content that is not related to the topic of the article. For citizens, information security is expressed in the protection of their personal computers, their personal information in information systems and networks, as well as the results of their intellectual activity.

For organizations, information security implies protection from external attacks of official information, corporate information systems and networks, as well as their intellectual property.

For the state, information security means the protection of national information resources and state information systems, as well as telecommunications infrastructure, organizations and services from external and internal threats. The main threats are computer epidemics, spam and computer vandalism.

Computer offenses are classified as criminal acts if there is intent and material damage caused to citizens, organizations or the state. In all developed countries, intentional computer hacking and the distribution of computer viruses are considered international crimes, which entails the forced extradition of offenders. In 2001, the countries of Europe, America and Asia adopted the Convention on Transnational Cybercrime, which was ratified by more than 40 states.

Crimes against data and crimes with data are criminally punishable. The list of these crimes includes illegal access, illegal interception, interference and illegal use of computer data, forgery and fraud with the intent to illegally obtain benefits for oneself or another person.

Child pornography is a criminal offense under the Convention on Cybercrime. Criminal offenses include the production of child pornography for distribution, distribution of child pornography on the Internet and the acquisition of child pornography for oneself or another person.

Legal regulation of virtual reality projects

One of the achievements in the development of digital technologies has become virtual reality (VR) projects. They belong to immersion technologies. This category also includes augmented reality (AR) projects and mixed reality (MR) technologies. What all of the above technologies have in common is that they combine elements of the real and virtual worlds. The prospects for the development of immersion technologies are very broad. We are talking not only

about the computer games and entertainment industry. Currently, virtual reality-based developments are used in medicine, education, trade, tourism and the military-industrial complex.

Like other assets, AR / VR become objects of various kinds of relations, which necessitates clear legal regulation. Existing legislation does not always have the necessary mechanisms and tools to resolve legal issues related to the use of a virtual environment.

Virtual and augmented reality are objects of intellectual law, since these projects are the result of intellectual and creative activity. The protection of intellectual property rights is part of the legal regulation of AR / VR projects.

Virtual and augmented reality technologies belong to the category of end-to-end digital technologies. A single technology is the result of intellectual, technical and scientific activity. Thanks to this, the person who organized the creation of a single technology receives the right to use the results of intellectual activity as part of the information technology. In this context, it acquires the status of a complex object.

Patenting is an effective way to protect inventions. Companies that are engaged in the creation of virtual reality projects can apply for a patent for their inventions. We are talking about devices for immersion in virtual space. In 2016, the Global Virtual Reality Association began its activities, with Samsung, Oculus, Google and a number of other companies becoming members.

They took on the mission of developing and implementing VR technologies. The work of this organization touches on issues related to the use of cross-cutting technologies. This also applies to the development of a unified approach to legal regulation.

The use of VR and AR is impossible without specialized software and databases. These two elements of the information system are closely related and cannot function separately. Software is an object of intellectual property. Exclusive rights to it belong to the developer - an individual or a company. If developers created software while working for one company, and then moved to an-

other and continued their activities, this can be considered as disclosure of a commercial secret, since the specialist creates new developments based on previous results.

f developers created software while working for one company, and then moved to another and continued their activities, this can be considered as disclosure of a commercial secret, because the specialist creates new developments based on previous results. This became the basis for high-profile lawsuits between companies producing virtual reality devices.

The rules for using intellectual property are applicable not only in the real world, but also in the virtual world. If a user of a computer game used the logo of a famous brand to create an object in a virtual environment solely for personal purposes, then the rules for using the trademark will not be violated. But if the rights to such an object were transferred to the provider of the virtual world and the object became part of the advertising content, then the owner of the trademark may have grounds for claims. Manufacturers of branded goods specifically opened their representative office in the online game, producing and selling licensed versions of their goods to users.

It is easy to violate intellectual rights in the virtual world. It is enough to create objects using protected material. Thus, game characters can copy the features of famous heroes of books or films protected by copyright. Such characters in computer games are created by fans, and copyright holders do not seek to enter into legal disputes with them. However, game characters copied from famous heroes can be used to create provocative and compromising content. Videos featuring famous heroes can be distributed on a commercial basis. Then the issue of protecting copyright holders will become especially relevant.

For some participants, selling game items through third-party sites becomes a source of real income. However, such business outside the game is often prohibited by the terms of license agreements with end users of games. The problem is that honest players find themselves in unequal conditions with those

who buy virtual objects for real money. Users bypass the rules and sell virtual items on game forums, online auctions and special sites.

The ability to sell virtual objects for real money becomes a cause of online theft. License agreements often allow the possibility of theft of game items by game heroes from each other. Game creators adhere to the position that the rules stipulated in the license agreement take precedence over the laws of the real world. By agreeing to this, gamers consciously limit their real rights and assume the corresponding risks.

From the point of view of criminal law, a virtual character who has stolen virtual objects is an instrument with which theft is committed. In this case, depending on the damage, the incident can be regarded as a civil offense or even a crime. The ban on stealing items from game characters does not protect players from real damage. Attackers illegally obtain logins and passwords of players and, having entered the game, put the stolen items up for sale.

Often, users themselves give the scammers passwords, hoping that they will help them pass a difficult level or get additional bonuses. To gain access to player accounts, attackers can use the vulnerability of game servers and malware. Also, virtual criminals can blackmail their victims, extorting money for the return of stolen items. Official game servers monitor incidents and block offending players from accessing the game, but it is impossible to return stolen property. Administrators of pirate game servers ignore such problems and do nothing. In a virtual environment, hiding behind fictitious names and images, it is easy to feel impunity. In the absence of frameworks that restrain behavior in the real world, users in the virtual world exhibit the basest qualities.

Therefore, in addition to direct material damage, computer game users may face cyberbullying. Griefing is used in online games. This is a targeted persecution of other users by players in cases that contradict the spirit of the game. Griefing can be expressed in the deliberate blocking of certain areas of the game. The main goal of griefing is to deprive other gamers of the pleasure of the game. The fight against griefing is left to the discretion of server owners. In

some games, such as EVE Online or GTA Online, griefing is not prohibited and users must counteract it themselves. VR/AR technologies allow collecting large amounts of information, including biometric data, movement data, and personal preferences of users. Such information may become the basis for discrimination or interference in privacy. The risks of unauthorized access to confidential information are increasing.

Risks of unauthorized access to confidential information are increasing. The introduction of mandatory requirements for the security systems of VR/AR devices can help in the fight against unauthorized access to personal data. Virtual means something that exists only as an electronic image and has no other specific existence. Augmented reality (AR) technology only introduces individual artificial (virtual) elements into the perception of the real world, thereby combining the real and the virtual.

This is done by superimposing information (in the form of graphs, text, images) on real objects. Augmented reality has become widespread in advertising, architecture, retail trade and geographic location. Carrying out illegal entrepreneurship on a social network without registering a legal entity entails the same liability as in the real world; insults on social networks may entail administrative liability; violation of intellectual property rights on a social network also creates the preconditions for collecting compensation for such an offense.

It is more correct to speak in this context about the digital environment, which includes information and communication technologies, including the Internet, mobile technologies and devices, as well as digital networks, data banks, content and services.

One of the digital environments is created by the technologies of the metaverse. This technology is not intended to fundamentally replace the Internet, but is based on it and transforms it. The metaverse is the successor to the mobile Internet, placing everyone in a virtual environment on an almost permanent basis. The metaverse is a network of interconnected skills and applications, devices and products, tools and infrastructure that create virtual worlds in which

an unlimited number of users are located in real time with an individual sense of presence and continuity of data, such as identity, history, access rights, objects, communications and payments.

Raph Koster distinguishes between online worlds, multiverses and metaverses. By online worlds, he means digital spaces designed for communication and chats (social online worlds), creating creative content (creative online worlds), and gaming (gaming online worlds). The multiverse, from his point of view, is several different online worlds connected into one network. The metaverse is a multiverse that interacts more with the real world. It includes significant elements of augmented reality.

Many issues remain unresolved and can entail legal consequences. For example, in the fall of 2021, Meta encountered a situation of sexual harassment in the application during beta testing of its Horizon Worlds platform. And this was in a situation where the user was unable to use the Safe Zone tool. Previously, such an issue was raised in relation to the situation of in-game interaction between avatars and was regarded more as a joke.

But in conditions where the metaverse is not recognized as a video game, such harassment may well be classified as a real offense committed through digital technologies. Experts raise questions about NFT. James Cooper notes that the metaverse is not described by traditional jurisdictional institutions.

From the point of view of an ordinary user, the functionality of such virtual worlds provides him with the opportunity to sell, buy or give away certain objects. An example is the trading platform of the virtual world Second Life. Similar functions are provided in other multi-user virtual worlds.

What are such “transactions” from the point of view of the law, which does not know the category of virtual objects as an independent object of legal regulation? The legislation does not provide an answer to the question posed, and the established practice is based on the licensing model of interaction between the user and the copyright holder of the virtual world.

In the case of purchasing a virtual object from the administrator, the intellectual rights are retained by the latter, but the right to own, use and dispose of a specific object passes to the purchaser of such an object.

The licensing model is used due to the current lack of other suitable legal structures for this, as well as due to the reluctance of the copyright holders of virtual worlds to transfer any rights to users. The mediation of relations on the turnover of virtual objects through the prism of licensing legal relations contains significant contradictions. For example, a typical situation for the real and virtual worlds is when a seller decides to remove a product from sale. This means that new people are unable to purchase the product from the seller.

In the license model, the licensor, as a general rule, has the right to revoke the license, thereby returning exclusive rights to the protected result of intellectual activity. That is, such a person may not only not issue new licenses, but also revoke all previously issued ones.

Such authority would introduce a significant imbalance into economic relations within the virtual world, since it would allow depriving the owners of virtual objects of the right to use them. In this regard, license agreements stipulate that the licenses issued by the user are terminated due to the deletion of their content, with the exception of licenses for objects that are in the inventory of other users. This actually makes it impossible to revoke a license and confirms the artificial nature of licensing legal relations in this area, the need to revise existing approaches to the legal qualification of relations on the circulation of virtual objects.

The essence of these relations directly indicates the need to change approaches to their legislative regulation. The structure of transactions for the alienation of virtual objects as independent objects of circulation, familiar to the average user, meets the established relations to the greatest extent.

However, its detailed development, in particular the answer to questions about which contractual structure should be used – a traditional sale and purchase, an agreement on the alienation of exclusive rights or a mixed contract

model specially developed for the specified relations - is the subject of further research and scientific discussions.

The chosen path will directly affect the understanding of the legal nature of virtual objects, their legal regime and protection: consideration of virtual objects as other property to which the rules on things or securities are applied by analogy; as a property right or a protected result of intellectual activity. The following areas can be named that will be subject to, or have already been subject to, the phenomenon of virtualization and in which the public interests of the state are directly affected. Taxation issues should be considered both from the point of view of the tax liability of the virtual world copyright holder and from the point of view of user taxation.

Since 2011, the Financial Crimes Enforcement Network (Fin CEN) (a division of the US Department of the Treasury) has required companies that carry out transactions with currencies, cash and other assets that replace currency to submit relevant reporting documents in order to combat the financing of terrorism. At the same time, issues of taxation of users in a situation where the alienation of a virtual object occurred between two independent residents without the direct participation of the copyright holder are not regulated. This becomes relevant in conditions where virtual stores selling virtual items will operate.

Virtual metaverses and the technologies used in them can open a new era of espionage. This ability to reproduce the appearance of an avatar combined with an imitation of a voice, which can initially be changed by the user without additional means of protection, primarily software, creates significant threats to unauthorized access to confidential information. There will be a need to regulate the activities of the self-employed who will use the metaverse as a platform for selling their goods and services, including from the point of view of their interaction with end users (consumers) in such virtual environments. The subject of the study was the phenomenon of virtual work.

The emergence of new types of offenses was also noted. This group of social relations includes, firstly, new types of offenses, the emergence of which is

directly related to the formation of the metaverse, for example, administrative offenses in the field of antitrust or advertising legislation, civil offenses in the field of consumer protection, crimes in the field of computer information and crimes committed using information technology.

Modern legal science knows the following types of legal regulation of social relations: self-regulation, state and international legal, as well as contractual regulation. Each of them can be used to regulate relations associated with activities in virtual worlds.

The predominant method of legal regulation of relations in virtual spaces is contractual regulation, the main form of expression of which are license agreements, as well as agreements on terms of service concluded between users and copyright holders of the virtual world. States and international organizations have not yet participated in determining the rules of conduct in virtual spaces. This is due to the fact that the law traditionally does not regulate frivolous, game relations, which, as a rule, cannot in any way affect state or public interests.

The absence of public law regulation has led to the fact that we can state the fact that users are effectively disenfranchised, and have no rights even to the results of their own creative work carried out in the virtual world. This is due to the fact that the content of contracts concluded with users is initially drawn up in such a way as to protect the interests of the copyright holder of the virtual world exclusively.

A license agreement, mediating the legal rights and obligations of participants in the virtual world and concluded with each of them, in the conditions of the metaverse can become an analogue of modern national law. This situation is considered as one of the threats to US national security due to the fact that the agreement may be deliberately drafted in such a way as to significantly limit or exclude the effect of state legal norms. Unlike public interests, not every private interest of a user is a legal interest that is protected by law.

Existing legal decisions and rules of conduct in the specified areas should be extended to relations that develop in virtual worlds, with the exception of that

part of them that would contradict the essence of these relations within the virtual world. The legal regime of virtual objects (assets) should be defined at the legislative level.

Not all public interests can be protected only by state regulation. Comprehensive regulation of relations in the virtual environment is necessary based on a combination of self-regulation with state and contractual regulation.

International legal regulation as applied to the virtual environment is a subsidiary mechanism. It is possible to regulate individual provisions at the international level, in particular, to consolidate the list of user rights in order to accelerate the process of moving away from the traditional concept of a disenfranchised user. At the initial stage, we should talk about acts of a declarative nature. At the same time, given the complexity of adopting international documents, it is precisely national regulation of the relevant issues that is necessary.

At the same time, we should strive to ensure that it is similar on key issues, otherwise, in the conditions of different legal systems, in which legal regulation may differ significantly, it will be impossible to effectively protect either the rights of users or the rights of copyright holders of virtual worlds. In the case of users, if one country recognizes the rights to virtual property, its legal regime will be determined, and in another the practice of refusing judicial protection of "game" claims continues, there will be discrimination against users on a regional basis. It is necessary to limit the institution of the arbitration clause in the interests of protecting the rights of users, with the exception of commercial entities.

The category of "virtual law" denotes a new independent direction of scientific research in the field of regulating relations in virtual spaces arising between users of virtual worlds (platforms), as well as between them and the copyright holders of such worlds.

This direction can be developed within the framework of the science of information law, as well as a new direction of research in the theory of state and law through the prism of the development of the soft law structure and the functions of civil society institutions in modern technological and social conditions.

Other branches of legal science, in particular, civil law, are not methodologically ready for the development of this direction due to intra-branch methodological contradictions, in particular, the naturalistic approach prevailing in civilistics, which causes difficulties with the inclusion of non-materialized objects in the subject of legal regulation.

Classic example of a virtual materialized object are securities and related disputes about the possibility of their recovery by analogy with the rules on things. In conditions when neither civil law science nor legal theory separately study the relevant problems, it should be recognized that it is information law as a legal science that comprehensively considers emerging problems in the information sphere that can become a platform for the development of the theory of virtual law and fill the existing gap.

In conditions where neither civil law science nor legal theory separately study the relevant problems, it should be recognized that it is information law as a legal science that comprehensively examines emerging problems in the information sphere that can become a platform for the development of the theory of virtual law and fill the existing gap. The solution of individual theoretical issues related to relations in virtual universes is possible within the framework of the theory of state and law and individual legal branches.

The attention of scientists and practitioners is drawn to virtual reality, since it is known that neurons in the human brain react to virtual elements in the same way as to elements of the real world. Therefore, a person perceives the virtual environment and reacts to what is happening inside the virtual world to events in the same way as to those taking place in reality. The first attempts to create interactive devices that allow interaction with simulated or augmented reality were made at the beginning of the 20th century. In 1965, Sutherland I. proposed the concept of the "ultimate display", which described a kinesthetic display. This concept laid the foundation for virtual reality.

The "father of virtual reality" is considered to be Heilig M., who patented the "Sensorama" machine in 1962 - a simulator that creates the illusion of reality

using a three-dimensional moving image with smell, stereo sound, seat vibrations and wind in the hair for the illusion. M. Heilig was also the first to invent a head unit for stereoscopic television in the form of glasses. The device created a sensation of peripheral vision and transmitted smells and sounds.

Augmented virtual reality creates a relationship between a person and a computer, which allows the user to interact and immerse themselves in a computer-generated environment in a natural way. Virtual reality technology consists of software for building a database and modeling virtual objects. The input tool is made up of trackers, gloves or a user interface. An important role is played by graphic rendering (visualization) systems of the output tool – visual, auditory and tactile, sensory stimuli of virtual reality using various forms of visual display technology.

The technology combines computer graphics, photographic images, video with sensory and even olfactory output devices. The main characteristic of virtual reality, which identifies it in an inclusive relationship between the participant and the virtual environment, is immersion, interaction and imagination. Immersion or immersion can be partial (non-immersive virtual reality) or complete (immersive virtual reality).

Non-immersive virtual reality assumes the presence of a display in front of the user, which covers a large field of view. Immersive virtual reality is provided by the presence of a device with the user, which establishes a connection between the user and the environment that is being modeled. Virtual reality allows the experimenter to manipulate not only the virtual environment, but also the embodied virtual body in ways that are impossible in physical reality.

Immersive virtual reality allows the manipulation of the body image in terms of structure, shape, size, and color in a way that can sharply contrast with one's own body image, for example, one can design one's own virtual body, but of the opposite sex, or see the future result of plastic surgery. For this reason, immersive virtual reality has much greater potential for application, in particular in the field of psychotherapy, rehabilitation, and behavioral neurology, as well

as in the study of consciousness. Virtual reality technologies may be needed in the treatment and prevention of various types of addictions.

The development of synthetic people capable of performing any task is a rapidly developing area of research. They can be used in healthcare, transportation, manufacturing, and many other industries. In healthcare, artificial people can be used to diagnose diseases, perform operations, and monitor the health of patients. In transportation, autonomous vehicles using synthetic human technology could provide safer and more efficient transportation options. In manufacturing, synthetic humans could be used to automate tasks, increase productivity, and improve overall product quality.

Software as an object of copy law

In many objects of copyright it is extremely difficult to distinguish between form and content, many borderline situations arise. This problem is especially noticeable in the protection of software programs that help users solve this or that problem on their smartphones, computers, servers or cloud systems.

Often the created programs will solve the same problem, but the software will work on different codes. As a result, the content of each of the objects is different. The program is a complex of algorithm, code and interface. It is impossible to view the source code of the program from the alleged copyright infringer, as well as to find out the algorithm of its operation.

For comparison, only the interface remains, but this will clearly not be enough to prove the violation. Another problem is directly related to the issue of protecting the company's own software. Attempts to keep the algorithm from prying eyes have always existed, and each time new methods were used, including at the level of patent law. However, there are some nuances here.

For example, the developer came up with an algorithm for checking the antivirus program, as well as a mechanism for monitoring the checksum of files.

If a certain antivirus software manufacturer patented this algorithm, then any other antivirus that uses a similar scanning tool will become an infringer.

Thus, a monopoly will begin. Systems that allow a monopoly understand that they actually limit the creativity and competition of antivirus software manufacturers. Any other software manufacturer will stumble upon these patents. Therefore, the line between patent law and copyright is very thin.

Any software customer may face not only theft or copying of a program created by competitors, but also a claim from one of the programmers for violating his copyright. To understand how to procedurally correctly formalize the process of creating software, it is important to know how the process of writing a program is structured.

The customer sets the task of creating software with certain parameters and functionality. A team of architects develops an algorithm plan, specifying what needs to be included in it. Then comes the stage of creating the code. It is written in various language environments and on various platforms. In most cases, special software is used that allows testing what the coders have written, if any error has been recorded, and monitoring the entire process of changes.

GateHub allows you to see commits. These are records that are entered into the general canvas by one or another author, as well as all individuals whose creative work created this program. With GateHub, you can set up the transfer of copyright. Reports can be automated and made monthly. Then the contract with a full-time programmer will look like a standard employment contract and an author's commission agreement.

Thanks to monthly reports on his work, he will be transferred bonuses for part of the written code along with his salary. Thanks to reports, you can create a single document with a receipt for all the work done by a particular person, the rights to which he transfers to his company. With a third-party author, you will only need an author's commission agreement. The most important thing is that you need to record the actions.

Despite the fact that there are no loud disputes now, this process can be very expensive and poorly structured in a legal sense. Where the design is weak, conflicts are inevitable.

The problem for lawyers who work with software is their protection from competitors. For any company that has created its own program, there is a risk that it will be copied or used in bad faith. Companies often write software to order, but register it in their own name. Copyright arises automatically by virtue of the fact of creating a program and does not require any state registrations.

Even if the code is registered, the plaintiff will never be able to view the opponent's source code. In this case, other evidence must be presented in court. You can compare installers, distributions, file sizes and names. At the time of launching a competing program, you can compare interfaces. But many programs are similar to each other, since they consist of the same elements: the location of buttons, their size, color, impact on convenience.

The service has an algorithm, code and interface. Each of these parts is subject to separate independent protection and separate independent registration. And if not through the code, then through other components of the software, you can prove a violation of rights.

A computer program is a special object of copyright, in which the code (form) is protected, and not the result that can be obtained with the help of this computer program (content). A computer program always exists in electronic form and is used with the help of computers, phones, servers and other devices. A computer program contains a set of commands for such devices.

Acquisition of the right of ownership of a tangible medium with a copy of a computer program does not entail the transfer of rights to the computer program. The transfer of exclusive rights to a computer program is formalized by an assignment agreement. Granting the right to use a computer program in certain ways is formalized by a license agreement.

A feature of a computer program is its constant change through error correction, revision and updating. Changes have different degrees and purposes.

Copyright law does not contain a definition of modification of a computer program, but does contain some description of actions for which the permission of the copyright holder is not required.

Modification and adaptation can lead to the creation of a derivative work. This requires that the result of the changes be of a creative nature. The rights of the developer of a derivative computer program can be realized only if the rights of the copyright holder of the original computer program are observed.

Usually, changes to a computer program are made by the developer. When significant changes accumulate, the program is released in a new version. The decision to release a new version is made by the developer. The license agreement for the right to use a computer program should include provisions granting the user the right to use all updates and changes to the computer program from the moment of signing the acceptance certificate, where such changes are reflected. In the event of significant changes to the computer program, a technical assignment is issued at the user's request. Any changes to the program by third parties are generally possible only with the permission of the copyright holder, except for cases provided for by law, such as adaptation.

Free software can be protected by authors of modified programs distributed under a free license. The obligation to comply with the requirements of a free license arises only when distributing free software. Any developer providing their software product based on free software is required to present the source code with installation instructions. If the recipient of such a program discovers non-compliance with the requirements of a free license, they have the right to go to court to eliminate the violation of their rights.

Digital Platform Law

The rights of such entities are based on internal regulations and user agreements signed by the parties. If there are regulations and user agreements, then the risks in terms of regulation must be taken into account or assessed.

Platforms are considered from the point of view of the circulation of information about users, transactions and supply chains. A digital platform is a model of remote interaction, a network of contracts that are tied to this platform, the totality of which can replace previous institutions. Distributed registry systems are most often used as a technological solution for the functioning of digital platforms. The operator of such a digital platform occupies a central place in the functioning of the information system.

From an economic point of view, any network, both digital and traditional, is based on scaling the network effect, the essence of which is that the more users, the higher the value of the network itself. A digital platform, as one of the nodes of a digital network, acts as an organizer of trade turnover.

Digital platforms cannot be considered market participants in the full sense of the word. They play an organizing role, being digital intermediaries. This status determines the features of the legal regulation of digital platforms and structures their area of responsibility. Digital platforms should not be held responsible for the quality of goods and services.

The axiom of the legal concept of digital platforms is the understanding that the platform is not a supplier of goods, a service provider or an employer. Digital ecosystems create a profitable business model for suppliers provide users with new opportunities due to the scale effect and the introduction of a new customer experience. As a result, the choice of users in the digital space is expanding. An example is end-to-end identification, when digital ecosystems have created convenient user access to several interconnected digital services.

With their emergence, users have the opportunity to use the entire functionality of the digital ecosystem on the "single window" principle, which in turn entails saving time on choosing goods and services, ease of use in the presence of a single end-to-end user identifier. Based on this tool, digital ecosystems allow business users and consumers to receive information about the positive and negative characteristics of the goods sold the services provided their demand in the market.

The most discussed issues were the risks associated with antitrust regulation and the protection of user data and consumer rights. In Europe, for example, based on the identified effects of the functioning of digital ecosystems and platforms, bills on digital markets (Digital Markets Act) and digital services (Digital Services Act) are being developed. In the USA and Canada, bills on digital ecosystems have been developed. In China, a law on the protection of personal data was adopted, affecting the processing of data on a digital platform.

Companies that own digital platforms (Google, Apple, Facebook, Amazon, Microsoft, Netflix) have created structures of affiliated or independent enterprises to provide comprehensive services to the user. The large scale of systems using artificial intelligence is important not so much from the point of view of maximizing the circle of contacts, but with the possibilities of improving machine learning. The use of training using big data can significantly expand the training capabilities of an intelligent system, including for predictive analytics, and improve its quality.

The more data is entered into the system, the better it works, and the more profitable it is for the user to join this system. An example is the Internet search algorithm. The more queries are addressed to this system, the more trained the algorithm becomes. Users provide training services with each search query and each response to search results. The effectiveness of training increases under conditions of sufficient diversity of user queries and the ability to collect additional information about the user's personal data, time and place of the query.

When assessing the position of companies in the commodity market and making appropriate decisions, antitrust authorities have additional questions about mergers and acquisitions, since the concentration in the areas of activity of digital ecosystems already tends to increase. If only large enterprises with the ability to large-scale machine learning can successfully operate in the market, this indicates the presence of high entry barriers. The use of artificial intelligence within digital ecosystems can pose a difficult task for the regulator and within the framework of the qualification of the behavior of companies.

One of the elements of this task is to distinguish between unplanned actions of algorithms that lead to anti-competitive consequences due to errors or accidents, and deliberate anti-competitive steps embedded in the structure of algorithms by authors or users. Attention is drawn to pricing algorithms that automatically implement pricing processes not only on stock exchanges but also on consumer markets.

The conceptual issue is related to the prosecution of violations not related to the direct expression of will of the collusion participants, when algorithms enter into an agreement regardless of their will. This problem goes beyond competition policy, since the development of artificial intelligence raises the question of the possibility of the guilt of artificial intelligence in principle.

The concentration of a large amount of user data in the database of the largest digital platforms and the transformation of this data into knowledge about users with the help of artificial intelligence increases the risks of price discrimination in the form of setting different prices for one product for different consumers and their groups.

The importance of maintaining a competitive environment as an environment for rivalry between several firms is especially important in the interaction of companies that intensively use artificial intelligence. Objective trends towards increasing concentration and significant entry barriers in the relevant markets narrow the development potential of such an environment. Periodic rotation of leaders and leading services within digital platforms indicates that a competitive environment exists, and defeat in the competitive struggle for users is possible.

Network effects and scale effects in machine learning prevent the replacement of leaders, but the emergence of fundamentally new or seriously modified services such as social networks Instagram and TikTok against the background of Facebook or messengers WhatsApp and Telegram intensifies the competition. Predictive analytics based on big data simplifies forecasting the development of a particular service and allows you to identify the most dangerous potential competitors in advance and buy them out.

Thus, Facebook acquired Instagram and WhatsApp, and the growth of their share relative to Facebook itself does not actually mean intensification of competition for the company as a whole. At the same time, the purchase of promising competitors and their inclusion in your own ecosystem at relatively early stages significantly simplifies the approval of transactions by antitrust authorities.

A digital platform is a key link in a platform ecosystem. Platform ecosystems can be the most painful phenomenon from an antitrust standpoint.

For competition, technical barriers must be removed through interoperability. The policy on economic concentration transactions must also involve forward-looking analysis to minimize the risks of "hostile" takeovers of promising competitors.

Methods for defining market boundaries as applied to ecosystems face the problem of zero price for goods and services, which may well be implemented by the ecosystem leader through cross-subsidization. Thus, individual applications can be sold to users at zero price if the ecosystem leader earns money by selling equipment or through additional services.

Defining market boundaries in the areas of ecosystem activity loses its significance, because the distribution of market shares in these areas has a much lesser effect on the intensity of competition than in traditional markets. Ecosystems operate in a wide range of markets, and their leaders can quickly enter new markets, applying their own technologies to new circumstances and creating appropriate structures within the ecosystems they control. Their communication technologies and user interfaces have a wide range of applications.

Ecosystems can exert competitive pressure in areas where they have not worked before. Therefore, the calculation of market shares and concentration and the identification of product and geographic boundaries, if they retain their significance, retain their auxiliary significance. The most important priority is the quality of services, which will be ensured by competition and the range of offers within the ecosystem.

The antimonopoly authority studies whether the company's actions to put pressure on complementors are aimed specifically at limiting competition in order to extract monopoly rent and harm competitors, or whether they are associated with maintaining the efficiency of the entire ecosystem due to requirements for the quality of complementors' work.

This may be beneficial to the leader, complementors, and consumers. The severity of sanctions, punishments, and the possibility of using regulatory tools may depend on this.

The level of interoperability also requires a compromise approach from the antimonopoly authority, although regulators require ecosystem leaders to be compatible with the standards of other ecosystems. There are also negative consequences of interoperability requirements. Companies lose incentives to develop new, more advanced standards. If a standard gains an advantage over others and becomes the main one, the owner of the corresponding technology will gain an unjustified advantage over other companies and additional market power.

As a result, it is necessary to search for the optimal level of compatibility required from digital platforms in new regulations, which is not yet provided for by them. A compromise is also needed in terms of assessing the restrictions applied by leaders to complementors. New regulations are mainly aimed at preventing excessive restrictions by ecosystem leaders, who by default have greater market power. These restrictions may be related to the rules for using data circulating between users, complementors and the leader.

Some restrictions may increase the value of the ecosystem for the user. Assessing economic concentration transactions from the standpoint of prospective analysis should prevent risks associated with the early absorption of potential competitors for current ecosystem leaders. It requires good predictive capabilities of the antitrust authority. Merger resolution rules are often carefully formulated and interpreted in relation to horizontal transactions.

The same applies to agreements between business entities. But in the case of ecosystems, we have to deal with mergers or agreements that do not have a

clearly expressed vertical or horizontal nature and are conglomerate mergers. Artificial intelligence based on the processing of big data about users allows for their effective differentiation and, ultimately, to approach price discrimination.

Another antitrust risk of using artificial intelligence is the emergence of algorithmic collusion, including against the will of the owners of these algorithms. This inevitably raises questions about the guilt of the parties involved and the mechanisms for their punishment. Predictive analytics requires the use of artificial intelligence by antitrust services.

Technologies are called "cross-cutting" because they are universal and are not associated with a specific area or product, but are used in all sectors of the economy, the social sphere and public administration. Cross-cutting digital technologies include virtual and augmented reality technologies, quantum technologies, wireless communication technologies, distributed ledger systems, robotics components and sensors, neural technologies and artificial intelligence.

Virtual reality technology allows using special devices to immerse a person in a semblance of the world around him. The created effects are perceived through sight, hearing and touch. Augmented reality technology makes it possible to open interactive content and see a virtual 3D object with animation or video that can be controlled in real space.

Quantum technologies involve using the features of quantum mechanics to perform complex calculations with the greatest efficiency, as well as to ensure absolute security of information due to quantum entanglement of particles. New production technologies include digital design, mathematical modeling and smart manufacturing technologies.

Wireless communication technologies include a global communication network, local communication networks, networks that link different devices used by humans, as well as technologies for transmitting communications between space and the earth. Distributed registry systems are decentralized systems in which users share a common ledger of transactions in the form of a chain of blocks, protected from unauthorized access.

All users of the system have access to the ledger. Each block is an encoded set of information, and the next block contains the code of the previous block. If someone wants to change any block, the code of all blocks will instantly change and the operation will not be performed.

"Robotics and Sensorics Components" involve the development of automated technical systems, sensory systems and methods for processing sensory information, interaction of technical systems, both among themselves and with humans. Neural technologies include neural prosthetics, technologies for recognizing consumer information through neural interfaces and neural stimulation.

Information, based on the analysis of which companies build their strategies in the modern world, is of particular value. The consumer, without realizing the value of information, pays for services with his personal data. In the digital world, information is considered a currency and a valuable asset for companies. AI Marketing includes consumer data analysis in algorithms, machine learning and optimization of marketing articles and Consumer Journey. Arrays of consumer data are taken from company databases, social networks, surveys.

The development of technology has led to the creation of Emotion AI, which allows algorithms to recognize and interpret emotions by analyzing facial expressions, body position, and voice timbre. facial expression recognition allows companies to identify people's emotions using facial recognition systems, reading data using the optical sensor of a webcam device and a smartphone camera. Based on intonation, volume, and speech rate, artificial intelligence is able to determine not only the speaker's emotions, but also their gender and age.

Analysis of data provided by consumers, as well as such an understanding of a person's emotional reactions to possible triggers provide almost unlimited opportunities for companies. Understanding the fact that consumer behavior is based not only on the analysis of the information available to them, but also on unconscious irrational elements, companies can create marketing strategies.

The most common strategy based on consumer data analysis is the personalization strategy, which provides a deep understanding of the consumer's

response to marketing strategies and provides the consumer with content at the right time.

The use of behavioral economics in company marketing strategies also affects legal issues. In the digital environment, one of the tools of competition among market participants is innovation and technology. Technologies make it possible to process existing consumer data. Analysis of this data array allows companies to identify behavioral characteristics of consumers that determine their decisions, actions and choices. Consumer information is a tool of competition. The use of this tool by companies may be the basis for identifying the fact of violations of competition law.

For competition law, the key point is the definition of the product market in which the economic entity operates. Thus, abuse of a dominant position is determined based on such position of the economic entity in the market of a certain product. Similar provisions are reflected in the law of the European Union: any abuse by one or more enterprises of a dominant position in the internal market or in a significant part of it is prohibited as incompatible with the internal market, since this may affect trade between Member States.

Cognitive classical philosophy: mind and language

The subject of this study is not the philosophical thought of a specific state, but the philosophical thought of a country that historically was territorially located in different states in the period from the 12th to the 21st century. This country had different geographical and historical-cultural names. The western part was called Black or Red Russia in the Middle Ages. The eastern part was called White Russia in the Middle Ages.

The local population, representing a hybrid of Slavic and Baltic tribes, developed their own Belarusian language with a Slavic dominant in the 12th century. This was confirmed by the study by F. Karsky of the texts of trade agree-

ments between the city authorities of Vitebsk, Polotsk and Smolensk with the Hanseatic League.

The historical borders of the country in question can be judged by the geography of the cities. This historical geography is formed by Bialystok, Brest, Grodno, Pinsk, Turov, Gomel, Mstislavl, Orsha, Vitebsk and Polotsk. We do not reduce the philosophical thought of Belarus only to the ethnic Belarusians. We take into account the role of representatives of the Jewish and Tatar communities who settled within the country in question in the 14th century. We also take into account the factor of migration of natives of Belarus to other countries, where they played an important role in the development of applied philosophy.

During the 12th century, the philosophical thought of Belarus developed under the influence of the consequences of the adoption of Christianity according to the Eastern rite. The main influence was that of Byzantine religious philosophy. It was noticeable in the Turov and Polotsk principalities. In the Turov principality, the intellectual gift of K. Turovsky was revealed. This thinker represented Christian patristics. He was a bishop. He adhered to Christian dogma. He saw his goal in strengthening the moral principles of religious life among priests and parishioners through parables. He emphasized Christian ethics.

Within the Polotsk principality, the intellectual gifts of E. Polotskaya were revealed. She represents the historical period of Christian scholasticism, when the main goal of spiritual activity was seen in the education of children and adults, the formation of the values of knowledge. The applied direction of her philosophy was a close connection with the architectural schools of Polotsk and Vitebsk. Architectural schools were engaged in the construction of temples and the saturation of them with religious artifacts.

E. Polotskaya commissioned Lazar Bogsha a unique cross, which became a national relic of Belarus. E. Polotskaya became the first woman in history canonized by the Christian Orthodox Church. In the 13th century, Europe was invaded by the Mongols of the Golden Horde. By this time, the civilization of the Medieval West had formed in Europe, which cultivated territorial expansion

through crusades to the East. The Baltic and Slavic tribes of Eastern Europe found themselves between two vectors of attacks from the East and the West. As a result of understanding the critical situation, these tribes united on the basis of military, political and economic mutual benefit. They created a state that was not self-sufficient in terms of civilization and sought this civilizational self-sufficiency through the conclusion of a union with the Kingdom of Poland.

The population of this state, although Catholic, was under the threat of territorial expansion of the Teutonic and Livonian Orders. The union of both states allowed the Teutonic Order to be militarily defeated in the decisive battle of 1412 near Grunwald. As a result of the victory and the adoption of the Catholic faith by the Baltic tribes, the integration of the territory of the state of the Baltic and Slavic tribes into the educational space of the civilization of the Medieval West began. This was facilitated by the opening of the University in Krakow, as well as the opening of the University in Königsberg. The Renaissance of the 14th-16th centuries became a contributing factor for the development of philosophy on a new civilizational platform.

The Renaissance was characterized by an emphasis on the development of science and technology. This was facilitated by the geographical discoveries of Europeans and their mass migration to the New World. At this historical time, canon law was losing ground. It was giving way to natural law and humanism. The topic of a strong state became relevant, since the threat from the East remained acute for Europe. This threat was created by the Arab Caliphate and the Ottoman Empire. Against the background of the topic of consolidation, a split developed in the Catholic world between supporters of the Pope and Protestants.

The Reformation began. Failures in the formation of political unions in Europe were compensated for by the formation of a single information space on the continent based on printing technologies. This basis allowed philosophers to print Bible texts in national languages, as well as print their own works. Among the natives of Belarus, M. Litvin, F. Skaryna, S. Budny, P. Mstislavets and M. Smotritsky were engaged in the publication of the Bible. They also published

philosophical texts, in particular, the works of Aristotle. Philosophy was also cultivated on the basis of new Latin poetry.

N. Gusovsky deserves much credit for this. In the poem "Song of the Bison" he formulated the basis of European security. It consists of a strong state power based on natural law, a market economy, the value of nature, the end of military conflicts within Europe and the development of education. Belarusians studied at European universities. They received medical and legal education. This allowed them to practice medicine (F. Skaryna, University of Padua) and to carry out the formation of constitutional principles of state power (A. Volan, L. Sapieha) and interstate relations (N. Gusovsky) on the principles of natural law.

In the 16th and 17th centuries, the Reformation gave way to the Counter-Reformation. In the 16th century, Protestants and Catholics created competing educational systems. The Vatican, with the help of the Jesuits, made every effort to have local youth return from Protestantism to Catholicism. For this purpose, an attractive educational system was created in the form of colleges.

They were opened by the Jesuits in Vilnius, Grodno, Polotsk and other cities. Philosophy was taught there. The colleges in Vilnius and Polotsk corresponded to the level of university education. At the University of Vilnius, I. G. Abicht taught the philosophy of I. Kant. He came to the position of professor from Erlangen.

For twelve years he taught logic, metaphysics, ethics, psychology and introduction to philosophy. He lectured in Latin. In the Introduction to Philosophy, he outlined the philosophy of I. Kant. The book was published in 1814 in Latin.

The professor's lectures generated interest in the philosophy of I. Kant among students. Without realizing it, I.G. Abikht created an image of I. Kant among students as a philosopher whose attention was focused on anthropology. And such an emphasis was consonant with romanticism. This was clearly demonstrated in the activities of the Philomaths and Philarets, among whom was Adam Mickiewicz.

There were critics of I. Kant's philosophy at the University of Vilno and the Polotsk Jesuit Academy. J. Snedetsky criticized the philosophy of I. Kant. In 1807-1815, he was the rector of the University of Vilno. He presented his criticism of I. Kant's philosophy in his works "On Metaphysics", "On Philosophy", "Philosophy of the Human Mind". He carried out his criticism from the position of the sensualism of the French enlighteners. He did not accept apriorism and transcendentalism.

The philosophy of I. Kant was critically examined by the associate professor of the philosophy department of the University of Vilnius A. Dovgird. He formulated his position in the book "Treatise on the Natural Rules of Thinking, or Theoretical and Practical Logic". The book was published in Polotsk in 1828. A. Dovgird analyzed the book of I. Kant "Critique of Pure Reason".

The subject of consideration was transcendental aesthetics, transcendental analytics and transcendental dialectics. The critic of the philosophy of I. Kant from the position of neo-Scholasticism was the professor of the Polotsk Jesuit Academy, the Italian Giuseppe Angiolini. In the lectures given to the students of the academy and published in Polotsk in 1819 after his death, a thorough analysis of the philosophy of I. Kant was given.

From the end of the 18th century until 1917, Belarus was part of the Russian Empire. Local youth received education in Vilno (the historical name of modern Vilnius during the Russian Empire) and Polotsk.

At the University of Vilno (the historical name of modern Vilnius during the Russian Empire), the emphasis in education was on developing an interest in the study of Eastern culture. In the context of the territorial expansion of the Russian Empire to the east, the Ministry of Foreign Affairs of the empire had a great demand for young people who spoke the languages of the peoples of the Near, Middle and Far East.

They were attracted to diplomatic activity in China through spiritual missions (I.A. Goshkevich) and through service in the Department of Foreign Affairs of the Russian Empire in St. Petersburg (O.I. Senkovsky, A.O. Mukhlinsky

and A.L. Khodko-Boreyko). O.I. Senkovsky and A.O. Mukhlinsky taught Arabic and Turkish at the University of St. Petersburg. O.I. Senkovsky, under the literary pseudonym "Baron Brambeus", laid the foundation for the practice of mass reading in the Russian Empire.

He published "The Library for Reading". The scientific achievements of O.I. Senkovsky were highly appreciated. He was elected a corresponding member of the Imperial Academy of Sciences (1828) and received the status of honored professor in 1847.

A.L. Khodko-Boreyko served in Persia. He studied the philosophy of the culture of the Caspian states. The subject of his study was the work of the Turkmen writer Makhtumkuli and the Azerbaijani writer Mirza Fatali Akhundov. O.M. Kovalevsky was sent by the authorities of the Russian Empire to the University of Kazan to create a scientific center for the study of the cultures of the Far East. The subject of O.M. Kovalevsky's study was Buddhism in the regions of Mongolia and Tibet. In the mid-19th century, the political philosophy of anarchism and Marxism developed in Europe.

It spread to the eastern regions of the continent. One of the theorists of Marxism in the Russian Empire was a native of the Grodno province A.A. Malinovsky (revolutionary pseudonym "Bogdanov"). He wrote a work called "Tectology", in which he formulated the principles of systems theory. He also developed the theory of the proletarian cult and was engaged in its practical implementation at the beginning of the 20th century.

In 1917, the Russian Empire ceased to exist. Soviet republics were formed on its territory, which united into the Union of Soviet Socialist Republics (USSR). One of the Soviet republics was the Belarusian Soviet Socialist Republic (BSSR). Its statehood was proclaimed on January 1, 1919 in Smolensk. The territorial formation of the new state was completed in 1920, when, following the results of the Riga Peace Treaty, the western part of Belarus was included in the Polish state.

The BSSR retained only the eastern part of the former Minsk province, represented by 6 counties. In the USSR, the political philosophy of Marxism had the status of state ideology. Marxist-Leninist philosophy was taught in all higher educational institutions of the USSR along with scientific communism and political economy. In the BSSR, Marxist-Leninist philosophy was developed by E.M. Babosov, P.A. Vodopyanov, Yu.A. Kharin and D.I. Shirokanov. The USSR ceased to exist on December 8, 1991.

Cognitive non – classical philosophy of the 19th-20th centuries

Against the background of the growing influence of political philosophy in Europe, caused by the approach of the First World War and revolutionary events in the countries of the continent, a humanitarian paradigm of reflection on the peculiarities of the inner world of the individual was formed. It aimed to find new basic structures of consciousness that could help the individual in the conditions of the crisis of the mind of European politicians.

The leadership of the Russian Empire, which made the empire one of the parties to the conflict in the First World War, was also in the space of the crisis of the mind of European politicians. The approach of the crisis of European culture was discovered by the representatives of existentialism. Their philosophy of the borderline situations of an individual between life and death was realized in the literary forms of the novel, story and short story.

The first intellectual generation of representatives of existentialism began its philosophical path in the second half of the 19th century. In the western part of northern Europe, the works of the Danish thinker S. Kierkegaard became famous. In the eastern part of northern Europe, the literary works of F.M. Dostoevsky became famous. Before migrating to St. Petersburg, the Dostoevskys lived in the southwestern part of Belarus. This was the Dostoyevo estate.

The second intellectual and creative generation of representatives of existentialism manifested itself as a result of understanding the events of the Second World War. In the western part of Europe, the depth of thinking of A. Camus and J.P. Sartre manifested itself. In the Eastern part of Europe, the tragic events of the Great Patriotic War became the basis for the literary existentialism of A. Adamovich and V. Bykov. Borderline situations between life and death became the basis for the description of the partisan movement in Belarus, as well as the frontline chronicle of the exploits of military units.

The topic of the genocide of the Belarusian people did not go unnoticed by writers. The fascists burned Belarusian villages with their population. They killed civilians, including children, in concentration camps. A. Adamovich and E. Klimov made a film called "Come and See" based on documentary facts. The film shows the existential tragedy of the events in Belarusian villages created by the fascists. If the representatives of existentialism only described the borderline situations of choice between life and death, and often the absence of this choice, then other philosophical schools tried to find a constructive replacement for the mind of European politicians that had surrendered its positions, with other structures of consciousness. Representatives of the philosophy of life appealed to the will (F. Nietzsche) and intuition (A. Bergson).

The revaluation of all values and the rejection of the arguments of the mind, postulated by F. Nietzsche, only accelerated the growth of the influence of nihilism in European culture. This topic was especially relevant for Russia, where nihilism became a noticeable phenomenon already in the second half of the 19th century thanks to the novel by I.S. Turgenev "Fathers and Sons".

A native of Belarus, N.M. Minsky, based his philosophy on criticism of F. Nietzsche's philosophy. He traced philosophical and mystical views back to the hermeneutic and Gnostic tradition. These were typical features of "decadence". They included pessimism, pathology, longing for death, irony and a tendency to reflection. N.M. Minsky was a representative of early symbolism. The basis for such recognition was the poem "City of Death". It contains all the existing signs

of the "diabolical" world. Also, his contemporaries highly appreciated the poem "On Two Paths of Good". N.M. Minsky developed the philosophical theory of Meonism. It emphasizes non-existence and the non-existent in the physical world. Representatives of neo-Kantianism also opposed the philosophy of F. Nietzsche. In order to protect the values of European culture, they endowed them with an a priori status.

The influence of neo-Kantianism in Belarus manifested itself through Vitebsk, where representatives of the philosophical circle from Nevel taught. The role was played by the value problems of culture actualized by G. Cohen, E. Cassirer and P.G. Natorp. Their lectures were attended by M.I. Kagan, whose activities were subsequently closely connected with the intellectual circle in Nevel. The mayor of Vitebsk P. Medvedev invited members of the philosophical circle M. Kagan, L. Pumpyansky, I. Sollertinsky, V. Voloshinov and M. Bakhtin to teach in the city. The question of the influence of neo-Kantianism on M. Bakhtin is quite interesting. We can assume that the dialogue model used by S. Maimon in presenting his intellectual discussion with I. Kant became part of the Kantian tradition, including the Jewish intellectual tradition, which was manifested in the works of M. Buber.

The dialogue model has always been present in European culture. It attracted the attention of M. Bakhtin in the context of his studies devoted to European medieval folk culture. He identified the main forms of dialogue of this culture, which were the main mechanism for opposing the monologue of the dominant culture. In the Renaissance, the mechanism of dialogue was used by representatives of humanism. The object of their consideration was the everyday life of the bearers of the dominant culture. Francois Rabelais became the image of dialogue.

We mean not so much the thesis that M. Bakhtin was a neo-Kantian, but the thesis that the genre of analysis of I. Kant's works used by S. Maimon in the form of individual comments on being and social reality created the structure of intellectual dialogue. M. Bakhtin expanded this methodology to the level of folk

culture and artistic text. He found elements of dialogue in the main subsystems of European culture. As a result, he discovered the universal status of the value foundations of culture and the obvious connection between the universals of culture and the categories of philosophy.

Philosophy with practical applications was cultivated. In order to popularize philosophy, articles were published in the newspaper "Molot" and the magazine "Den' iskusstva" in Nevel. And also the newspaper "Izvestia" and the magazine "Iskusstvo" in Vitebsk were used. M. M. Bakhtin published the article "Art and Responsibility".

Since a philosophical school must have a conceptual part, then such a part can be considered the article by M. I. Kagan about Hermann Cohen, which he wrote in 1918 in Germany. It was an obituary for a teacher. M. I. Kagan in the article characterized the philosophy of G. Cohen. This philosophy had a critical part. The object of criticism was the philosophy of B. Spinoza. G. Cohen expressed his attitude to the philosophy of I. Kant in a special work.

His works were characterized by a critical approach. In 1922, M.I. Kagan translated P. Natorp's study "Social Idealism" into Russian. This became evidence of M.I. Kagan's constant interest in the evolution of the Marburg school of neo-Kantianism, in particular, in the issue of analyzing the subject matter of the philosophy of culture. At the beginning of the twentieth century, the key topic in this subject matter was the problem of the crisis of culture.

M.I. Kagan influenced M.M. Bakhtin. Thus, M.M. Bakhtin, in the process of writing the work "Subject of Morality and Subject of Law", asked M.I. Kagan to send him a book by G. Cohen from Orel.

While in the philosophical school of Nevel, M.M. Bakhtin was ready to perceive the philosophy of I. Kant. When he studied at the university in St. Petersburg, he was in his specialization under the supervision of A.I. Vvedensky, a famous supporter of I. Kant's philosophy. Under the influence of A.I. Vvedensky, the theme of someone else's Self appeared in the mind of M.M. Bakhtin.

And the presence of someone else's Self is the basis for dialogue. Through dialogue, a certain personality is formed as a moral personalized entity. Dialogue is associated with an act. An act contains duty and responsibility.

M.M. Bakhtin, under the influence of neo-Kantianism, was interested in the ontology of culture. He discovered it in the folk culture of the European Middle Ages and Renaissance ("The Works of Francois Rabelais and the Folk Culture of the Middle Ages and Renaissance"). As a result, the concepts of "chronotope", "carnival" and "culture of laughter" appeared in the categorical apparatus of the dialogue.

The path to Russian religious philosophy began from the Vitebsk province through the neo-Kantianism of N.O. Lossky. He learned about neo-Kantianism while being a student at St. Petersburg University. Lectures were given by A.I. Vvedensky.

If N.O. Lossky left the space of the intellectual province, then K. Malevich came to its space in the city of Vitebsk. He arrived in the city in 1919 at the invitation of the leadership of the Vitebsk People's Art School. A short stay in the city was marked by significant results in the field of philosophy. This was the philosophy of Suprematism.

In the process of developing the philosophy of Suprematism, K. Malevich could not ignore the philosophy of I. Kant. Attention to the philosophy of I. Kant was a characteristic feature of the Russian avant-garde. K. Malevich considered the philosophy of Suprematism as a practical philosophy, on which artistic practices were based.

K. Malevich returned philosophy and artistic practices to Platonism and ontology. He believed that an artist should not create copies of objective transcendental reality. His interest should be focused on transcendental non-objective reality. M. Chagall did not agree with K. Malevich and adhered to the philosophy of the urban environment with its characteristic images of everyday life. But he improvised with this everyday life and endowed it with unusual accents of expressing love for his native city.

Against the background of K. Malevich's grandiose panoramic festival city-wide compositions, M. Chagall's paintings looked modest in the structure of these compositions. The modesty was not in their size, but in the theme, color and sounds of the city depicted. The theme of shtetl Jewish culture dominated in all the variety of musical images, as well as the theme of love.

These are not flights to a revolutionary future. This is art in the genre of a parenting novel. Another participant in the creative life of Vitebsk, M. Bakhtin, wrote about the peculiarities of this novel. M. Chagall used blue and green colors in a biographical context. These are the main colors of the region. They are connected by the figures of specific characters of culture through the synesthesia of the space of earth and sky. This methodology was not used by artists.

They were not familiar with the flight methodology. This methodology was subsequently used on the basis of laser presentations at city festivals.

M. Chagall did not plan such a prospect of using his creative solutions. He wanted to create a panorama of a single urban space in which the sky with its blue color is part of the environment. M. Chagall gave priority to saturated color, which is very important in the conditions of the dominance of the urbanized space of culture, where negative gray contexts can dominate the individual's worldview.

One of the solutions to the problem of the crisis of culture, Z. Freud and K.G. Jung considered the mobilization of not one, but all levels of consciousness of the individual and social community. They attributed the unconscious, the subconscious and consciousness itself to all levels of individual and collective consciousness. Z. Freud assigned a special role to the unconscious level of consciousness. L.S. Vygotsky. He was born in the city of Orsha. His formation in the field of psychology and philosophy took place in Gomel. We learn about the influence of the works of I. Kant, G. Fichte and B. Spinoza on L.S. Vygotsky from the works of F.T. Mikhailov.

When developing the cultural-historical concept of the human psyche, L.S. Vygotsky discovered that B. Spinoza was also concerned with the problems

of thinking and being, freedom and necessity. Then G. Fichte encountered the solution to these problems. He found a solution in the form of an ontology of subject - subject relations. This ontology suited L.S. Vygotsky, since it returned to the origins of new European rationalism. These origins were revealed by W. Shakespeare in the image of the dual consciousness of Hamlet. R. Descartes was forced to come to terms with this duality. I. Kant also retained it, but emphasized the rational component of consciousness.

L. Vygotsky saw the phenomenon of thinking (rationality) not from the point of view of opposition, but from the point of view of the synergy of sensory and logical components of consciousness in the process of socialization of the individual. With this approach, he gave applied significance to the teaching of I. Kant on experience as the unity of the sensory ability to perceive and the rational arrangement of this perception by the categories of space and time with the subsequent connection to this rational arrangement of the main part of the categorical structures of experience. As a result, the phenomenon of the sensory world is integrated by individual consciousness into the cultural rational context, which is the result of socialization.

L. Vygotsky substantiated this thesis in the process of applied psychological research. As a result, he showed the applied significance of I. Kant's philosophy and at the same time showed that the philosophy of the German thinker is not limited to aspects of thinking. In this philosophy, there is a subject field of the philosophy of consciousness, which was discovered in their time by representatives of neo-Kantianism. But their understanding of I. Kant's philosophy was conceptual and metaphysical. L. Vygotsky emphasized the study of consciousness in the natural environment of a particular culture. In this understanding, the subject accents of cognitive psychology, which forms and develops individual consciousness, begin to play an important role.

The shift in emphasis from the subject-object relationship to cognition as a process has become important, since the socialization of the individual is car-

ried out through cognition. It is on this thesis that the socialization system is built, in which education (training) plays a key role.

The goal of such socialization is the formation of a rational basis for the individual, which is considered as a starting point for professional education. In this rational basis, cultural values play a key role. Through them, the expansion of the individual's consciousness occurs due to the space of cognitive artifacts. Such an interpretation means that the individual exists in the system of subject-subject relations in their new modification. This is not a conversation between the individual and himself. This is his communication with the historical context of culture, the bearer of which are values.

The topic of historical memory and the preservation of values was taken up by hermeneutics. In Belarusian literature, this topic is developed in the works of Vladimir Karatkevich "The Wild Hunt of King Stakh", "The Black Castle of Golshansky" and "Ears of Corn under Your Sickle". The historical past is woven into the fabric of modern events and people associated with these events.

The impact of technology on society in the 20th century has become so obvious that philosophers and engineers began to consider it within the framework of a systems approach. Among the Belarusian engineers of the Russian Empire period, A.A. Pavlovsky from Vitebsk stood out for his clearly philosophical orientation, who wrote a number of works on the role of technology in culture. In 1896, the Vitebsk railway engineer published the work "Achievements of Technology and Their Influence on Civilization". He paid special attention to understanding the phenomenon of technology as an artifact of engineering activity, the influence of technology on human domestic life. He also considered the influence of technology on the social status of women.

Science plays an important role in the implementation of technology policy. This is the key theme of the philosophy of positivism, which defended strict criteria for the scientific nature of logical thinking. These strict criteria for the scientific nature of logical thinking were implemented in 1921-1927 at the Bela-

rusian State University by V.N. Ivanovsky. He published in Minsk "Methodological Introduction to Science and Philosophy" in 1923.

Philosophy and methodology of science was the main topic of V.S. Stepin's research. He studied the main features and stages of the formation of scientific theory using physics as an example. He was also interested in the methods of scientific research. V.S. Stepin singled out the foundations of science for study. He attributed the philosophical principles, ideals and norms of scientific activity and the scientific picture of the world (paradigm) to the foundations of science. As part of an absentee discussion with T. Kuhn, V.S. Stepin considered the dynamics of science through the concept of scientific revolutions and the change of scientific pictures of the world (paradigms).

He gave a classification of the forms of scientific rationality and expanded the study of science to the level of categorical structures of culture. His philosophical activity was associated with higher educational institutions in Minsk. Then it continued in the Russian Federation at the Institute of Philosophy of the Russian Academy of Sciences (hereinafter RAS).

V.S. Stepin was elected an academician of the RAS. The expansion of the topic of philosophy of science to the topic of philosophy of culture was realized not only in the works of V.S. Stepin, but also in the works of E.N. Gurko. She analyzed the problem of naming God as a fundamental prerequisite for understanding language and human existence as such. This understanding opens up the prospect for an independent discipline called "divine onomatology". The position of this discipline is intermediate between philosophy and theology, which destroys the already traditional assertion about the impossibility of finding common ground between them.

Gurko Elena Nikolaevna began her path in philosophy at the Belarusian State University. In 1981 she became a candidate of philosophical sciences. Then her philosophical interests coincided with the philosophical interests of Jacques Derrida. They jointly studied the phenomenon of deconstruction. In the list of subsequent statuses of E.N. Gurko is Doctor of Theology (Boston Univer-

sity, 2005) and Professor. She teaches philosophy and religion at Boston University, Emerson College, and Merrimack College in Boston.

Her professional interests include deconstruction, modal methodology, and divine onomatology. E. N. Gurko devoted a special study to the modal methodology of David Zilberman, on the basis of which this original philosopher tried to overcome the locality of philosophy, conditioned by its historical formation, and help it reach a synthetic conceptual level of unified categorical structures of thought.

Analytical Philosophy

For philosophers of analytical orientation, the process of argumentation and its structure are no less important than the result achieved with their help. Philosophers rely on formal (mathematical) logic, the epistemology of empiricism, and scientific data. Language is considered not only as an important means of presenting philosophical ideas, but also as an independent object of study. Analytical philosophy is not a single school. It is an analytical movement in philosophy that adheres to the principles of rigor, precision, terms used, and a reserved attitude toward speculative reasoning.

The movement was formed in the USA, Canada, Great Britain, Scandinavia, Australia, and New Zealand. It uses neo positivist practices in the analysis of language. This is the influence of the Austrian (Vienna Circle, L. Wittgenstein) and Polish (Lviv-Warsaw) continental schools of neo positivism. During the Second World War, representatives of continental neo positivism migrated to Great Britain. In the USA, one of the foundations of the analytical movement in philosophy was pragmatism.

One of the founders of the applied analytical tradition in philosophy was A.A. Malinovsky (Bogdanov), a native of the Grodno province. "Tectology" by Alexander Alexandrovich Bogdanov (real name Malinovsky) (1873-1928) made him famous. "Tectology" was published by A. A. Bogdanov in 1913 in 2 parts.

Then it was published in one volume in Berlin in 1922. Then there was a publication in parts in 1925; 1927 and in 1929.

Tectology, or "General Organizational Science" was written by A. A. Bogdanov based on the integration of ideas from the natural and humanitarian sciences. Its role was not only to unite the general patterns of emergence, development and death of complex formations (complexes) in the environment. A. A. Bogdanov based his theory of knowledge on the category of experience. The energy principle served as a single scientific principle for him, but by the time he completed his work on Tectology, the energy principle had been replaced by the organizational principle.

"Tectology" by A. A. Bogdanov was recognized as the first scientific concept that presented the main ideas of cybernetics, systems theory and synergetics. Tectology discusses the concepts of organization and disorganization, the criteria for progressive and regressive development of forms in the environment, types of crises in development, ways of simplifying and complicating the quantitative and structural composition of forms, regulatory mechanisms that ensure their preservation or destruction, ways of increasing the stability and plasticity of forms, methods of resolving systemic contradictions.

Tectology introduced the concept of irreversibility in the development of complex forms, explaining their individual uniqueness. A historical analysis of the genesis of organizational forms, the methods of their interaction with the environment, the established mechanisms of stability, maintaining a mobile equilibrium, the nature of activities, resistances and types of connections between them was carried out. On this basis, trends in the development of forms are predicted. Among the main works of A. A. Bogdanov are “The Basic Elements of the Historical View of Nature” – St. Petersburg.

1899. 251 p., “A Short Course in Economic Science” Moscow, 1897 (15 reprints). “General Organizational Science. Part 1. (1913), Part II. (1917), Part III. (1922, Berlin), “Organizational Science and Economic Planning” // Proceedings of the 1st All-Russian Initiative Conference on the Scientific Or-

ganization of Labor and Production, January 20–27, 1921. Moscow, 1921. Issue 1, pp. 8–12, “Essays on Organizational Science” // Proletarian Culture. 1919. No. 7–10.

One of the prominent representatives of the analytical movement in the United States is Noam Chomsky, who has Belarusian roots on his mother’s side. She is originally from Bobruisk. One of Chomsky's first and widely known works is the book "Syntactic Structures" (1957), in which he outlined the idea of generative linguistics. N. Chomsky presented the grammar of natural language as a mechanism that is capable of generating an infinite number of grammatically correct sentences with initially limited language resources. However, his goal was not only to identify a mathematically precise grammatical system, but also to explain the creative use of language by people and the mechanisms of language acquisition by children.

The idea of universal grammar arose on the basis of a whole complex of studies devoted to the topic of the connection between language and thinking, in particular, under the influence of L.S. Vygotsky's book "Thinking and Speech", 1934, and is also based on the views of R. Descartes regarding the innate nature of thinking. N. Chomsky believes that universal grammar as a general set of syntactic rules is built into the human brain.

The logic by which a person constructs sentences and operates with language structures is dictated by the biological characteristics of his brain, and this is one of the conditions according to which universal grammar exists. An example in favor of this idea is the observation of how children learn language. At about the age of two, a child already understands speech without having any theoretical basis for this understanding. Any person with a normal level of mental development is capable of using language.

N. Chomsky believes that studying the structure of language, as well as its free use, will help to understand the structure of the human mind. His theory does not cover the entire set of facts regarding language and thinking. However, he is so confident in the correctness of the chosen direction for the development

of linguistics that he calls on scientists to actively develop their ideas in the future. The research of V.V. Martynov turned out to be close to the subject matter of N. Chomsky's works. Having synthesized the results of linguistic research with the achievements of semiology, praxeology and information theory, the scientist proposed a method for calculating linguistic meanings.

In the monograph "Cybernetics. Semiotics. Linguistics" (1966) V.V. Martynov, the foundations and prospects of deductive semiology are set out. The work "Semiological Foundations of Information Science" (1974) contains a prototype of a universal semantic code as a means of removing uncertainties in the structure of natural language. The monograph "Universal Semantic Code" (1977) presents the first version of the code, which V.V. Martynov improved in the works: "Categories of Language. Semiological aspect" (1982), "Universal semantic code: USC-3" (1984), "Universal Semantic Code. USC - 5" (1995), "Fundamentals of semantic coding. Experience of knowledge representation and transformation" (2001).

Fundamental analysis of the features of analytical philosophy, starting with the premises of R. Descartes' philosophy, was carried out by Doctor of Philosophy, professor of the Belarusian State University N.V. Rozhin. These are such publications as "Modern Western Moral Philosophy: (analytical tradition)" (1991) and "The Problem of Objective Reliability of Knowledge in European Philosophy (from R. Descartes to L. Wittgenstein) (2001).

Philosophy of language

Philosophy of language was formed within the framework of the cognitive paradigm of human intellectual activity. Aristotle, through the creation of formal logic, described the structures of human logical thinking. He did not limit himself to syntax. Within the framework of the implementation of the semantic approach, he formulated the postulate that knowledge must correspond to reality.

I. Kant transformed semantics. He substantiated the thesis that the truth of knowledge depends on the cognitive procedures used by the subject. Language structures (analytical and synthetic judgments, categories) are universal tools of cognition. It is possible to cognize the structures of thought only by cognizing the structures of language, since language is the only material expression of consciousness.

W. von Humboldt continued the implementation of I. Kant's philosophy of language. Thanks to his works, studies of the phenomenon of language were transformed into the concept of linguistic drift by E. Sapir, the hypothesis of B. Whorf about different models of world dissection and event coding embedded in different languages, the epistemology of "words and things" by M. Foucault and the generative grammar of N. Chomsky. N. Chomsky believed that it was necessary to reject Saussure's concept of language as only a systematic inventory of units and return to Humboldt's concept of hidden competence as a system of generative processes.

Linguistic theories, the cognitive dominant of which is the understanding of language as an active, creative principle, had the greatest influence on philosophical studies of language in the 20th–21st centuries. Theories have been developed in which language is defined as an information activity (W. von Humboldt, K. Bühler, L. Wittgenstein, J. Austin and J. R. Searle). Theories have also been developed in which language is defined as a constructive activity (J. Habermas, P. Berger, and T. Luckmann).

P. Berger and T. Luckmann developed the theory of institutionalization. It is based on the proposition that any human actions, as they are repeated, first become habitual and then turn into patterns.

The process of habitualization is the first phase of language activity and is found in speech stereotypes and cliches. As a result of multiple repetitions in various communicative situations, the most important and practically appropriate of them are selected. The habitual in actions becomes normal and creates the basis for the transition to institutionalization.

First, there is a segmentation of the institutional order, when only certain types of people perform certain actions. Then, as a result of the social distribution of knowledge, one or another type of role knowledge is assigned to specific types of people. As a result, the problem of integrating the entire diversity of meanings and legitimizing different types of institutional activity arises.

This is how the transition to the legitimation phase occurs, which leads to the emergence of semantic sub-universes. These are symbolic structures that include a set of values that a certain group adheres to, for which these values have the character of objective reality. An example of a sub-universe is law, served by the language of lawyers.

The symbolic universe of language ensures the integration of the processes of habitualization, institutionalization and legitimation. The "nomic" function of the symbolic universe is that everything in a person's life is put in its place, ordered and acquires meaning. The constructive function of language as an activity is manifested in the generation and accompaniment of non-linguistic symbolic worlds.

Analytical philosophy played a special role in the development of the philosophy of language. It began its reflection with a distrust of natural language. The analytical philosophy of logical analysis was oriented towards the language of science and sought to build a meta language for the latter that would be free from the inaccuracy, ambiguity, and metaphoric of natural language.

Frege and Russell were the creators of mathematical logic and tried to use it to analyze scientific knowledge and related philosophical problems. Objectivity as independence from ontological premises is guaranteed in the methodology of such approaches as the semantic concept of truth by A. Tarski, the theory of logical types by B. Russell, and the concept of external and internal questions about existence by R. Carnap.

Linguistic philosophy originates in Moore's philosophy of common sense and in the philosophy of the late Wittgenstein, Austin, Malcolm, and Ryle. Its representatives do not believe that artificial formal languages can solve all the

problems of knowledge and philosophy. They believe that natural language is a correct and sufficient tool for knowledge. Many of the semiotic categories have been developed in analytical philosophy.

In post structuralism, the category of language was replaced by the categories of discourse and text, and proto-writing. The predominant attention to language and its traditional understanding as a single system of signs are declared "logo centrism" and are explained by the researcher's violence against real material. Saussure's characteristics of the sign as the unity of the signifier and the signified are revised. The position that there is no signified without a signifier is supported, but the signifier is freed from the uniqueness of the signified, since it can form the most diverse relationships with all other signifiers. The text is characterized by a plurality of meanings the single intention of its author is deconstructed. The text is subject to transformation, irreversible disassembly and assembly in a new quality.

G.-G. Gadamer language is considered as the single language of the human mind. The utterance is interpreted by Gadamer as a response. Therefore, it is always motivated by the dialogical context. The meaning of the utterance is determined by the question to which it answers. Hermeneutics must reveal this meaning. Philosophy does not have its own language, Gadamer believes, and it should be engaged not so much in the criticism of language, as is asserted in the analytical tradition, as in its search, since a new language is required to express the meanings that are newly emerging in culture.

Phenomenologists put the analysis of the work of consciousness in the first place. Language turns out to be a symbolic expression of the work of consciousness. It is important that utterances are full-fledged signs of patterns, eidoses developed by consciousness.

After the works of N. Chomsky, the dominant position passed to syntax and pragmatic aspects of language. Pragmatics continued the study of meaning and became a kind of rival of semantics. The further development of the pragmatic turn, and along with it functionalism in grammar and cognitive linguistics

represented an effective counterweight to both structuralism, which sees language as an immanent closed structure, and the purely formal generative grammar of N. Chomsky and his followers.

Communication in nature and natural language are theoretically opposed to each other in many works. Experts highlight the genetic non-heritability of language; conventionality of the means of linguistic representation; the presence of syntax; the existence of linguistic rules; openness and incompleteness of language. The complexity of human language exceeds the complexity of any form of communication in nature, and for a long time language was considered the main distinguishing feature of man.

In ancient Greece, there were two theories of the origin of language – "fusei" and "thesei". The "fusei" school included supporters of the natural origin of names of objects (φυσει – Greek by nature), in particular, Heraclitus of Ephesus, believed that names are given by nature, since the first sounds reflected the things to which the names correspond. The one who names things must reveal the correct name created by nature, if this fails then he only makes noise.

Supporters of the "thesei" school believed that names come from the establishment, according to custom, of an agreement between people (θεσει – Greek by establishment). Democritus and Aristotle belonged to them. They pointed out many discrepancies between a thing and its name: words have several meanings, the same concepts are denoted by several words.

If names were given by nature, it would be impossible to rename people. The social contract hypothesis shows the influence of the ancient theory of Theseus, according to which people agreed to designate objects with words. This hypothesis was supported by the English philosopher Thomas Hobbes.

One of the theoretical and methodological devices for analyzing the processes of transmission, accumulation and inheritance of information, the processes of communication and cognition of the environment is the representative symbolic, "code" model, which is presented in the semiotics of C. S. Peirce and F. de Saussure and in the theory of information developed for technical systems.

According to this model, a sign encodes independent information (meaning, sense) different from the code signal itself.

The philosophy of language is associated with an expanded interpretation of the very concept of "language", in which language turns into a universal philosophical category, similar in scope to such concepts as "being", "substance" and "consciousness". A broad interpretation of language is based on the idea that there are many other, both man-made and non-man-made "languages". This approach defines language as any event, process and phenomenon.

In the works of C. Peirce there is a concept of "Legisignum". This is an ideal sign. Each legisignum signifies something due to a specific case of its application, which is called its Replica. It is through the Legisignum that a specific instance, a specific sign of an ideal sign becomes meaningful. C. Peirce, analyzing the article the, claims that a spoken or printed word, a word as a specific fact is not a genuine word. A genuine word is general and one in number, it does not exist. It determines things that exist in reality.

The existence of direct and indirect determination of skills, perception and thinking by "external" language and other sign systems was studied within the framework of the "Sapir-Whorf hypothesis", in the concept of "narrative logic" of F. Ankersmit, semiotic tradition and research studying such a phenomenon as sociocultural and semiotic scaffolding. The most famous in this area of research is the "theory of linguistic relativity" proposed by E. Sapir and B. L. Whorf.

In it, starting with the studies of J. M. Penn, it is customary to distinguish two versions: weak and strong. According to the weak version of the hypothesis, the vocabulary and grammar of a language to a certain extent influence ideas, correlate with them, but do not strictly determine them.

The strong version of the hypothesis represents the position of linguistic determinism, believes that thinking is impossible without language, and language (its structure, vocabulary, grammar) are the direct cause and necessary condition that forms ideas and thinking.

The ancient Greeks used the word "logos" to denote a word, speech, spoken language and at the same time to denote reason, thought. They began to separate the concepts of language and thought much later. W. Humboldt, a German linguist, the founder of general linguistics as a science, believed that language is the forming organ of thought.

Nevertheless, modern scientists tend to associate it mainly with the left hemisphere, which is responsible for speech, its coherence, abstract, logical thinking and abstract vocabulary. The right hemisphere is associated with visual-figurative, concrete thinking, with the subject meanings of words.

This hemisphere is non-verbal, responsible for spatial perception, controls gestures (but the left hemisphere usually recognizes sign language). A number of scientists offer a more complex classification of types of thinking and principles of their development, not based only on the verbal-logical model of thinking. In particular, Robert J. Sternberg believes that a person has three main types of intelligence: 1) analytical – studied by modern tests and solving logical problems; 2) creative – capable of solving non-standard problems; 3) practical – capable of solving problems of everyday life. Another researcher, Howard Gardner, offers a more complex theory of "multiple intelligences", which suggests the possibility of studying and assessing at least eight types of intelligence: 1) linguistic; 2) logical-mathematical; 3) spatial; 4) musical; 5) bodily-kinesthetic; 6) interpersonal; 7) intrapersonal and 8) naturalistic.

The development of these ideas about cognitive abilities will probably lead to further improvement of the structure and types of tests and refinement of methods for checking knowledge and skills. Thinking and language at the early stages of their development implement, complete and accompany practical activity. Based on this, it can be assumed that it is not so much language or thinking that develop each other, but rather practical activity, built into and conditioned by a certain ecosystem, that determines their existence and specific (subject-semantic) content. Therefore, evolutionarily, language and thinking have always been important not in themselves, but only as components and deriva-

tives of practical activity, being, using the terminology of J. Lewontin and S. D. Gould, its "spandrels".

Relatively autonomous, decontextualized linguistic activity (languaging), and its development, liberated from other forms of activity, and thinking as such are the result formed at later stages of social evolution and associated with the emergence of abstract thinking and "theoretical culture". 2. Development of language and theoretical thinking Analyzing the role of language in the development of thinking, science and literature, E. B. Condillac says that the sign systems of language are similar to the signs of geometry, which allow new knowledge to be born and expand the cognitive capabilities of researchers.

For example, I. Newton, according to the author, owes his discoveries in mathematics and physics to the developed language and methods of calculation of science, which allowed him to make outstanding discoveries.

Cognitive philosophy had a great influence on the development of music in the 20th century. Dmitry Shostakovich became one of the most prominent continuers of this tradition. A festival dedicated to the work of D. Shostakovich is held in Belarus. The forum honors the personality and work of the composer not only due to his unique contribution to the world musical treasury.

Dmitry Shostakovich's family originates in the Myadel district of the present-day Minsk region.

The most famous musical work of the Great Patriotic War gave enormous support to the residents of besieged Leningrad. The "Leningrad" Symphony became the author's dedication to the city under siege. It was evidence of the irreconcilable strength of spirit of the Soviet people.

The premiere of the work took place in 1942. The music sounded in every home, on the streets, on the radio and from public loudspeakers. It was on the day of the premiere of the Leningrad Symphony Orchestra that the German military realized that they would lose the war. The author of the famous seventh anti-fascist "Leningrad" symphony was D. Shostakovich. He created operas, bal-

lets, and film music. People's Artist of the USSR, laureate of the Stalin Prize, Soviet classic.

Not far from the Belarusian city of Myadel, on a farm that was once an estate of nobles, lived the great-grandfather of the great composer. To this day, a temple has survived, in which, according to the composer's genealogy, Shostakovich's ancestors were married and baptized their children. Once the temple was wooden. Today it is a temple listed as an architectural monument of the 18th century. Here are rare icons of the Mother of God of Vostrabramskaya and the Mother of God. Amazing stained glass windows from French masters, once invited to decorate the interior.

As if a complete picture is being formed of how everything was in the old days (that is, during the life of Shostakovich's ancestors). But an unexpected sensation straight from the provinces. The composer's great-grandfather Pyotr Shostakovich lived four kilometers from the farmstead, in the village of Kolodnaya. In the 17th century, the Shostakovich surname was quite common in the local lands. Shostakovich Sr. did not live in Kolodnaya for long.

Thanks to local Belarusian enthusiasts, the Shostakovich Contemporary Music Festival was born. For the sixth time, the Myadel land was chosen as the venue for one of the concerts. In addition to the temple, gardens, alleys and a park laid out by the owners of the estate have been preserved here. The place lives a quiet, ordinary life and continues the glorious history of the region. The concert featured two cycles of the composer - "Spanish Songs" and "Satires".

The cycle "Spanish Songs" presents a mysterious work of the composer, about which little is known. This work was created at the suggestion of the famous singer Zara Dalukhanova, who, according to one version, recorded and presented the composer with real folk melodies, and according to another, asked the composer to write songs to the poems of a young Spanish youth who was taken from Franco's Spain to the USSR as a child, where he grew up.

The poems were translated into Russian, and this semi-professional poetic experience formed the basis of the cycle. "Spanish Songs" reflected the Spanish

tradition in Russian music. The color, rhythms and melodies of Spain have always attracted Russian composers.

These are the Spanish overtures of M. Glinka, the romance "I am here, Inesilla", "Spanish Capriccio". Rimsky-Korsakov, the Spanish dance from "Swan Lake" by P. Tchaikovsky and his "Don Juan Serenade".

The cycle "Satire" based on the poem by Sasha Cherny is one of the most famous vocal cycles of D. Shostakovich. It was a reaction to the discovery of the names of the banned poets of that time. "Satires" became a kind of diary of the era, where all the use of life was reflected in the smallest details.

In the poems of the 1910s, the composer felt something close to the atmosphere in which he grew up and his creative style was formed, the atmosphere of bold literary experiments and sharp humor. D. Shostakovich definitely saw a parallel with a man whose life was increasingly drowning in the quagmire of everyday life, lack of money and boredom, and his own situation in the early 60s of the twentieth century.

Cognitive science

One of the directions of modern structural engineering and artificial intelligence has become simulation modeling of the processes taking place in the human brain. These studies should contribute to the development of computer programs that will behave like the everyday lifestyle of a modern person, taking into account communicative connections with people and the social environment. Solving this problem will allow robots to take over various functions of people's everyday life, taking into account their professional activities.

Under the influence of constantly changing communication situations, computer programs are forced to have a resource of mobile self-education in order to achieve an adequate response to visual information exposure. This includes the ability to recognize information and images, proactive consideration of the distinctive features of the participants of communication.

This means that the computer program must have not only an analogue of keywords for building texts, but also a mental conclusion of categorizing information in terms of legal, moral-ethical, technical, mental norms.

The problem is created by the locality of the mental norm. One and the same norm can have linguistic and visual cultural modifications. Norms can contain various quantitative parameters. A computer program can encounter deviant behavior of people who do not correspond to the norms accepted in society. Semi-sedentary forms of human consciousness are designated as cognition. They include manipulation of knowledge, information, taking into account the mental peculiarities characteristic of human consciousness. Psychology and logic are closely related to pragmatics. Synthesis gives an idea of how people think and how language affects the content of thought and its demonstration.

Mechanisms of social adaptation, public opinion, life strategy and tactics, communication create a norm phenomenon, which is designated as a frame, template, algorithm and invariant. The cognitive paradigm received a disciplinary modification in the form of cognitive psychology, anthropology, computer science, cognitive linguistics, neuron philosophy and neuron marketing. Cognitive linguistics studies the mental features of a person's understanding of information and its presentation in the form of key words and sentences – text in the form of verbal and written language. Particular attention is paid to the construction of images.

Cognitive studies the stylistics of text construction in accordance with the communication patterns developed by the social environment. At the same time, the factor of cognitive interpretation has to be taken into account. It is modeled as a cognitive calculation of the meaning of thought. Modeling is facilitated by the distinctiveness of a person not only to perceive information, but also to actively systematize it based on the conclusion of categorical worldview structures (patterns). These structures filter information.

Its value falls if it does not correspond to the life goals of the individual. For example, the pattern of professional dominance confirms academic disciplines in the student's mind by their practice-oriented value.

The main resource of information processing is categorized experience. The product of information processing is represented by means of language. Cognitive linguistics studies consciousness and thinking in the concepts of language. A person receives information through different channels. Cognitive linguistics is only interested in those related to language. In addition to the function of obtaining information, language performs the function of presenting knowledge, taking into account mental characteristics and processes.

Mentality transforms information and creates the phenomenon of its tropism. Cognitive linguistics investigates the peculiarities of human perception of information, its categorization, classification, accumulation of knowledge and its use by humans in the processes of activity and communication.

Mentality conditioned the formation of psycholinguistics, ethno linguistics, sociolinguistics, and linguistic cultural studies in the structure of cognitive linguistics. Cognitive linguistics developed the terminological apparatus of operational units of human memory. Frames denote stereotypical situations, scenarios that form the structure of experience.

Concepts reflect a set of meanings covered by a word. Gestalts reflect premental images of the environment. Experience on this conclusion forms a person's orientation to information (intentionality).

Mentality creates group and individual characteristics of communication. In this situation, interpretation plays an important role. It reflects the resources of the range of tolerance. Different concepts of the conceptual scheme can be denoted by the same word. Namely, this circumstance became one of the reasons for the study of language in anthropological and cognitive contexts. Cognitive activity provides a person with information necessary for adaptation to the social environment, to achieve specific goals.

Concepts create a rational basis for communication. If a person possesses a conceptual apparatus, he is integrated into categories and classes developed by society. There is a category of concepts of cultural universals.

Macro concepts reflect the toponymy of the biosphere, for example, the elements. The basic concepts of consciousness form a system of value coordinates (Motherland, home). Micro concepts reflect aspects of the everyday combination of work and leisure. The engineering science of artificial intelligence had an influence on the formation of the methodology of cognitive linguistics. The similarity of a computer and a person in the step-by-step processing of information is taken as a conclusion.

Concepts of information and knowledge structure, information processing and memory retention, information representation in human consciousness and language forms are taken from information theory. Questions about how a person learns, what information becomes knowledge, how mental spaces are formed are taken from philosophy. As a result, a thesis was developed about thinking as manipulation of frames, plans, scenarios, models, concepts.

Cognitive psychology takes a similar position. According to this science, the key ability of the human brain is the ability to classify and categorize objects and phenomena of life. Categories have a modification of mental concepts forming long-term memory. The direction of intellectual tasks of image recognition, text understanding, representation, storage, search, information processing and algorithms is selected.

Cognitive linguistics is directly related to cognitive psychology, since the study of language is impossible without taking into account the perceptual processes of perception and memory. Gestalt psychology plays an important role in cognitive linguistics. The interdisciplinary context of cognitive science is determined by its tasks to describe and explain the mechanisms at the entrance and exit of human reflection, to investigate the inner mental nature of a person, his activity in the world of this nature. Affects and deviation create a risk factor.

The subject area of cognitive linguistics is focused on the theory of knowledge taking into account the rules of interpretation (cognitive semantics and pragmatics).

Belarusian researchers made a significant contribution to the formation of the disciplinary topography of modern cognitive science. Thus, the development of cognitive linguistics was facilitated by the work of Y.F. Karsky, L.V. Shcherby, who emphasized the study of distinctiveness of living language. L.M. Lyashcheva focused her research interest on the topic of lexical polysemy in the cognitive aspect. The ambiguity of words in natural languages creates difficulties not only in translation, but also in recognizing the content and correctly interpreting the message.

Talented native of Belarus S.I. Janouskaya did a lot to integrate cognitive linguistics with the topic of artificial intelligence through mathematical modification. While working at Moscow State University, she made a lot of efforts to acquaint the Russian-speaking audience with the achievements in the field of artificial intelligence in the USA. This became the basis for the active development of research in the USSR. The ban on cybernetics was lifted.

Domestic researchers and developers began to pay significant attention to issues of artificial intelligence and its role in the modernization of management, creativity, and engineering. One of the first research schools on the border of cognitive linguistics and artificial intelligence was created by V.U. Martinau.

At the level of philosophical reflection, the work of M.I. Zhukov, dedicated to the analysis of the distinctiveness of mathematical language, computer science, artificial intelligence. His student – S.P. Kulik summarizes methodological approaches to human thinking from the standpoint of the strategy of computerization of society and professional activity.

Artificial intelligence will be in the field of vision of specialists in the field of aesthetics. M.I. Krukouski published a special work dedicated to cybernetics and the laws of beauty. The philosophy department of the Belarusian National Technical University became the venue for the meeting of cognitive logic

and aesthetics. The result of methodological research was the joint work of Z.V. Brazhnikova and A.S. Karluk.

Belarusian State Pedagogical University has become one of the centers of cognitive psychology research. Its institutionalization led to the formation of a scientific tradition of cognitive studies, which are held once every two years and provide an opportunity for Belarusian researchers to present the results of their scientific work.

The foundations for cognitive neurophysiology and neurobiology were created by researchers at medical institutions of higher education in Minsk and Vitebsk. After joining the computer graphics laboratory of the United Institute of Informatics of the National Academy of Sciences of Belarus, the connection of neural networks with cognitive technologies from the standpoint of studying the activity of the human brain with cognitive processes became evident.

The emerging system of cognitive sciences in Belarus required a synthetic paradigm of cognitive science. The beginning of its development was laid by the research of M.V. Rozhin, in which epistemology was transformed into cognitive science. The initial thesis is that the human brain is oriented to knowledge by a certain system of conceptual coordinates in the form of the requirement of logic, principles, paradigms, ideals of knowledge. Categorical structures synthetically look like conceptual schemes.

When a person learns reference words, he acquires personal habits of individuation and classification of things. Cognition resembles an intellectual game. One of the means of this game is language. Grammatical expressions are the rules of the intellectual game. Conceptual schemes set reliability criteria only within the scope of competence. We guess with the help of schemes. We do not investigate them. From this arises the space of mentality. The character of the experience and the conceptual means by which the experience realizes itself represent a function of the corresponding language.

Categorization became the subject of research by V.S. Stepin. He studied it on the example of the interaction of universals of culture and categories of

philosophy. Categorization activates the resources of memory and attention. Any science strives for categorization and thus develops the discourse of the subject area of research and presentation of their results in the form of scientific texts. Scientists are engaged in the categorization of sciences.

This was the case with mathematics. First, she developed the language of arithmetic, then geometry. R. Descartes developed the language of algebra. J. Boole proposed the language of mathematical logic. In the 20th century, this language became the language of artificial intelligence technologies, design and construction activities of engineers. European philosophy paid more attention to the intellectual professional activity of scientists.

The philosophy of the United States made the daily life experience of an American a subject of research. A similar approach took place in S. Maiman's autobiographical study. He will make his own consciousness the subject of cognitive research. This methodology had a practical use in the practice of Belarusian lawyers, creators of the Statutes of the Republic of Belarus. Abstract categories were not imposed on the population on the contrary phenomena that had no scientific justification were regulated in the articles by norms. Thus, in one of the articles of the Statute of the Great Patriotic War, the status of dragons was regulated and punishments for harming them were prescribed.

Cognitive studies include consideration of the relationship between consciousness and the brain. We are talking about what happens in a person's brain when it realizes the function of consciousness (reflecting, processing information making decisions in the form of a reaction). Brain structures are studied at the level of molecules, neurons, receptors, physiology, physics and chemistry of processes. Cognitive psychology is considered in an interdisciplinary connection with neurobiology and neuron philosophy. P. and P. Chorchlandy became supporters of this methodology.

It is one thing to study the mechanisms of the human brain in order to develop medical, educational, educational, ergonomic tips, and another thing is transhumanism, which involves the gradual transfer of functions of thinking, de-

cision-making, effective organization of humans and automated systems. During the transition period, engineers will follow a hybrid methodology. A person will remain on the biological platform of an organism with its characteristic shortcomings. Technical devices will supplement then replace a person in the processes of economic, sedentary life.

In perspective, transhumanists see a person in demarcation with the biological nature of the organism and its characteristic shortcomings. Under such a scenario of technological determinism, a person will go beyond the limits of biological evolution. Many concepts of everyday life will lose their meaning. Genetic engineering provides an option to preserve human nature with the possibility of correction and transformation on an organic basis. But even here there are risks. The construction methodology of the future of man is connected with the NBICS concept. It involves a combination of nanotechnology, biotechnology, informatics, cognitive science, and social approaches in futurology.

Economic determinism argues for the need for innovation. At the same time, the calculation is based on the traditional mechanism of the ratio of supply and demand. In order to meet the growing demand, you need to have the prospect of growing incomes and employment. The organism of a modern person determines the appropriateness of a significant part of commodity production in the sectors of food, drink, comfort, clothing (shopping), age needs, pharmaceuticals, cosmetics, the service sector, and medicine. The shadow economy uses the mechanisms of drug trafficking, intimate services, migration, and terrorism. A person outside the biological body transforms the social environment.

Thus, the human perspective at the conclusion of the paradigm of technological determinism is related to fundamental questions for humans. The methodology of cognitive sciences does not look into such a distant perspective. She is interested in the processes of interdisciplinary synthesis of various scientific disciplines within the innovative trend. The paradox of the modern stage of technological evolution lies in the fact that the humanities have become a part of engineering. What happened was not so much the humanization of technical sci-

ences as their instrumental for the tasks of technological determinism. D. Dennett, J. Searle, J. Fodor, D. Hofstadter, J. Lakoff, J. McClelland, S. Pinker.

The conclusion is the use of computer models of the theory of artificial intelligence, experimental methods of psychology and physiology of the higher nervous system (the theory of the human brain).

The methodological approach claims that human thinking is similar to the thinking of a computer that has a central processor and processes streams of symbolic data. At the same time, it is argued that human thinking cannot be reduced to a computer processor, as it is not compatible with neurobiological data on brain activity. Human thinking can be stimulated by artificial neural networks, which consist of formal neurons that process data streams. This explanation gave rise to cognitive neurobiology.

As a result, mathematical logic and artificial intelligence, material cognitive science, cognitive ethology, neurology, neurophysiology, neurolinguistics, cognitive geography, cognitive anthropology, neuroscience, experimental psychology appeared in the space of convergence. knowledge.

M. Minsky drew attention to the computer analogue of the organization of knowledge. In a relatively small amount of memory, intelligent systems are able to store a large amount of data to adequately respond to questions. One of the special organizations of databases is the frame organization of databases. A frame as a structure holds slots and windows in which daemons are accumulated, links to other frames, and internal information in the form of values. It is an element of the human cognitive system.

The frame reflects the knowledge known to the majority of members of this society. It includes stable conventional features that facilitate quick frame recognition. The frame performs the function of storing information in the form of a topic and slots (information terminals). A frame is a cognitive structure of schematization of experience and is part of a concept. These structures reduce the difference between observed and imagined phenomena to one thing – to a rubric.

Concepts are the building blocks of the conceptual system. They facilitate information processing. Static and dynamic frames (scenarios) are described. A dynamic frame contains necessarily minimal structured information that uniquely defines a given class of objects and typologies any object relative to this class of objects. It maintains the sequence of events caused by a recurring situation. It maintains a conventional nature, as it is based on sociocultural information.

V. Martynov developed a method of calculating linguistic meanings in the form of deductive semiology. As a result, he developed a universal semantic code. Computational linguistics is updated. The practice of developing decision-making algorithms in the system of universal semantic code based on the conclusion of semantic coding has been created. This is possible thanks to the nominative arrangement of the language in the form of a semantic code with speech and visual means characteristic of it, organizing predicate and predicate interactions within the language system.

Categorization in combination with the classification of nominative units of the language of reality opens the way to the formation of symbolic units with the function of meaning, fragmentation of reality and the formation of categorical structures. These structures become a resource of artificial intelligence, which, based on the conclusion of language as a system of signs, gets the opportunity to transform information.

Issues of human perception of visual images in the context of their recognition based on the frame system are considered. Issues of understanding meanings in sentences of natural language, organization of systems of frames intended for these purposes, and calculation of construction of computer programs that understand the language of communication are highlighted.

A frame is a data structure for representing a stereotypical situation. Different types of information are associated with the frame. One part of it indicates how to use this frame. The second part shows what can result from its use. The third part suggests what to do if expectations are not met. The frame consists of nodes and connections between them. They create a rational network, the upper

levels of which are formed by concepts applicable to any situation. At lower levels, special terminal vertices dominate, which should be filled with characteristic examples or data. A high mobility of reaction to changes in the content of information is achieved.

M. Minsky gave an applied aspect to the paradigm shift methodology. Having understood how the human brain and psyche are arranged, it is possible to actualize these phenomena in a computer program. She will be not only thinking, but also emotional "The emotion machine". F. Rosenblatt described the first artificial neural network. M. Minsky developed a practical implementation of this network. It is used for analyzing large volumes of data, deep learning, and deep sleep. The first artificial neural networks had a small number of neurons. A minimal neural network includes three hundred and twenty neurons in the Celegans worm.

In the visual cortex of the human brain, there are ten thousand connections per neuron. In the hippocampus, one neuron has fifty thousand connections per neuron. No artificial neuron can yet perform such a volume of connections. As a result, human imitation has become a long-term strategy. Specialists focused their interests on robotics. The subject was human emotions, an imitation of which robots in the service sector need. Robots need vision. This means that they must have the ability to recognize colors, construct color images in the form of images. Since robots are included in communication processes, feedback, video signals, image recognition, and tactile-motor activity of human technical analogues became the subject of research.

Robots began to transmit simple movements of the hands and feet of a person, as well as the head. The reconstructions were subject to sensations that accompany contact with another object. Educational institutions in Brest and Minsk deal with robotics. At BrSTU, A. Dunets created a student research laboratory, in which students developed the designs of a robot guide, a robot guard, a robot tour guide, and a technical vision system.

The robot consists of hardware and software. Software code is loaded into the board. It updates information from sensors and controls engines. The details of the robot are modeled in "3D Max" or "Sketch Up" programs and printed on a 3D printer. The Faculty of Information Technologies and Robotics is the basic faculty of the Belarusian National Technical University. Mobile, small-sized, extreme, functional robots are being developed. They include an embroidery robot, a robot polisher, a welding robot, drones, manipulators. Industrial robots and robotic complexes are relevant for industry.

Automation has become an element of traffic control, security systems. Convergence has become a trend in the activity of corporate structures. So, the BSUIR developed a robot for the Ministry of Emergency Situations based on the "Belarus-132" tractor. BSU has developed a dosing robot with a coordinate 3D manipulator. Robotics talents have the opportunity to take part in the World Robot Olympiad from Belarus. The High Technologies Park is the coordinator of this work. Economic prospects of robotics are considered by K. Kelly (New Rules for the New Economy). Robots will be given functions that are measured by efficiency and productivity categories. These functions are presented in the form of twelve trends.

Robots need an artificial neural network (mathematical model and software or hardware), built according to the principle of organization and functioning of networks of nerve cells of a living organism. The use of simulation modeling dominates the developments. Strong artificial intelligence uses methods of building algorithms capable of self-learning.

This is necessary if there is no clear solution to any problem. In this case, it is easier not to look for a solution, but to create a mechanism that will come up with a method for its search. Deep learning is machine learning algorithms that use a lot of computing resources (neural networks).

G. Altshuler was one of the first to show how a computer program (ARVZ) can perform search tasks of design activity. Neuron marketing search programs quickly determine the tendencies of buyers and offer them product

catalogs. Search programs allow you to avoid risks based on the analysis of transactions. Artificial intelligence has become a platform for providing taxi and room services. This is explained by the fact that access to resources has become more significant than owning them.

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